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# FCC Test Report

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Report No.: AGC00703190601FE05

**FCC ID** : 2AQQKWJ11  
**APPLICATION PURPOSE** : Original Equipment  
**PRODUCT DESIGNATION** : 2.4G Camera  
**BRAND NAME** : Howell  
**MODEL NAME** : WJ11, WJ12, WJ13, WJ14, WJ15  
**APPLICANT** : Shenzhen Howell Intelligent Technology Co.,Ltd.  
**DATE OF ISSUE** : Jul 05, 2019  
**STANDARD(S)** : FCC Part 15.247  
**TEST PROCEDURE(S)**  
**REPORT VERSION** : V1.0

Attestation of **Global Compliance (Shenzhen) Co., Ltd**

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**REPORT REVISE RECORD**

<b>Report Version</b>	<b>Revise Time</b>	<b>Issued Date</b>	<b>Valid Version</b>	<b>Notes</b>
V1.0	/	Jul. 05, 2019	Valid	Initial Release

## TABLE OF CONTENTS

<b>1. VERIFICATION OF CONFORMITY .....</b>	<b>5</b>
<b>2. GENERAL INFORMATION.....</b>	<b>6</b>
2.1. PRODUCT DESCRIPTION .....	6
2.2. TABLE OF CARRIER FREQUENCYS .....	6
2.3. IEEE 802.11N MODULATION SCHEME.....	7
2.4. RELATED SUBMITTAL(S) / GRANT (S) .....	7
2.5. TEST METHODOLOGY .....	7
2.6. SPECIAL ACCESSORIES.....	7
2.7. EQUIPMENT MODIFICATIONS .....	7
<b>3. MEASUREMENT UNCERTAINTY .....</b>	<b>8</b>
<b>4. DESCRIPTION OF TEST MODES.....</b>	<b>9</b>
<b>5. SYSTEM TEST CONFIGURATION .....</b>	<b>10</b>
5.1. CONFIGURATION OF EUT SYSTEM .....	10
5.2. EQUIPMENT USED IN EUT SYSTEM.....	10
5.3. SUMMARY OF TEST RESULTS.....	10
<b>6. TEST FACILITY .....</b>	<b>11</b>
<b>7. OUTPUT POWER.....</b>	<b>12</b>
7.1. MEASUREMENT PROCEDURE .....	12
7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....	12
7.3. LIMITS AND MEASUREMENT RESULT .....	13
<b>8. 6 DB BANDWIDTH.....</b>	<b>15</b>
8.1. MEASUREMENT PROCEDURE .....	15
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....	15
8.3. LIMITS AND MEASUREMENT RESULTS .....	16
<b>9. CONDUCTED SPURIOUS EMISSION .....</b>	<b>24</b>
9.1. MEASUREMENT PROCEDURE .....	24
9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....	24
9.3. MEASUREMENT EQUIPMENT USED .....	24
9.4. LIMITS AND MEASUREMENT RESULT .....	24
<b>10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY .....</b>	<b>43</b>

- 10.1 MEASUREMENT PROCEDURE ..... 43
- 10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)..... 43
- 10.3 MEASUREMENT EQUIPMENT USED ..... 43
- 10.4 LIMITS AND MEASUREMENT RESULT ..... 43
- 11. RADIATED EMISSION..... 51**
  - 11.1. MEASUREMENT PROCEDURE ..... 51
  - 11.2. TEST SETUP ..... 52
  - 11.3. LIMITS AND MEASUREMENT RESULT ..... 53
  - 11.4. TEST RESULT ..... 53
- 12. BAND EDGE EMISSION ..... 59**
  - 12.1. MEASUREMENT PROCEDURE ..... 59
  - 12.2. TEST SET-UP..... 59
  - 12.3. TEST RESULT..... 60
- 13. FCC LINE CONDUCTED EMISSION TEST ..... 76**
  - 13.1. LIMITS OF LINE CONDUCTED EMISSION TEST..... 76
  - 13.2. BLOCK DIAGRAM OF TEST SETUP ..... 76
  - 13.3. PROCEDURE OF LINE CONDUCTED EMISSION TEST ..... 77
  - 13.4. TEST RESULT OF LINE CONDUCTED EMISSION TEST ..... 78
- APPENDIX A: PHOTOGRAPHS OF TEST SETUP ..... 80**
- APPENDIX B: PHOTOGRAPHS OF EUT ..... 82**

## 1. VERIFICATION OF CONFORMITY

<b>Applicant</b>	Shenzhen Howell Intelligent Technology Co.,Ltd.
<b>Address</b>	5/F, No.13 Building, Nangang 2ndIndustrial Park, Songbai Road, Xili Town, NanShan District, Shenzhen, China 518055
<b>manufacturer</b>	Shenzhen Howell Intelligent Technology Co.,Ltd.
<b>Address</b>	5/F, No.13 Building, Nangang 2ndIndustrial Park, Songbai Road, Xili Town, NanShan District, Shenzhen, China 518055
<b>Factory</b>	Shenzhen Howell Intelligent Technology Co.,Ltd.
<b>Address</b>	5/F, No.13 Building, Nangang 2ndIndustrial Park, Songbai Road, Xili Town, NanShan District, Shenzhen, China 518055
<b>Product Designation</b>	2.4G Camera
<b>Brand Name</b>	Howell
<b>Test Model</b>	WJ11
<b>Series Model</b>	WJ12, WJ13, WJ14, WJ15
<b>Declaration of Difference</b>	All the same except for the model name
<b>Date of test</b>	Jun. 20, 2019 to Jul. 04, 2019
<b>Deviation</b>	None
<b>Condition of Test Sample</b>	Normal
<b>Test Result</b>	Pass
<b>Report Template</b>	AGCRT-US-BGN/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Tested By

*Calvin Liu*

Calvin Liu(Liu Junchen)

Jul. 04, 2019

Reviewed By

*Max Zhang*

Max Zhang(Zhang Yi)

Jul. 05, 2019

Approved By

*Forrest Lei*

Forrest Lei(Lei Yonggang)  
Authorized Officer

Jul. 05, 2019

## 2. GENERAL INFORMATION

### 2.1. PRODUCT DESCRIPTION

The EUT is designed as “2.4G Camera”. It is designed by way of utilizing the DSSS and OFDM technology to achieve the system operation.

A major technical description of EUT is described as following

<b>Operation Frequency</b>	2.412 GHz~2.462GHz
<b>Output Power(Average)</b>	IEEE 802.11b:15.31dBm; IEEE 802.11g:14.72dBm; IEEE 802.11n(20):14.76dBm; IEEE 802.11n(40):13.98dBm
<b>Modulation</b>	DSSS(DBPSK/DQPSK/CCK);OFDM(BPSK/QPSK/16-QAM/64-QAM)
<b>Number of channels</b>	11 channels for 802.11b/g/n20 7 channels for 802.11n40
<b>Hardware Version</b>	XWL_WJ11_MainBoard_Rev1.5 2019.04.17
<b>Software Version</b>	21.117.0.7.50
<b>Antenna Designation</b>	Integrated antenna
<b>Antenna Gain</b>	2dBi
<b>Power Supply</b>	DC 5V by adapter or DC 3.7V by Battery

### 2.2. TABLE OF CARRIER FREQUENCIES

Frequency Band	Channel Number	Frequency
2400~2483.5MHZ	1	2412 MHZ
	2	2417 MHZ
	3	2422 MHZ
	4	2427 MHZ
	5	2432 MHZ
	6	2437 MHZ
	7	2442 MHZ
	8	2447 MHZ
	9	2452 MHZ
	10	2457 MHZ
	11	2462 MHZ

Note: For 20MHZ bandwidth system use Channel 1 to Channel 11, For 40MHZ bandwidth system use Channel 3 to Channel 9

### 2.3. IEEE 802.11N MODULATION SCHEME

MCS Index	Nss	Modulation	R	NBPS	NCBPS		NDBPS		Data rate(Mbps)			
					800nsGI		20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
					20MHz	40MHz						
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5		
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0		
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5		
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0		
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0		
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0		
6	1	64-QAM	3/4	6	312	648	234	489	58.5	121.5		
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0		

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPS	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	Guard interval

### 2.4. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for FCC ID: 2AQQKWJ11 filing to comply with the FCC Part 15 requirements.

### 2.5. TEST METHODOLOGY

KDB 558074 D01 15.247 Meas Guidance v05: Guidance for compliance measurements on Digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules  
ANSI C63.10:2013 : American National Standard for Testing Unlicensed Wireless Devices

### 2.6. SPECIAL ACCESSORIES

Refer to section 5.2.

### 2.7. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

### **3. MEASUREMENT UNCERTAINTY**

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in measurement" (GUM) published by CISPR and ANSI.

- Uncertainty of Conducted Emission,  $U_c = \pm 3.2$  dB
- Uncertainty of Radiated Emission below 1GHz,  $U_c = \pm 3.9$  dB
- Uncertainty of Radiated Emission above 1GHz,  $U_c = \pm 4.8$  dB



#### 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX
2	Middle channel TX
3	High channel TX
4	Normal operating

**Note:**

Transmit by 802.11b with Data rate (1/2/5.5/11)

Transmit by 802.11g with Data rate (6/9/12/18/24/36/48/54)

Transmit by 802.11n (20MHz) with Data rate (6.5/13/19.5/26/39/52/58.5/65)

Transmit by 802.11n (40MHz) with Data rate (13.5/27/40.5/54/81/108/121.5/135)

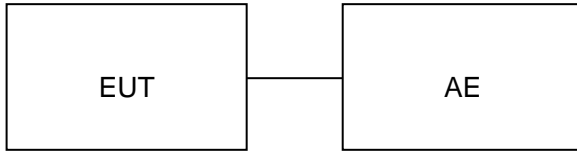
**Note:**

1. The EUT has been set to operate continuously on the lowest, middle and highest operation frequency Individually, and the eut is operating at its maximum duty cycle>or equal 98%
2. All modes under which configure applicable have been tested and the worst mode test data recording in the test report, if no other mode data.
3. The test software is the MT7601USB which can set the EUT into the individual test modes

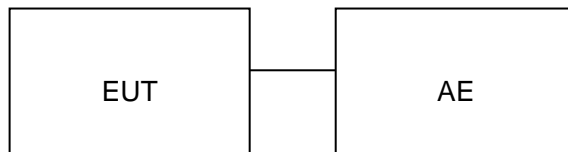
## 5. SYSTEM TEST CONFIGURATION

### 5.1. CONFIGURATION OF EUT SYSTEM

Radiated Emission Configure :



Conducted Emission Configure :



### 5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	2.4G Camera	WJ11	2AQQKWJ11	EUT
2	Adapter	JHD-AP006U-050100BB-2	DC 5V/1A	AE
3	USB-TTL	N/A	N/A	AE

### 5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247	Output Power	Compliant
§15.247	6 dB Bandwidth	Compliant
§15.247	Conducted Spurious Emission	Compliant
§15.247	Maximum Conducted Output Power SPECTRAL Density	Compliant
§15.209	Radiated Emission	Compliant
§15.247	Band Edges	Compliant
§15.207	AC Power Line Conduction Emission	Compliant

## 6. TEST FACILITY

<b>Test Site</b>	Attestation of Global Compliance (Shenzhen) Co., Ltd
<b>Location</b>	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
<b>Designation Number</b>	CN1259
<b>FCC Test Firm Registration Number</b>	975832
<b>A2LA Cert. No.</b>	5054.02
<b>Description</b>	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

### TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	Jun. 12, 2019	Jun. 11, 2020
LISN	R&S	ESH2-Z5	100086	Aug. 28, 2018	Aug. 27, 2019

### TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun. 12, 2019	Jun. 11, 2020
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 20, 2018	Dec. 19, 2019
Power sensor	Aglient	U2021XA	MY54110007	Sep. 20, 2018	Sep. 19, 2019
2.4GHz Fliter	Micro-tronics	087	N/A	Jun. 12, 2019	Jun. 11, 2020
Attenuator	Weinachel Corp	58-30-33	N/A	Jun. 12, 2019	Jun. 11, 2020
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 21, 2017	Sep. 20, 2020
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Jun. 13, 2019	Jun. 12, 2020
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May 17, 2019	May 16, 2020
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 25, 2018	Oct. 24, 2019
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep. 28, 2017	Sep. 27, 2019

## 7. OUTPUT POWER

### 7.1. MEASUREMENT PROCEDURE

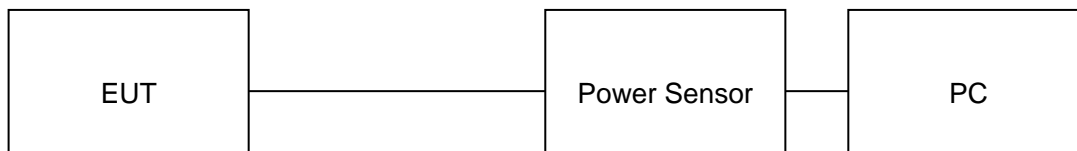
For average power test:

1. Connect EUT RF output port to power sensor through an RF attenuator.
2. Connect the power sensor to the PC.
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Record the maximum power from the software.

**Note :** The EUT was tested according to ANSI C63.10 (2013) for compliance to FCC 47CFR 15.247 requirements.

### 7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

#### AVERAGE POWER SETUP



**7.3. LIMITS AND MEASUREMENT RESULT**

<b>TEST ITEM</b>	OUTPUT POWER
<b>TEST MODE</b>	802.11b with data rate 1

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.412	<b>15.31</b>	30	Pass
2.437	15.08	30	Pass
2.462	14.96	30	Pass

<b>TEST ITEM</b>	OUTPUT POWER
<b>TEST MODE</b>	802.11g with data rate 6

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.412	14.66	30	Pass
2.437	<b>14.72</b>	30	Pass
2.462	14.58	30	Pass

<b>TEST ITEM</b>	OUTPUT POWER
<b>TEST MODE</b>	802.11n 20 with data rate 6.5

Frequency (GHz)	Average Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.412	<b>14.76</b>	30	Pass
2.437	14.31	30	Pass
2.462	14.55	30	Pass

<b>TEST ITEM</b>	OUTPUT POWER
<b>TEST MODE</b>	802.11n 40 with data rate 13.5

<b>Frequency (GHz)</b>	<b>Average Power (dBm)</b>	<b>Applicable Limits (dBm)</b>	<b>Pass or Fail</b>
2.422	<b>13.98</b>	30	Pass
2.437	13.77	30	Pass
2.452	13.69	30	Pass

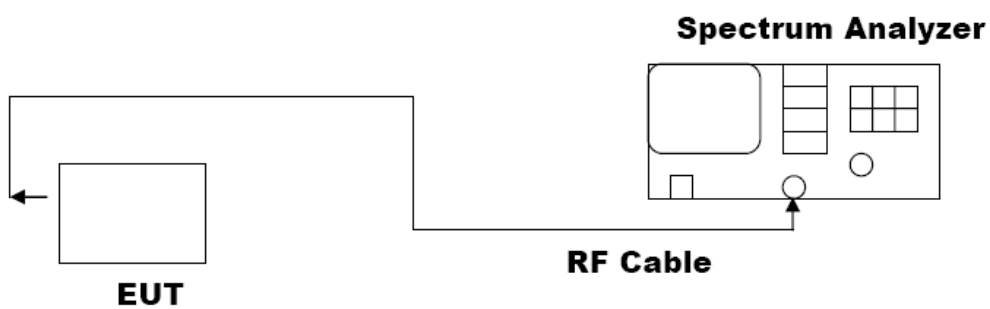
## 8. 6 DB BANDWIDTH

### 8.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW $\geq$ 3 $\times$ RBW.
4. Set SPA Trace 1 Max hold, then View.

**Note:** The EUT was tested according to ANSI C63.10 (2013) for compliance to FCC 47CFR 15.247 requirements.

### 8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



**8.3. LIMITS AND MEASUREMENT RESULTS**

<b>TEST ITEM</b>	6DB BANDWIDTH
<b>TEST MODE</b>	802.11b with data rate 11

<b>LIMITS AND MEASUREMENT RESULT</b>			
<b>Applicable Limits</b>	<b>Applicable Limits</b>		
	<b>Test Data (MHz)</b>		<b>Criteria</b>
>500KHZ	Low Channel	10.08	PASS
	Middle Channel	10.08	PASS
	High Channel	10.07	PASS

<b>TEST ITEM</b>	6DB BANDWIDTH
<b>TEST MODE</b>	802.11g with data rate 54

<b>LIMITS AND MEASUREMENT RESULT</b>			
<b>Applicable Limits</b>	<b>Applicable Limits</b>		
	<b>Test Data (MHz)</b>		<b>Criteria</b>
>500KHZ	Low Channel	16.36	PASS
	Middle Channel	16.35	PASS
	High Channel	16.36	PASS

<b>TEST ITEM</b>	6DB BANDWIDTH
<b>TEST MODE</b>	802.11n 20 with data rate 65

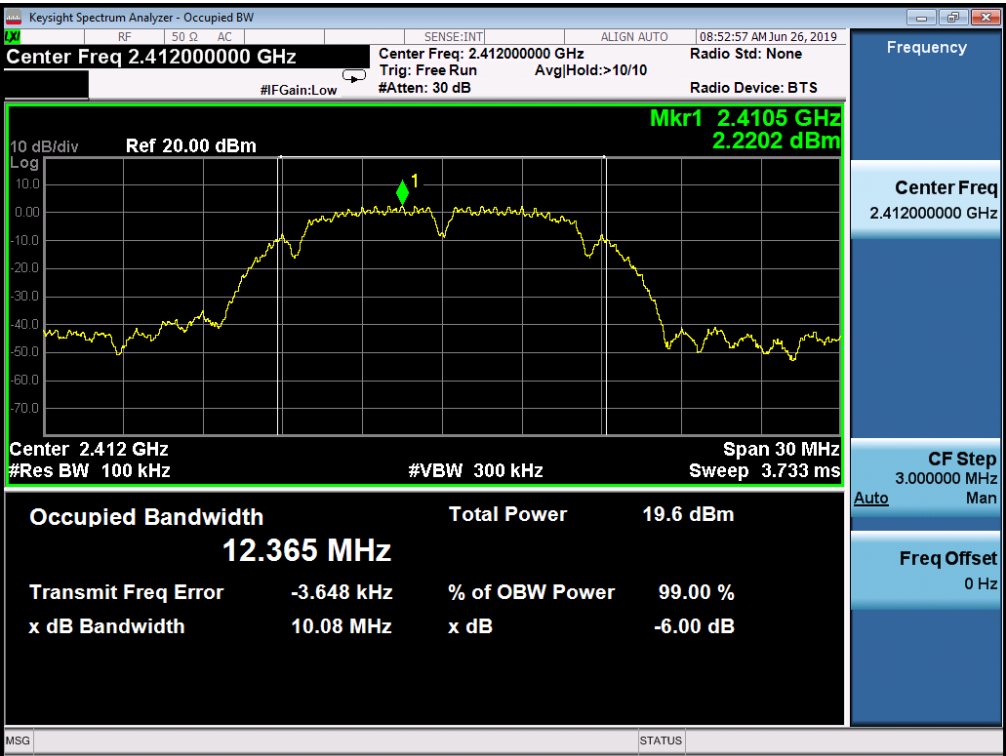
<b>LIMITS AND MEASUREMENT RESULT</b>			
<b>Applicable Limits</b>	<b>Applicable Limits</b>		
	<b>Test Data (MHz)</b>		<b>Criteria</b>
>500KHZ	Low Channel	17.04	PASS
	Middle Channel	17.05	PASS
	High Channel	17.05	PASS



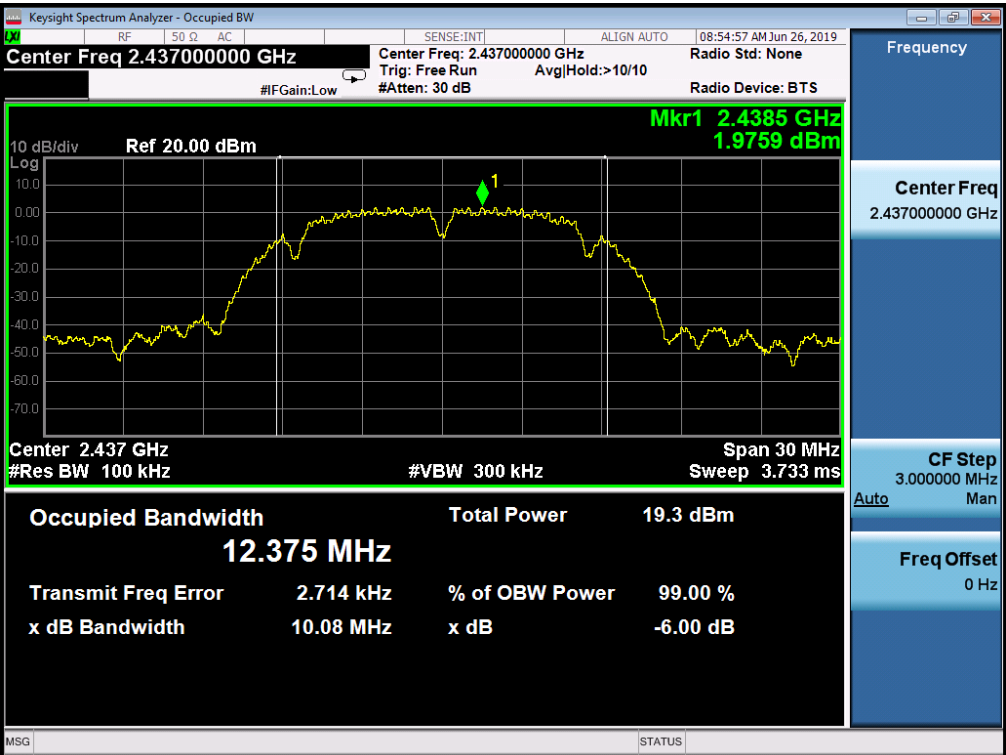
<b>TEST ITEM</b>	6DB BANDWIDTH
<b>TEST MODE</b>	802.11n 40 with data rate 135

<b>LIMITS AND MEASUREMENT RESULT</b>			
<b>Applicable Limits</b>	<b>Applicable Limits</b>		
	<b>Test Data (MHz)</b>		<b>Criteria</b>
>500KHZ	Low Channel	35.15	PASS
	Middle Channel	35.17	PASS
	High Channel	35.20	PASS

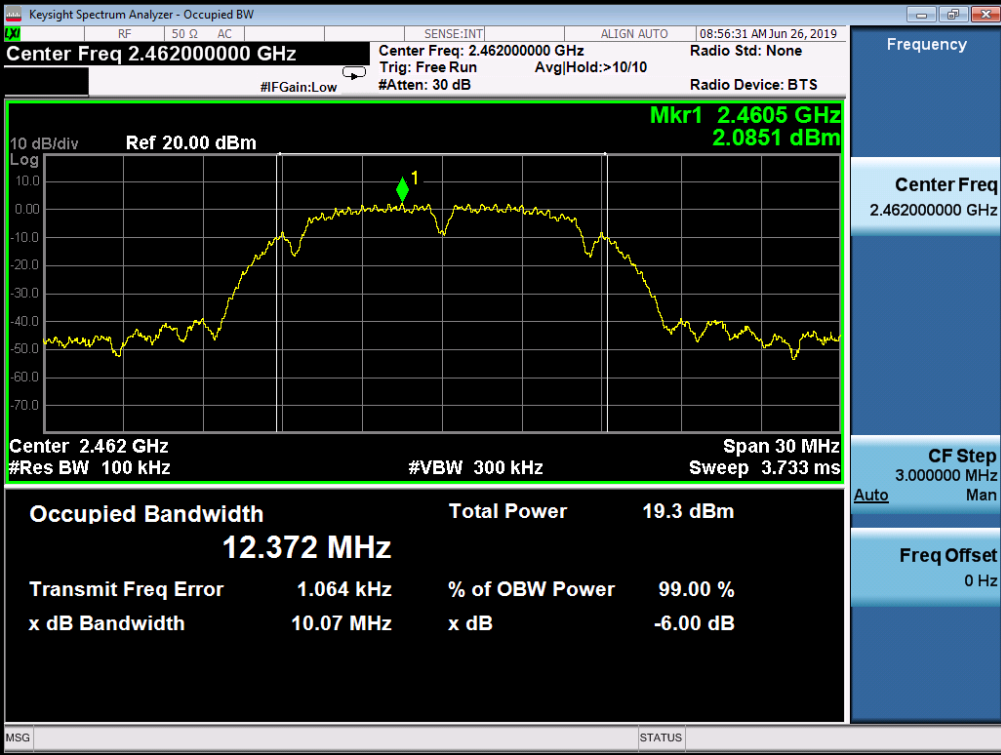
**802.11b TEST RESULT**  
**TEST PLOT OF BANDWIDTH FOR LOW CHANNEL**



**TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL**

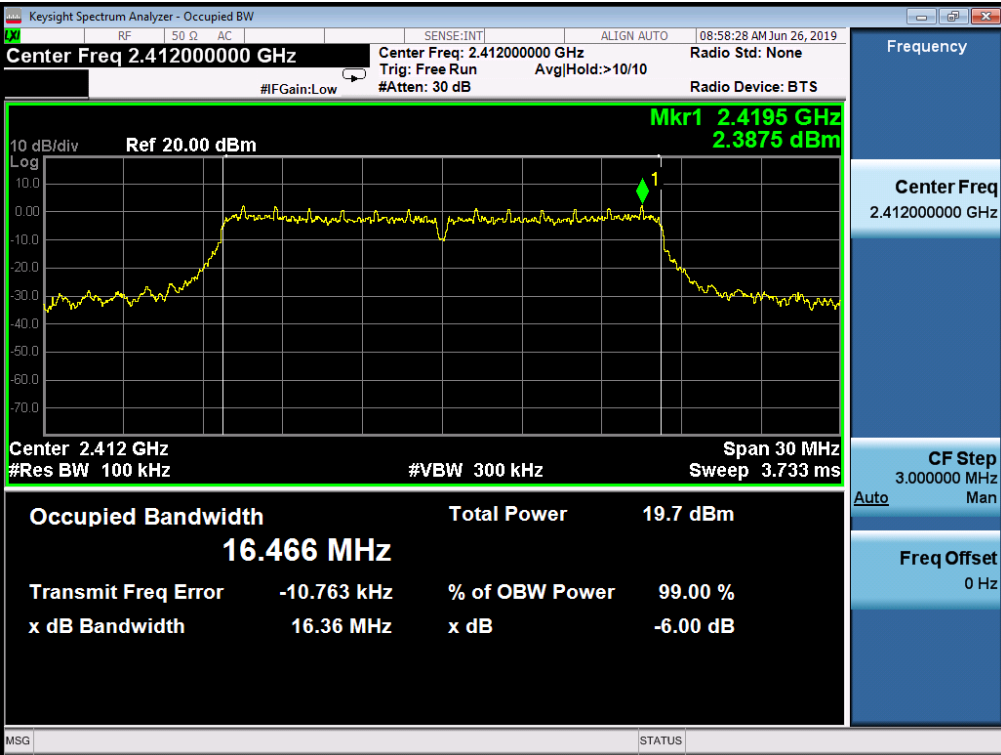


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

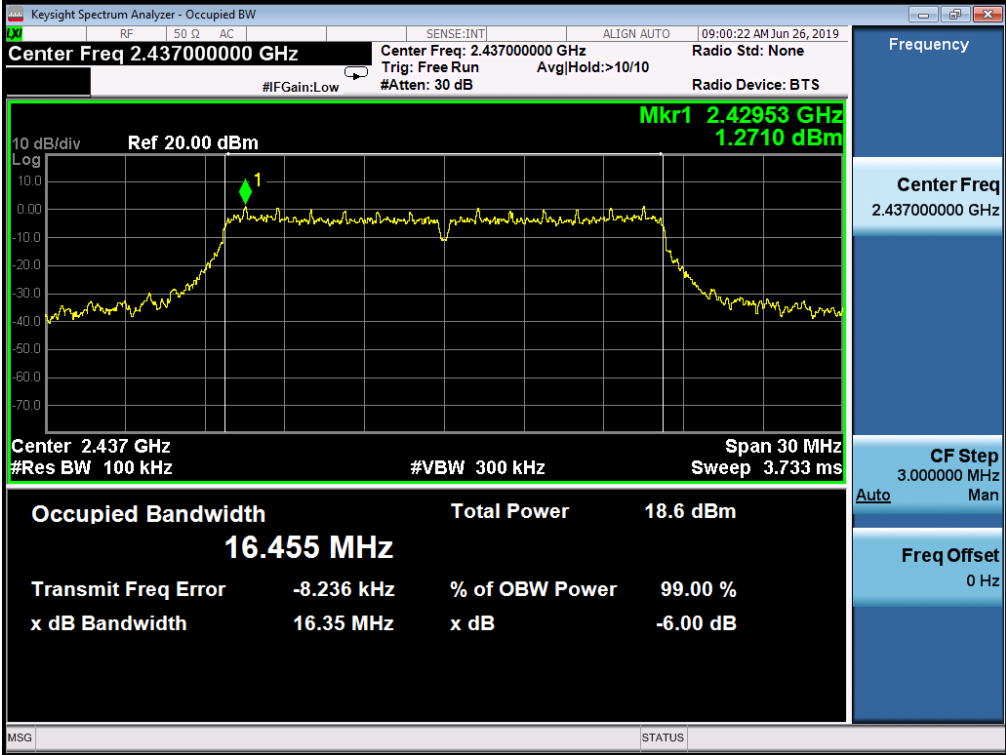


802.11g TEST RESULT

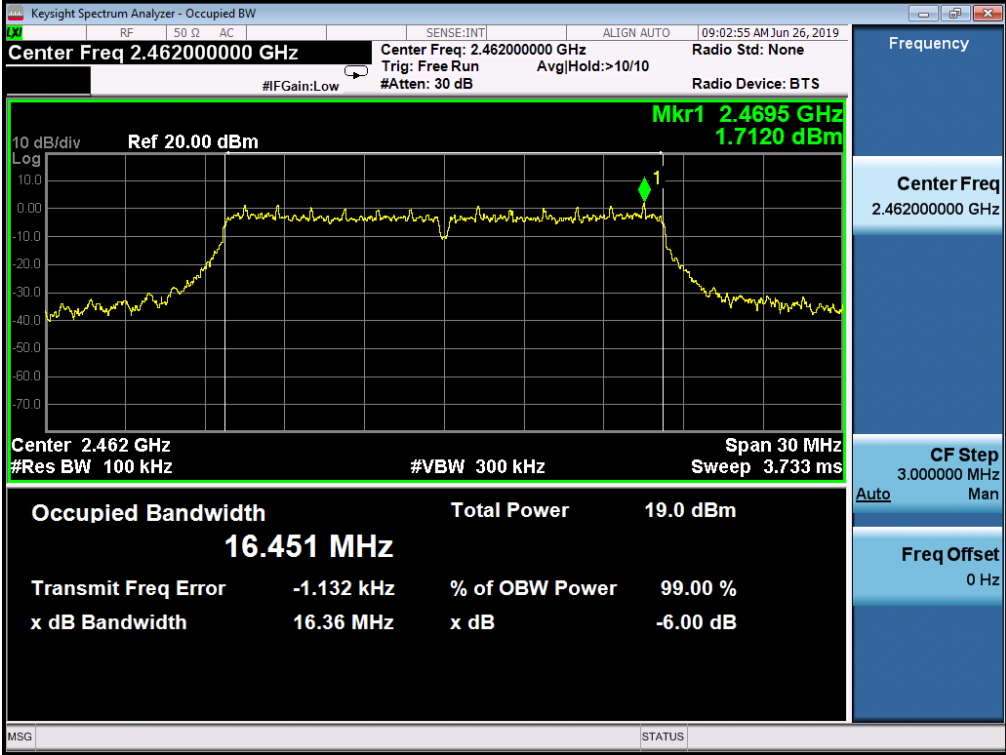
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



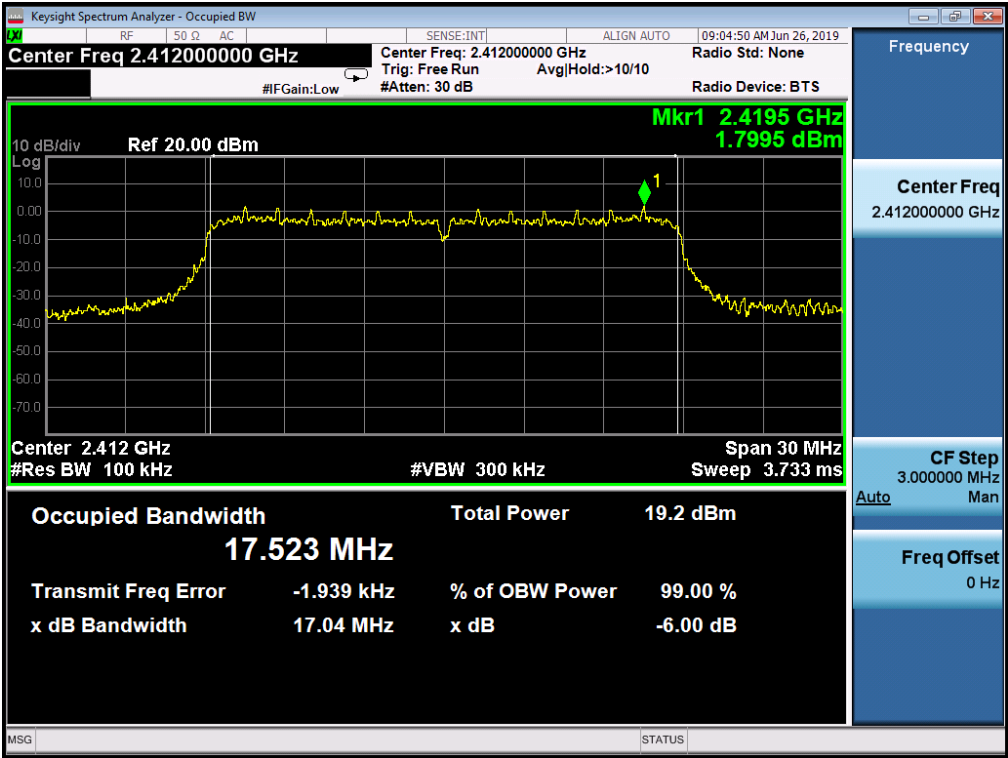
TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



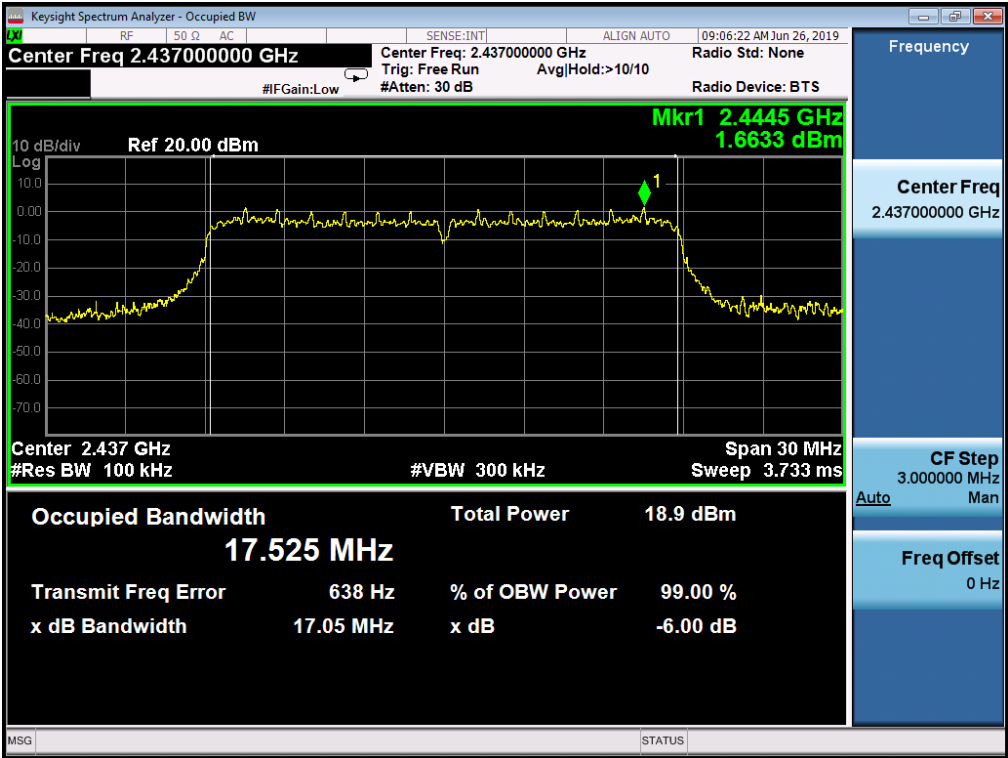
TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



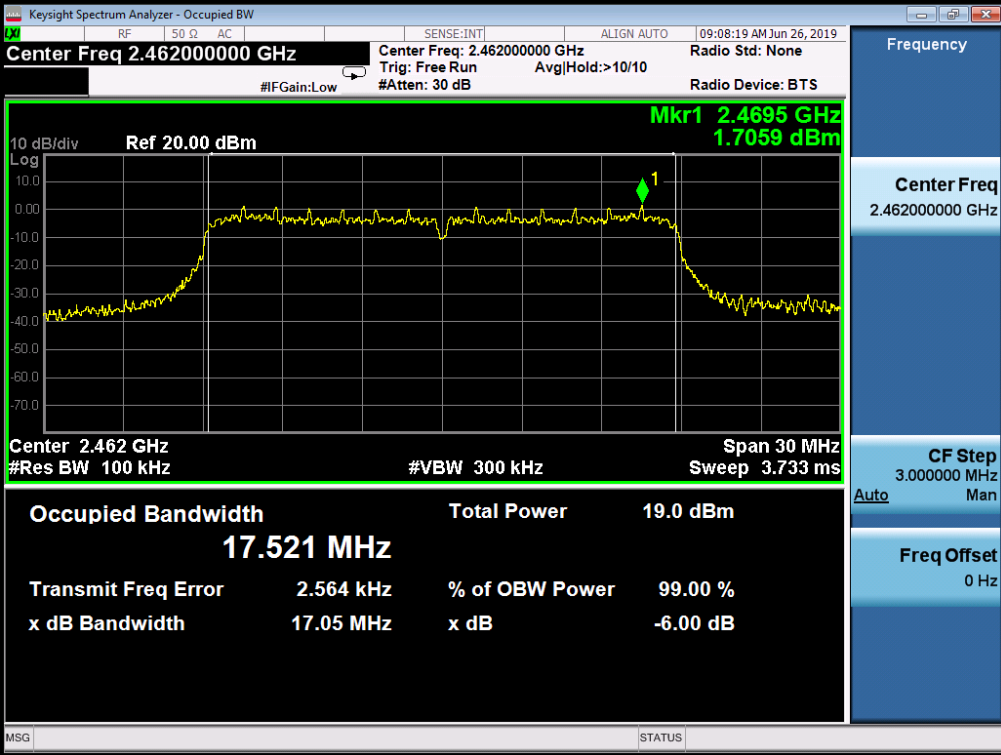
**802.11n (20) TEST RESULT**  
**TEST PLOT OF BANDWIDTH FOR LOW CHANNEL**



**TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL**

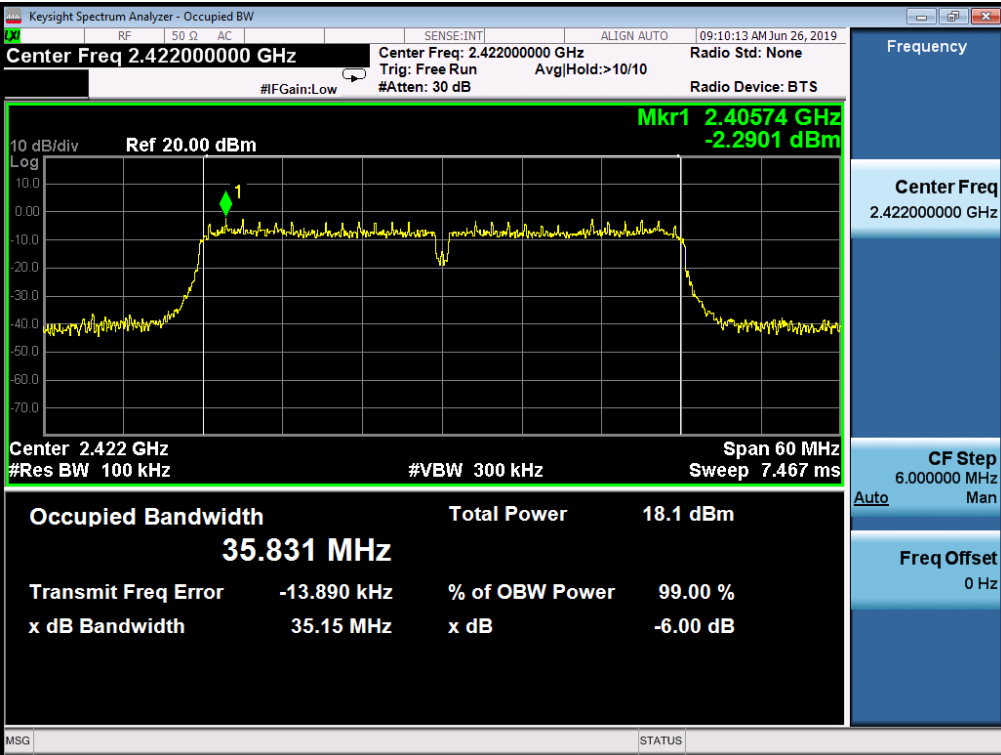


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

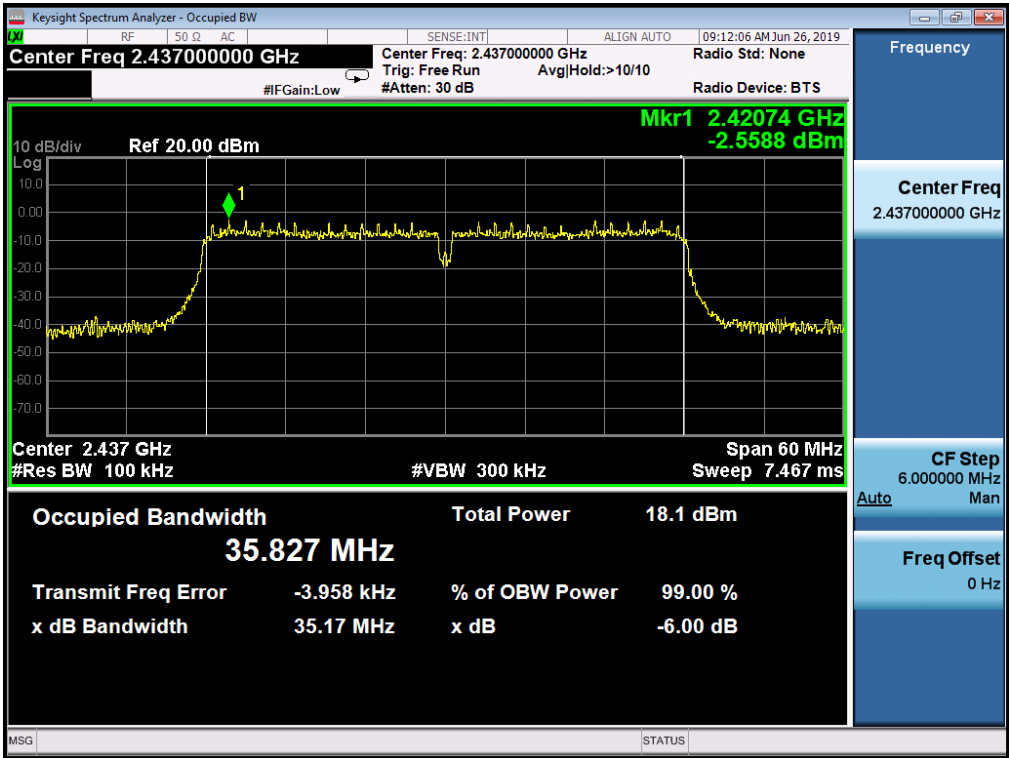


802.11n (40) TEST RESULT

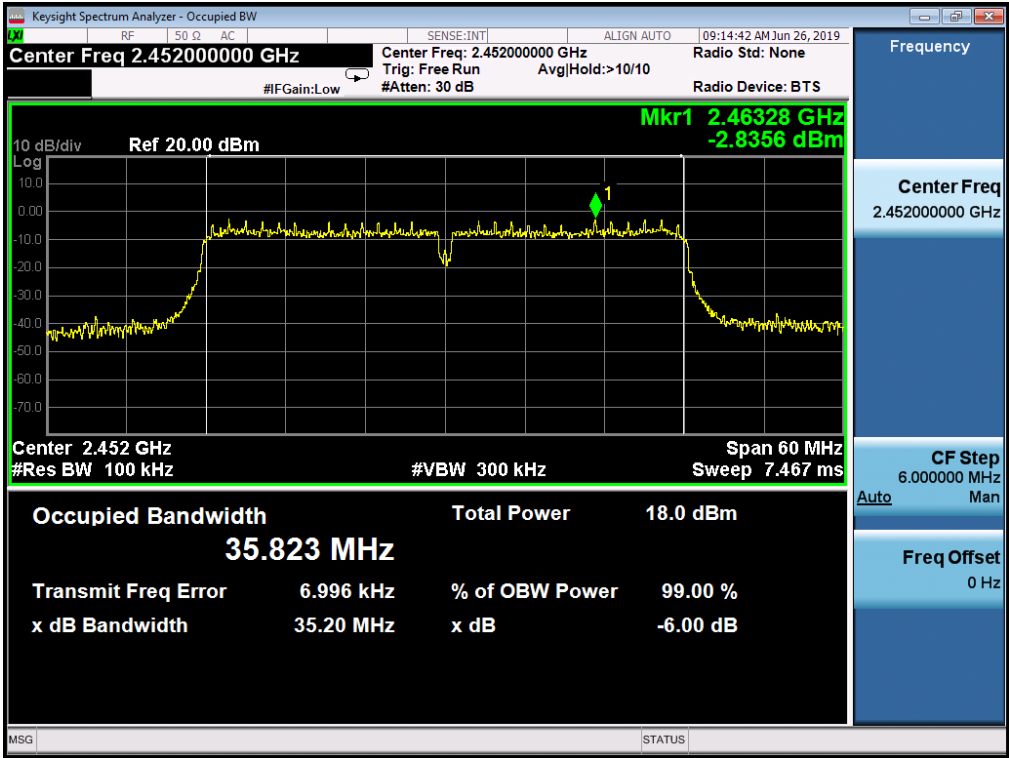
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



**9. CONDUCTED SPURIOUS EMISSION**

**9.1. MEASUREMENT PROCEDURE**

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Trace 1 Max hold, then View.

**Note:** The EUT was tested according to ANSI C63.10 (2013) for compliance to FCC 47CFR 15.247 requirements. Owing to satisfy the requirements of the number of measurement points, we set the RBW=1MHz, VBW>RBW, scan up through 10th harmonic, and consider the tested results as the worst case, if the tested results conform to the requirement, we can deem that the real tested results(set the RBW=100KHz, VBW>RBW) are conform to the requirement.

**9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)**

The same as described in section 8.2.

**9.3. MEASUREMENT EQUIPMENT USED**

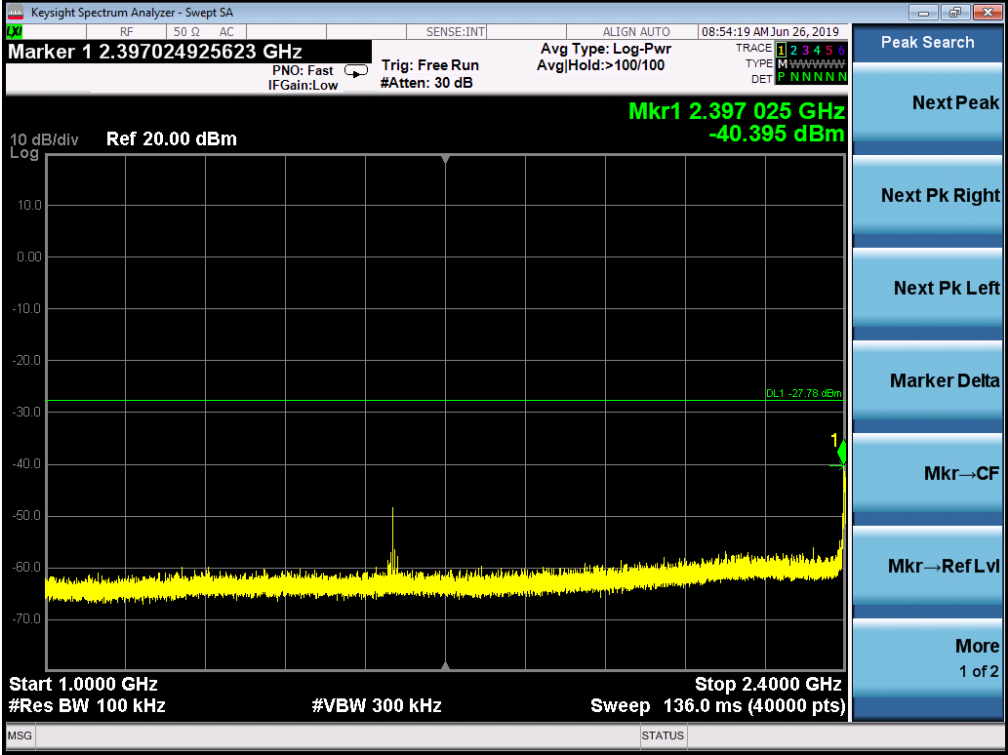
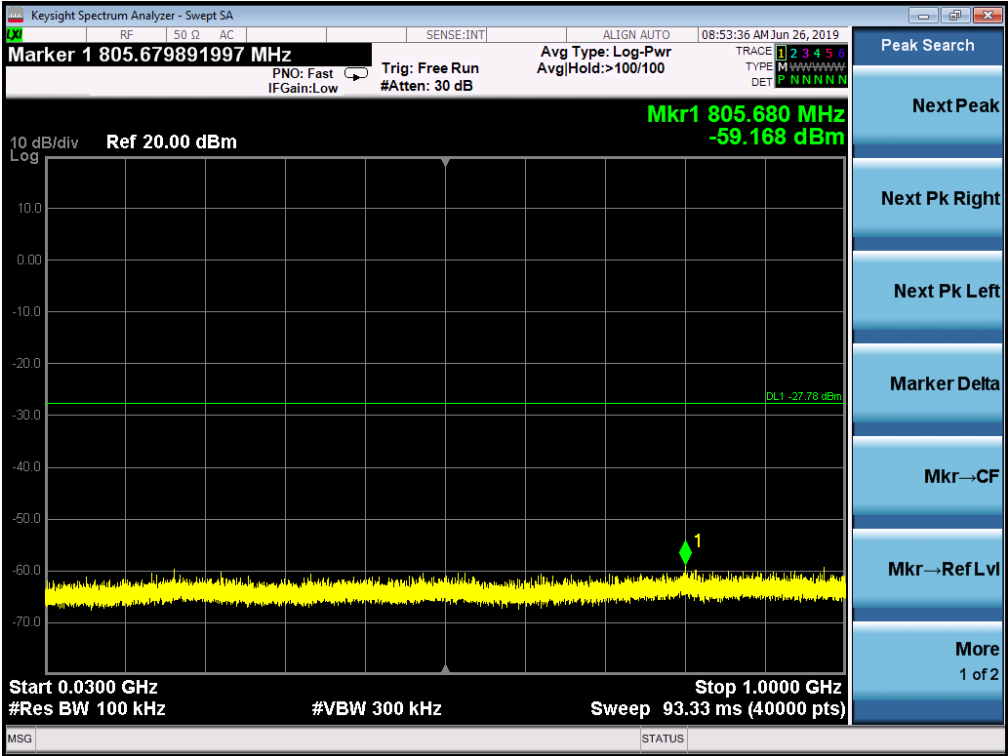
The same as described in section 6.

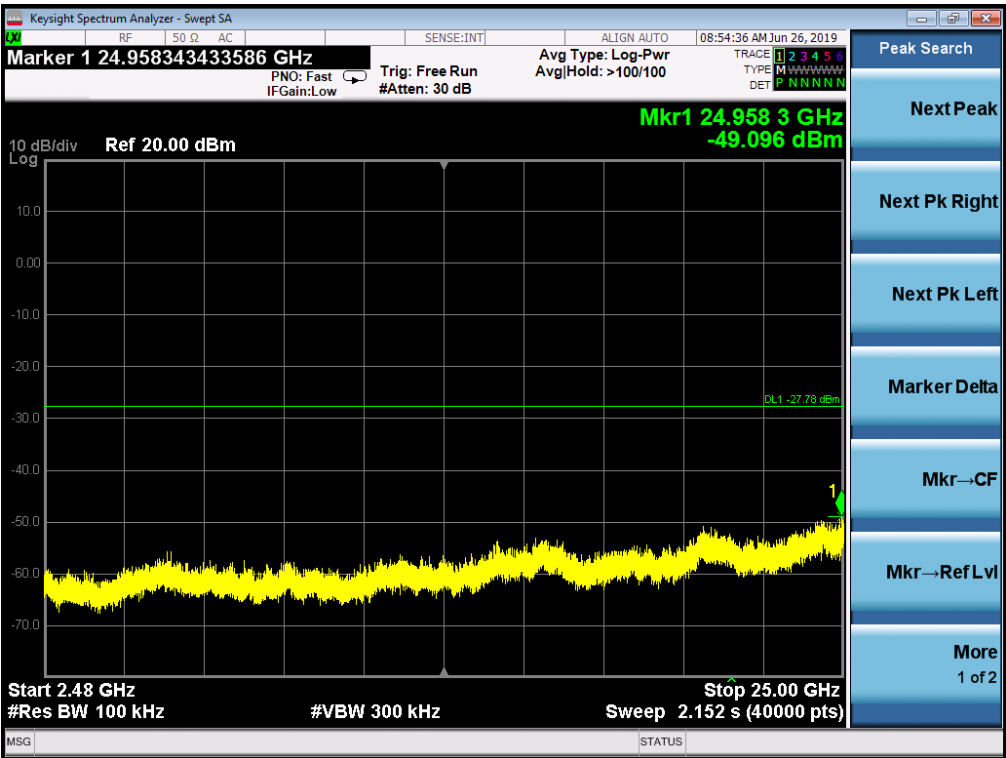
**9.4. LIMITS AND MEASUREMENT RESULT**

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 30 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a)	At least -30dBc than the limit Specified on the BOTTOM Channel	PASS
	At least -30dBc than the limit Specified on the TOP Channel	PASS

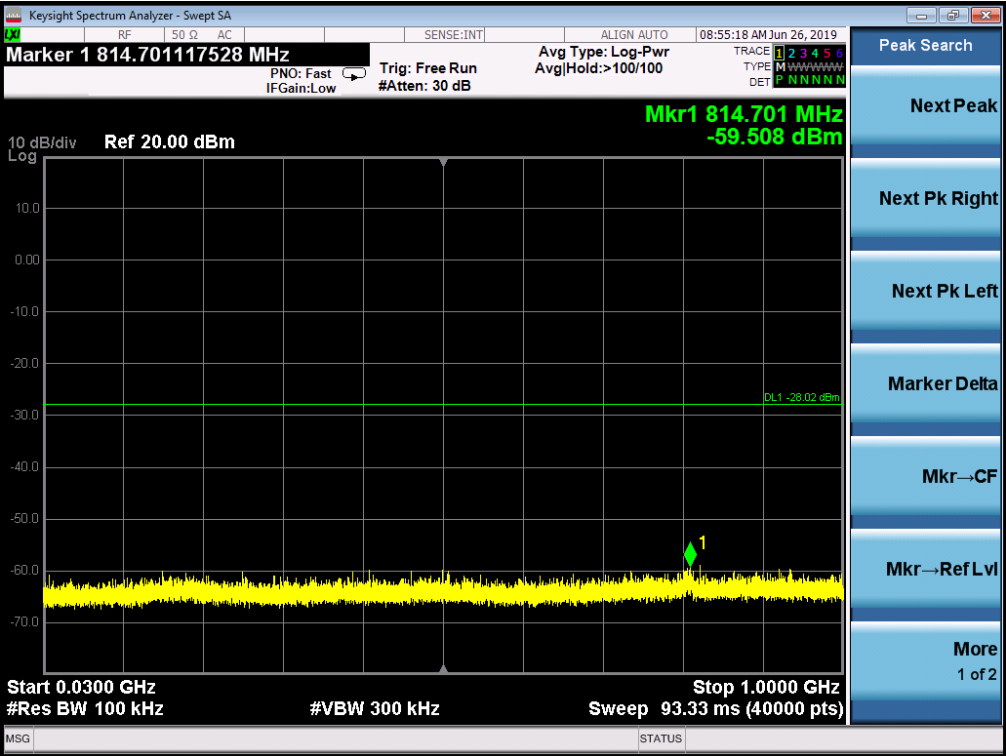


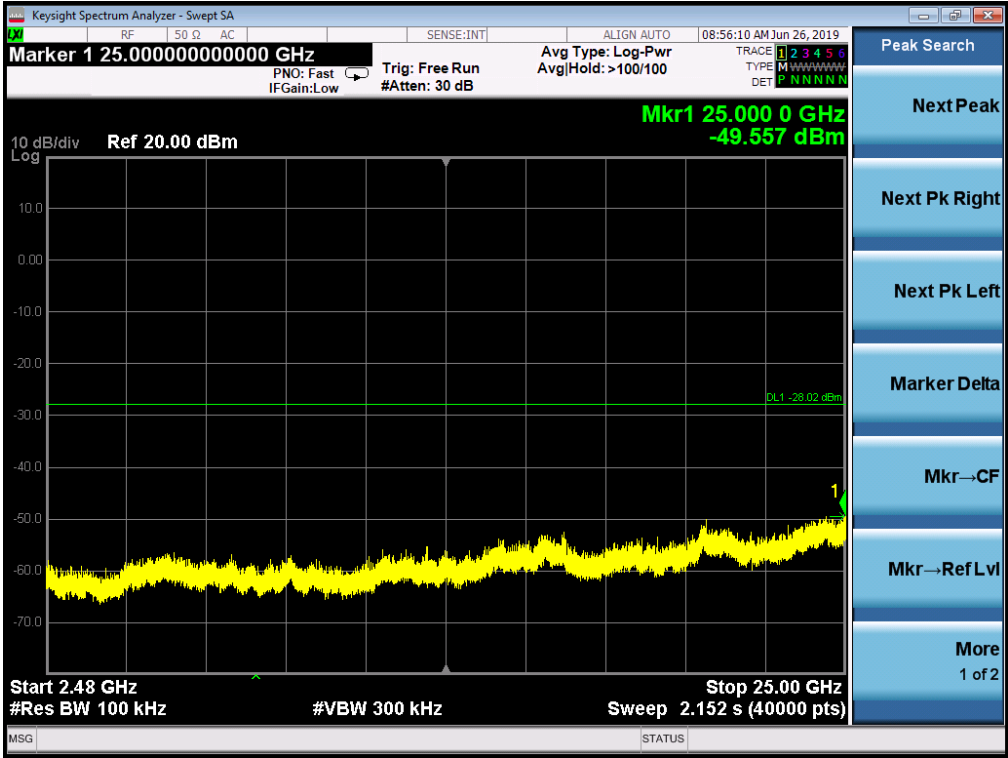
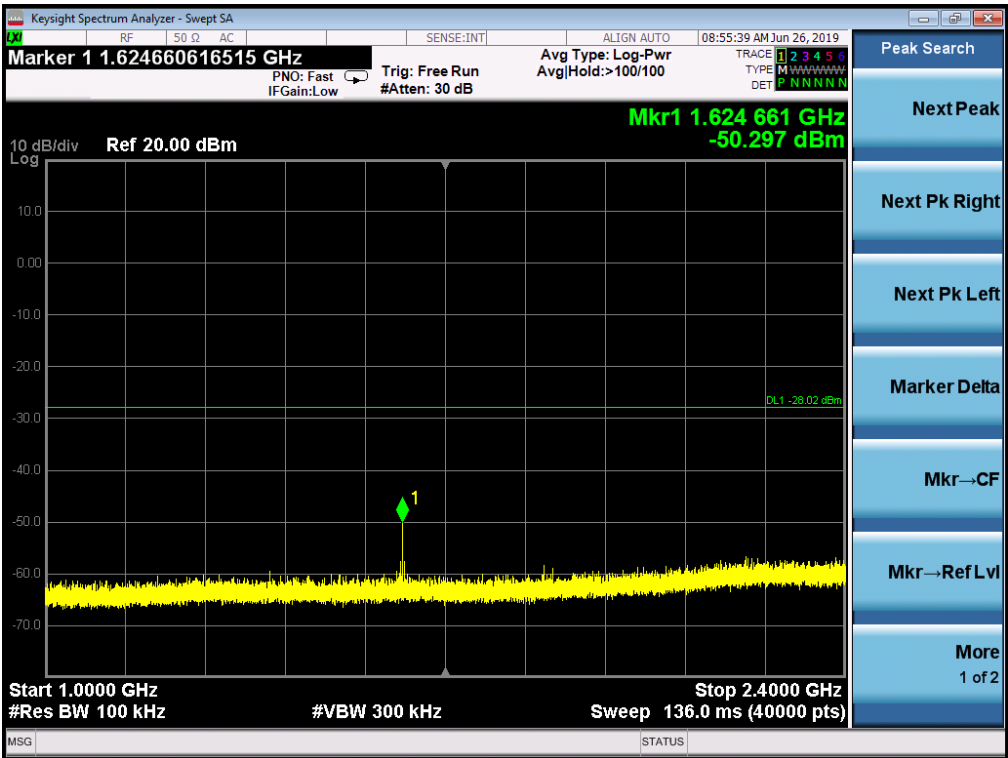
TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE  
OF (802.11b with data rate 1) FOR MODULATION IN LOW CHANNEL



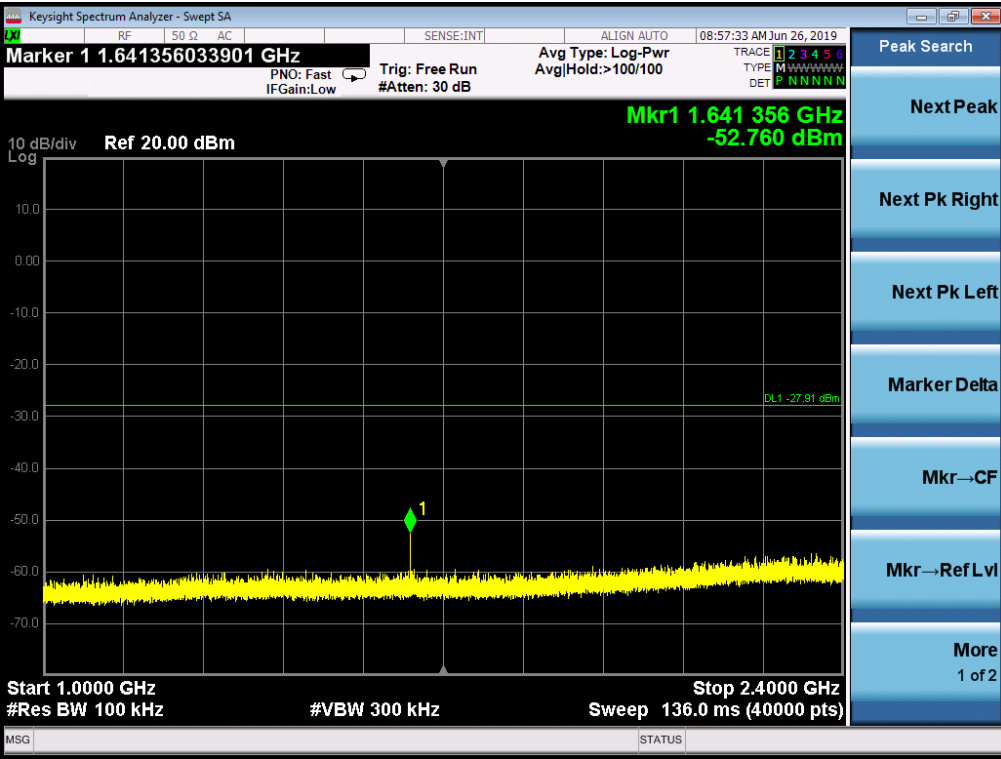
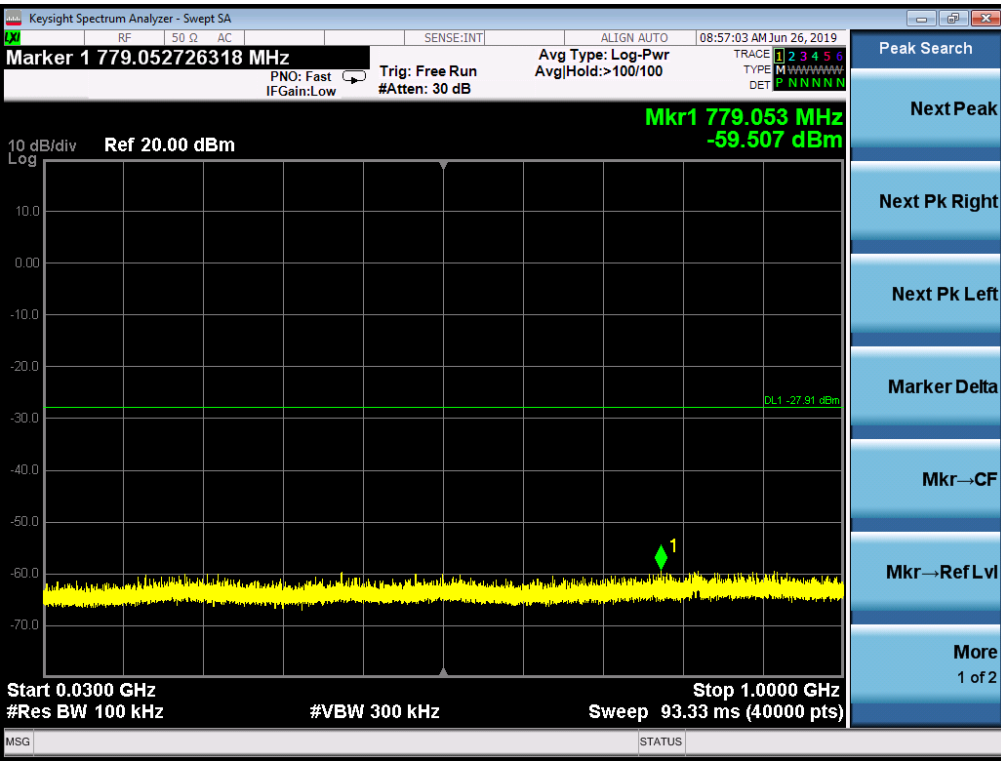


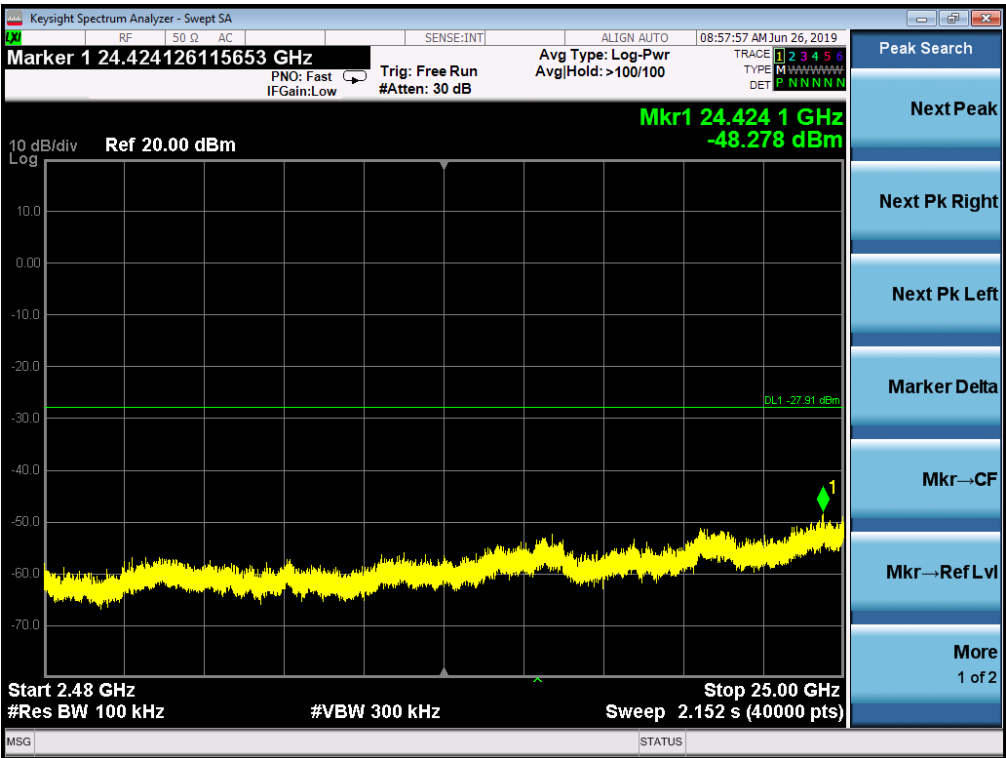
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE  
OF( 802.11b with data rate 1) FOR MODULATION IN MIDDLE CHANNEL



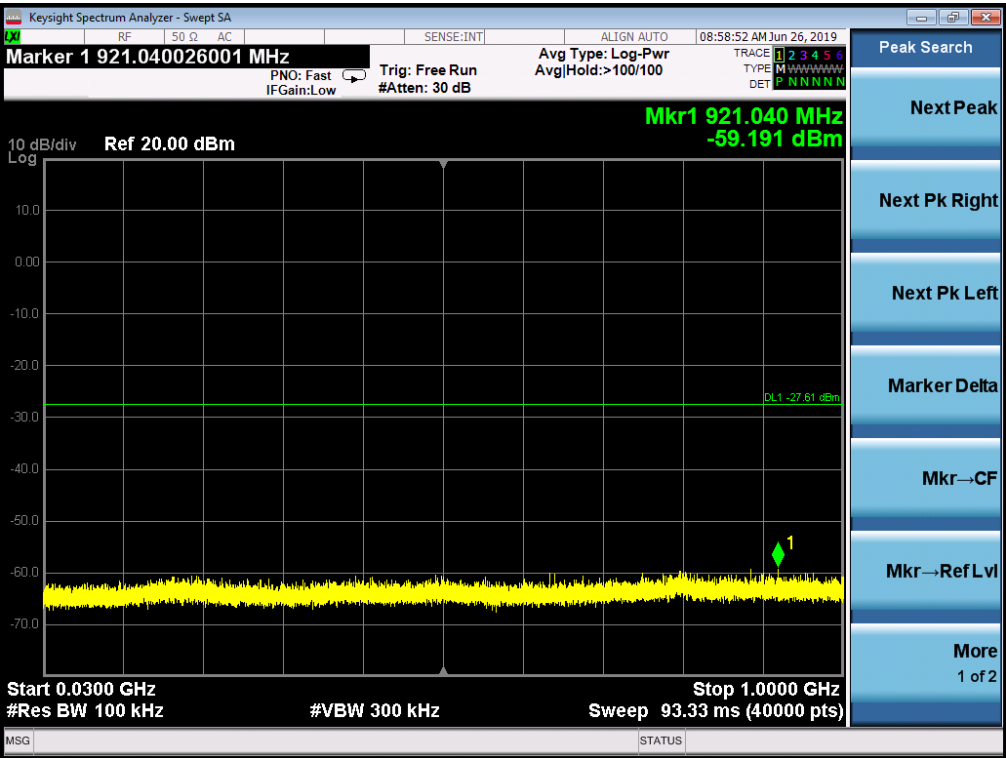


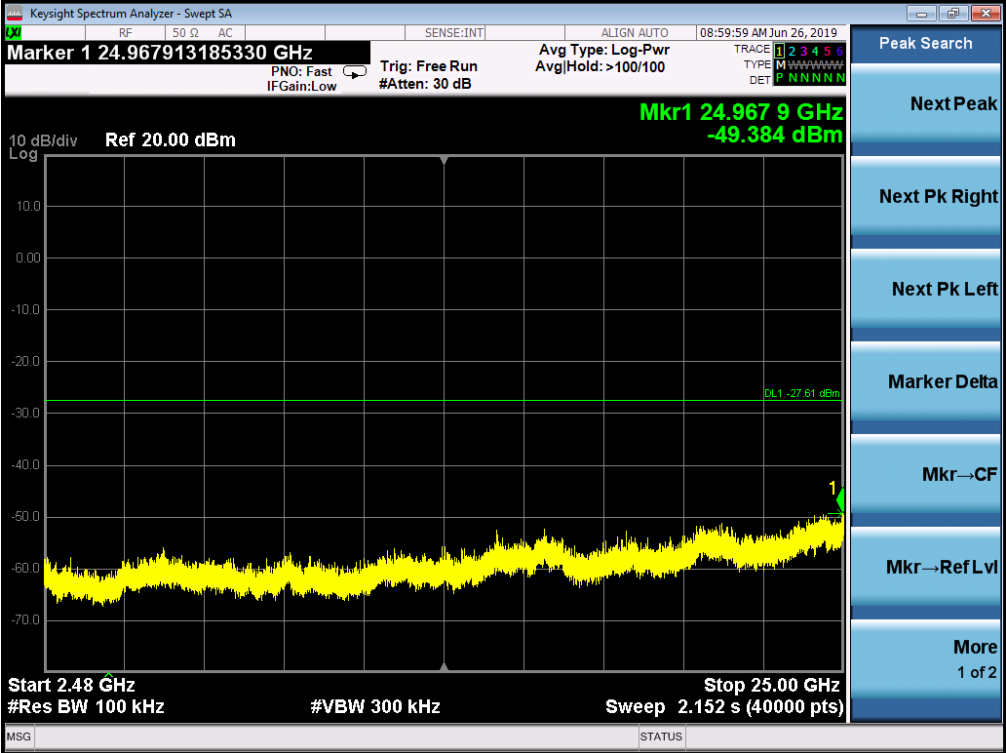
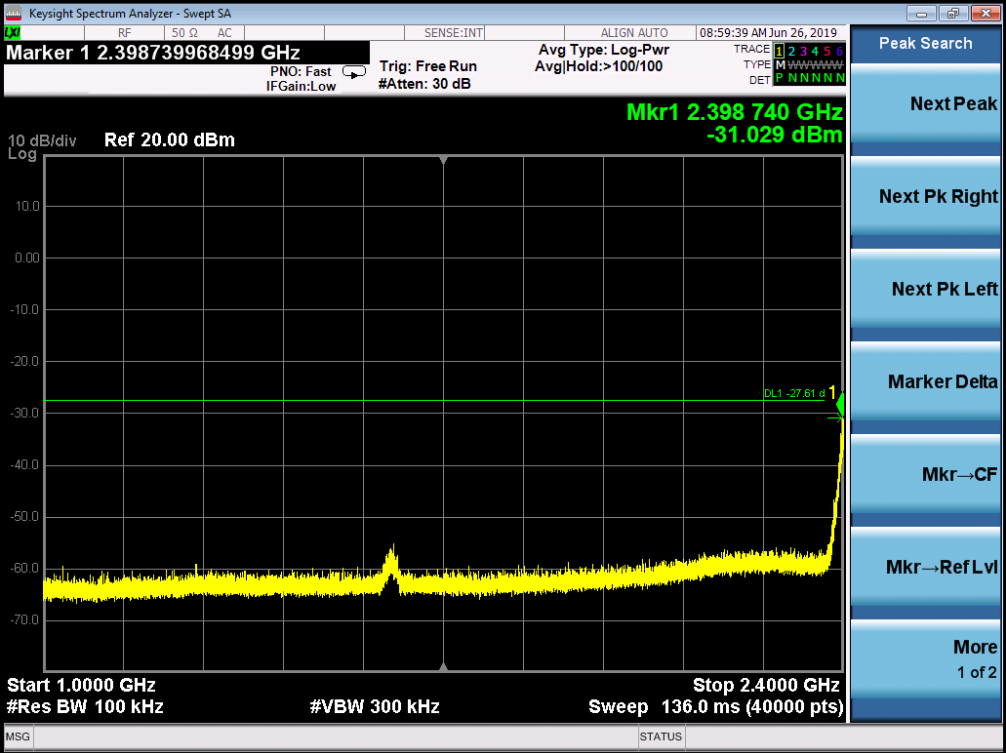
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE  
OF( 802.11b with data rate 1) FOR MODULATION IN HIGH CHANNEL



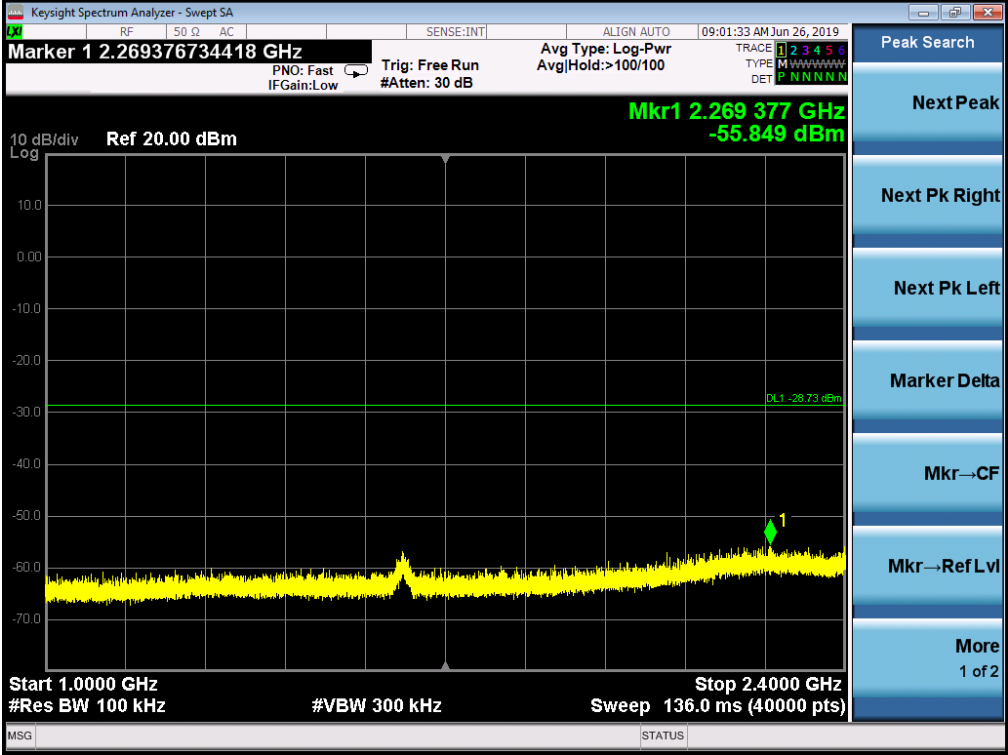
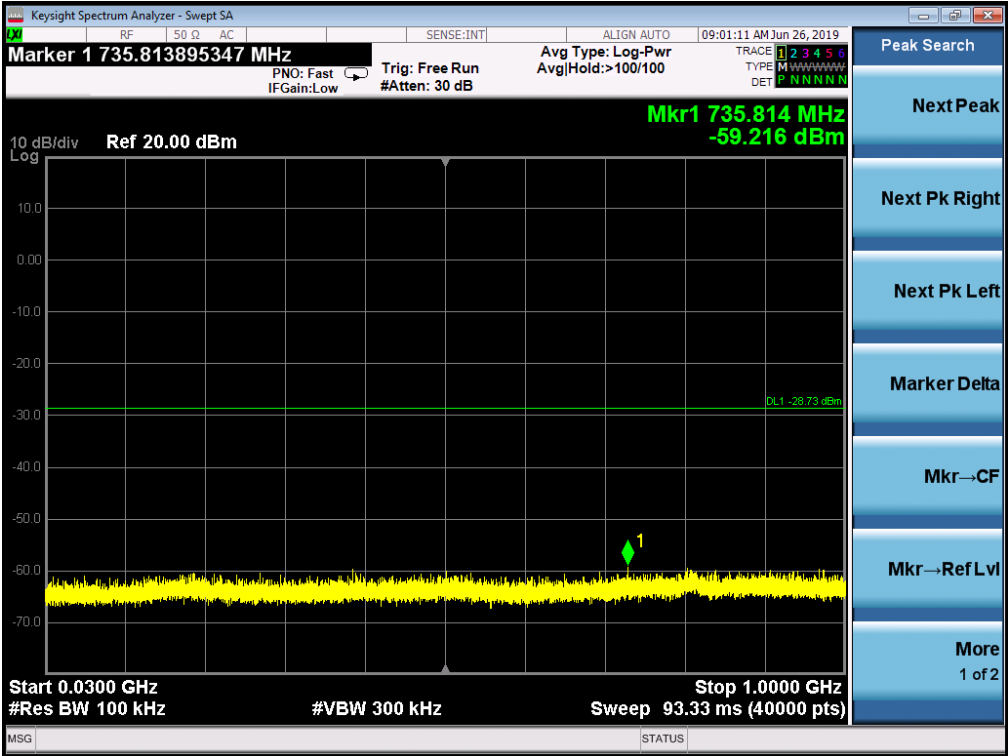


TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF (802.11g with data rate 6) FOR MODULATION IN LOW CHANNEL



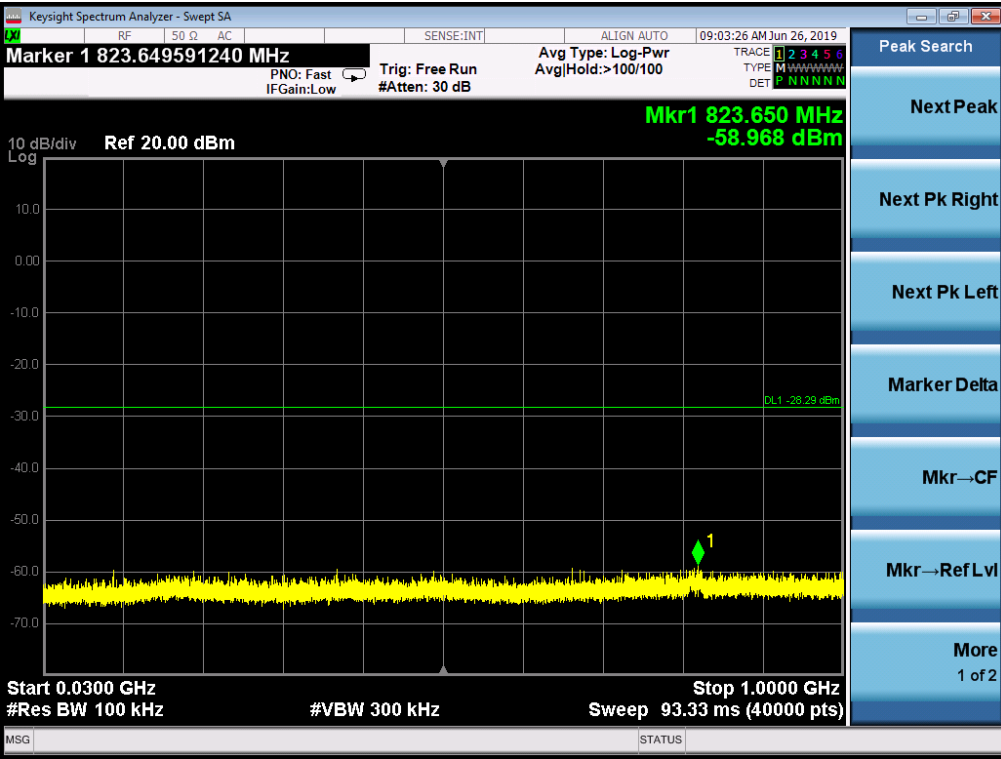


TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE  
OF (802.11g with data rate 6) FOR MODULATION IN MIDDLE CHANNEL

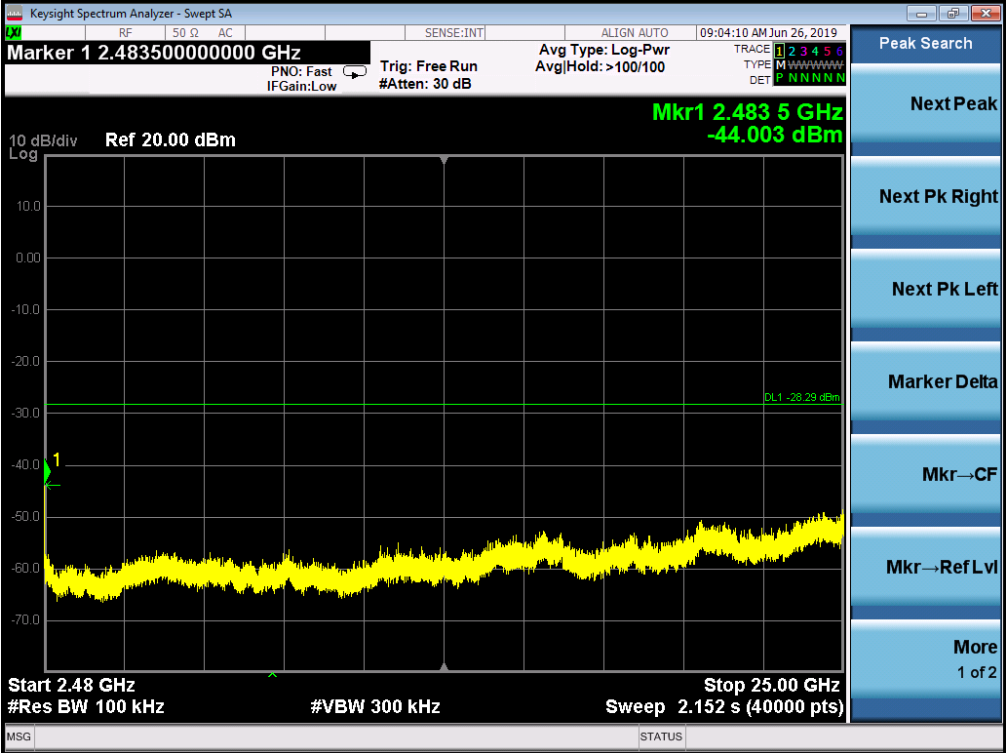
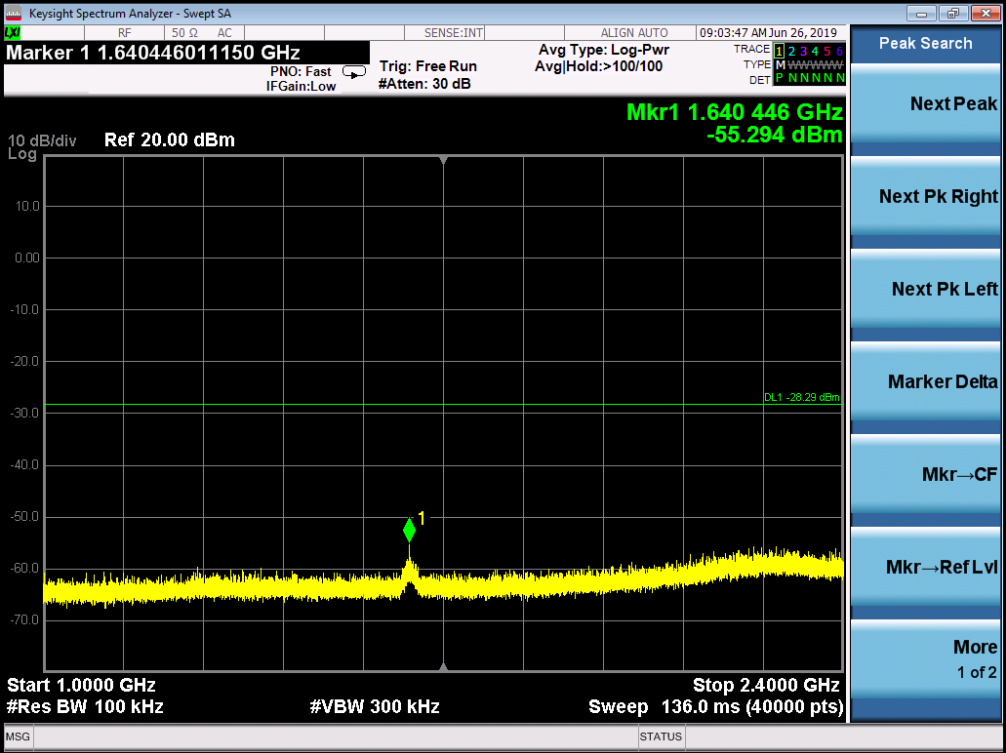




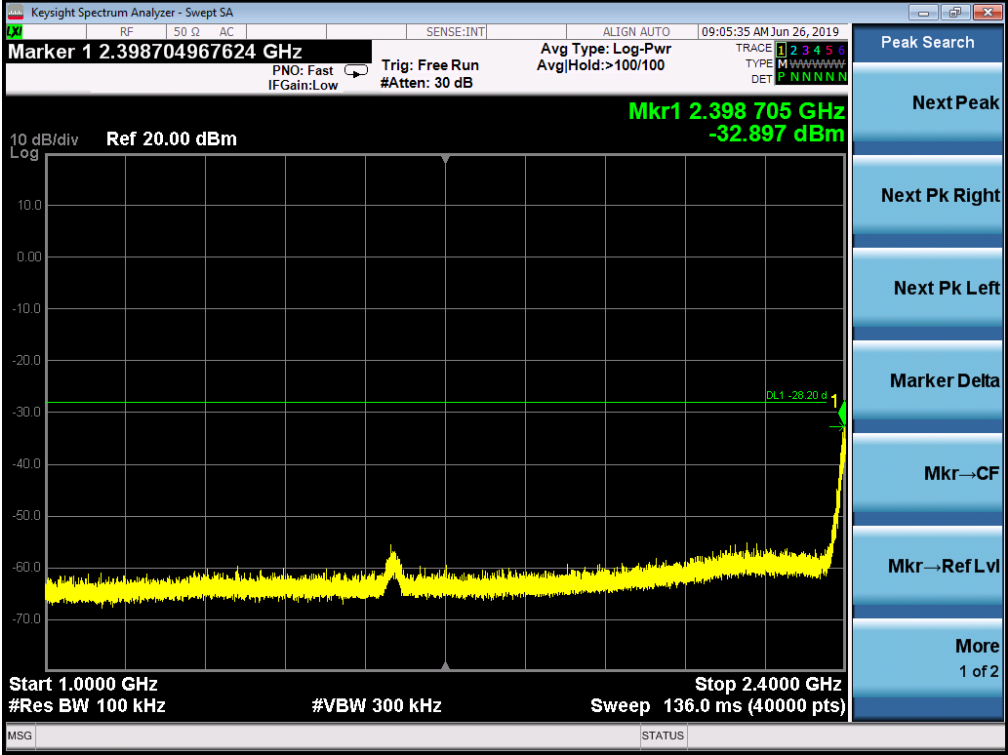
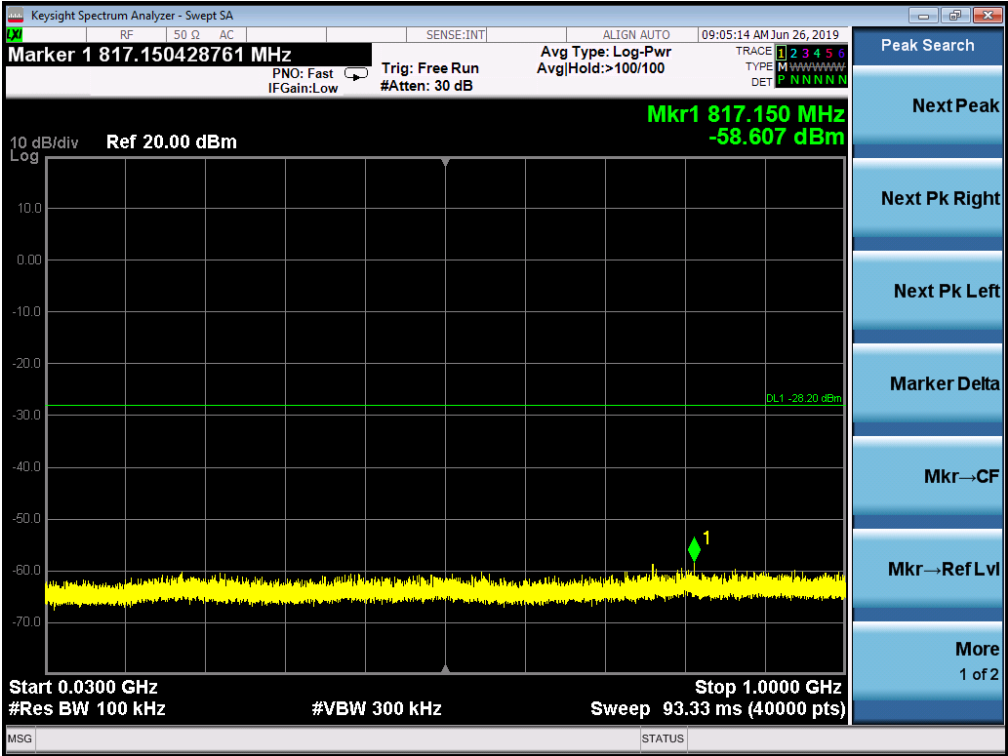
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF (802.11g with data rate 6) FOR MODULATION IN HIGH CHANNEL

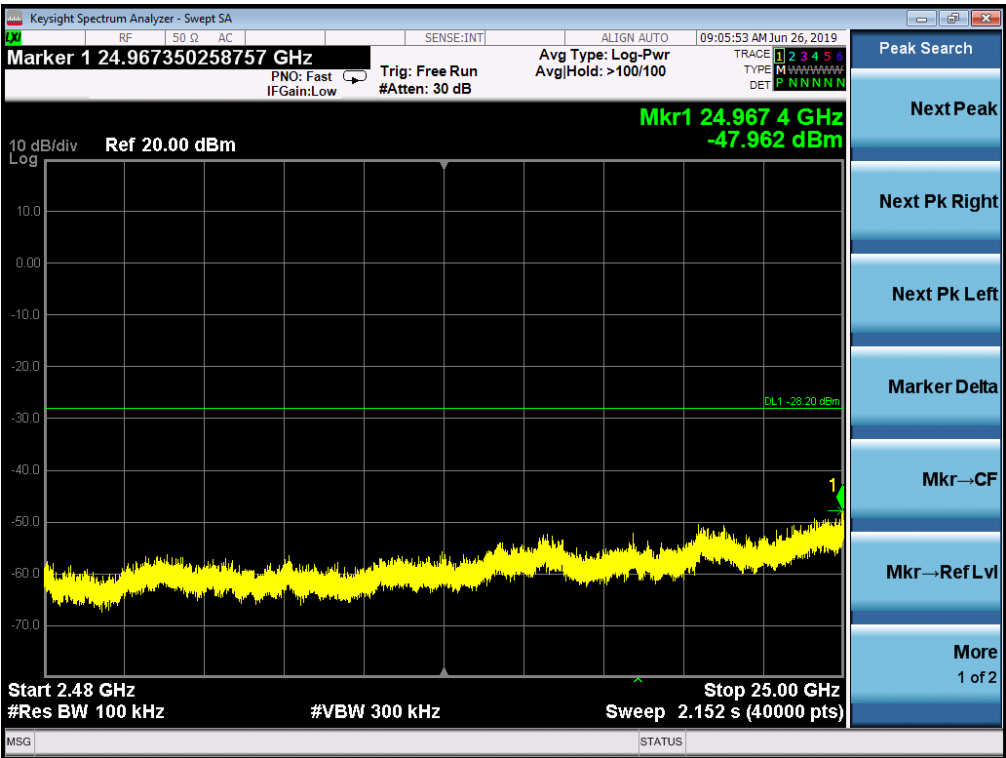




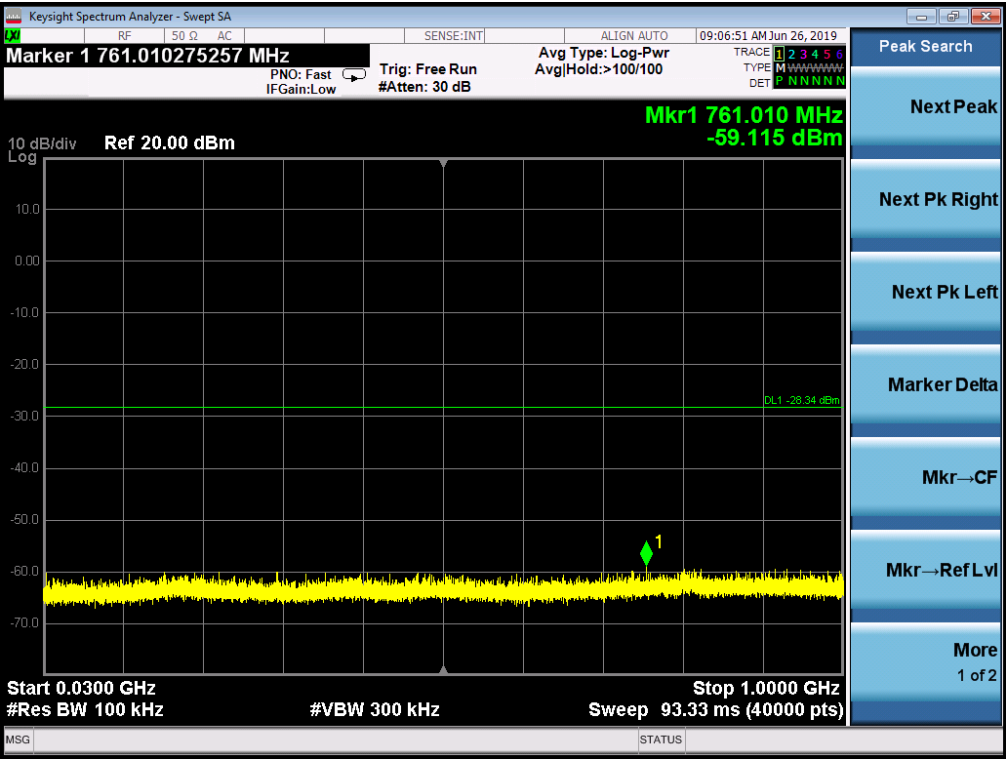


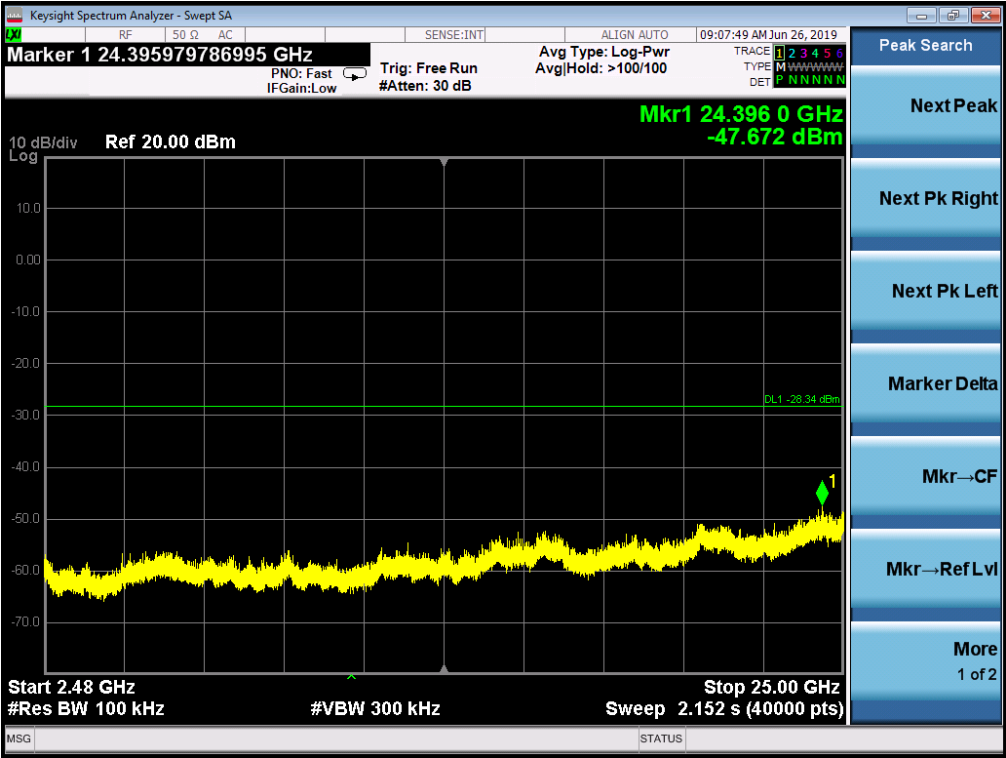
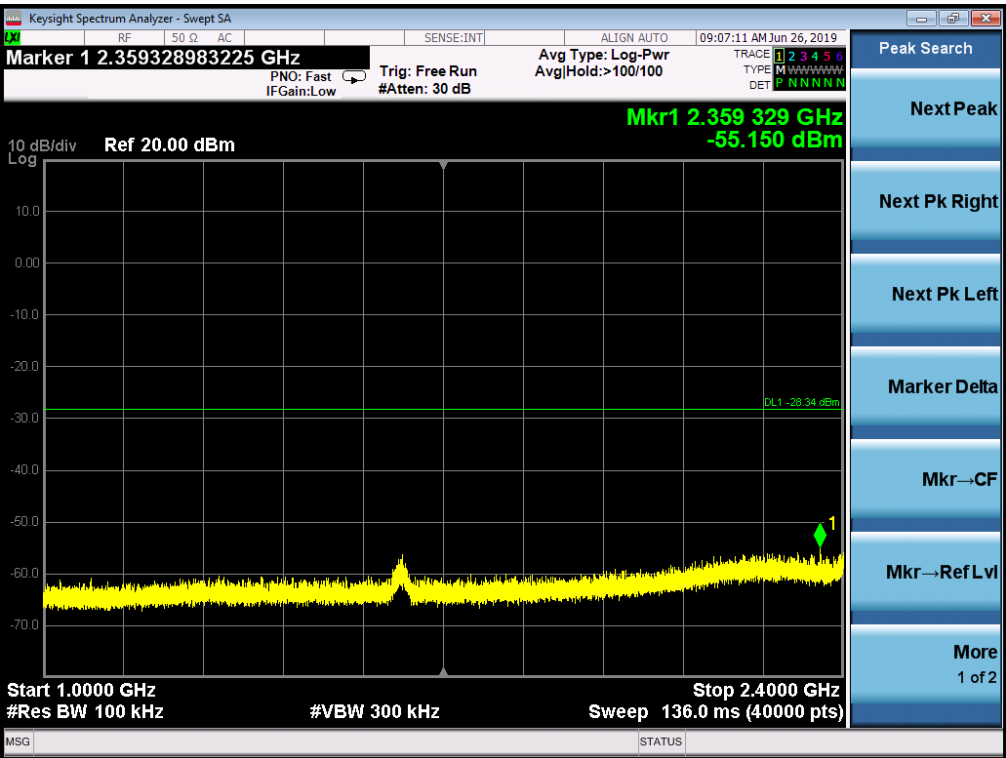
TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE  
OF (802.11n20 with data rate 6.5) FOR MODULATION IN LOW CHANNEL



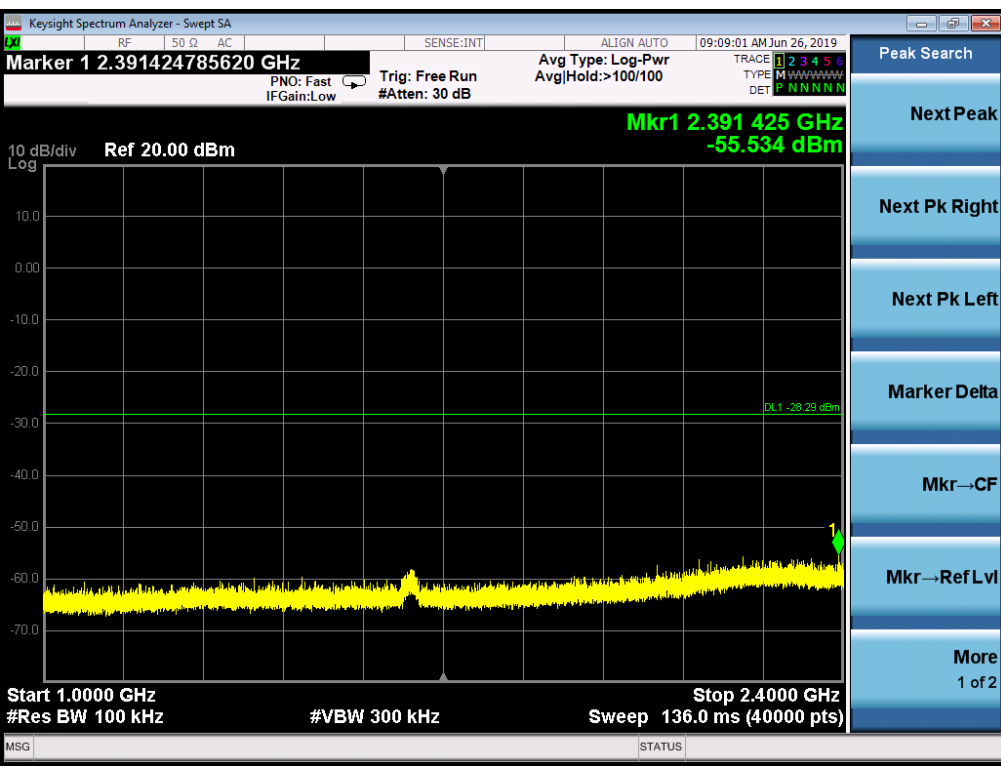
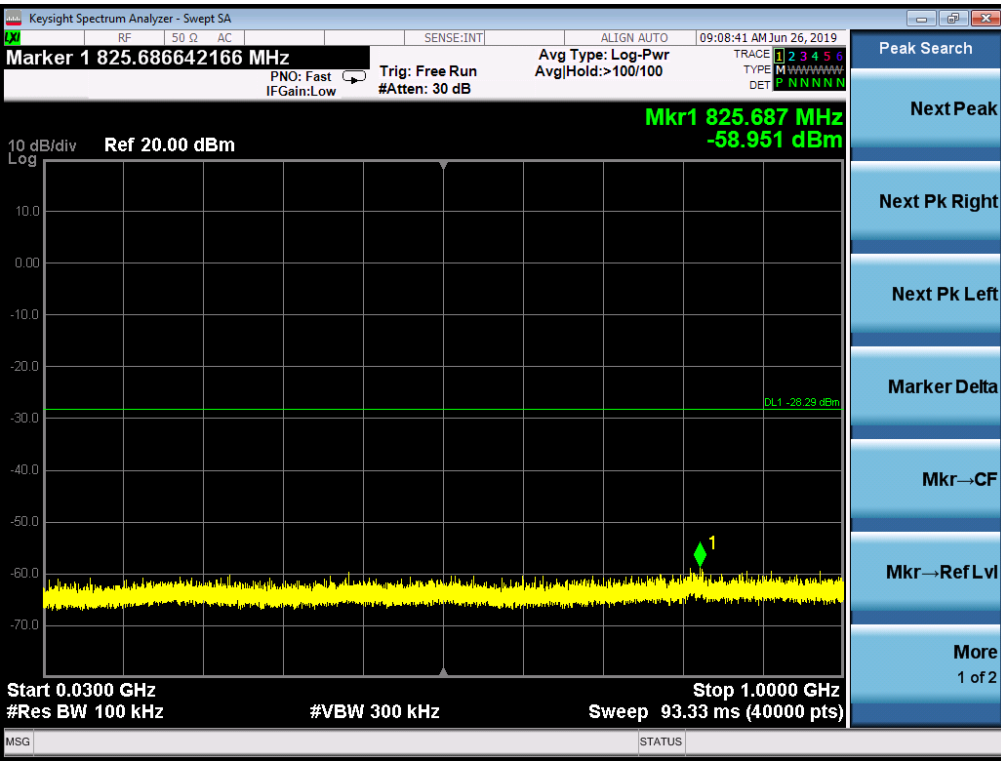


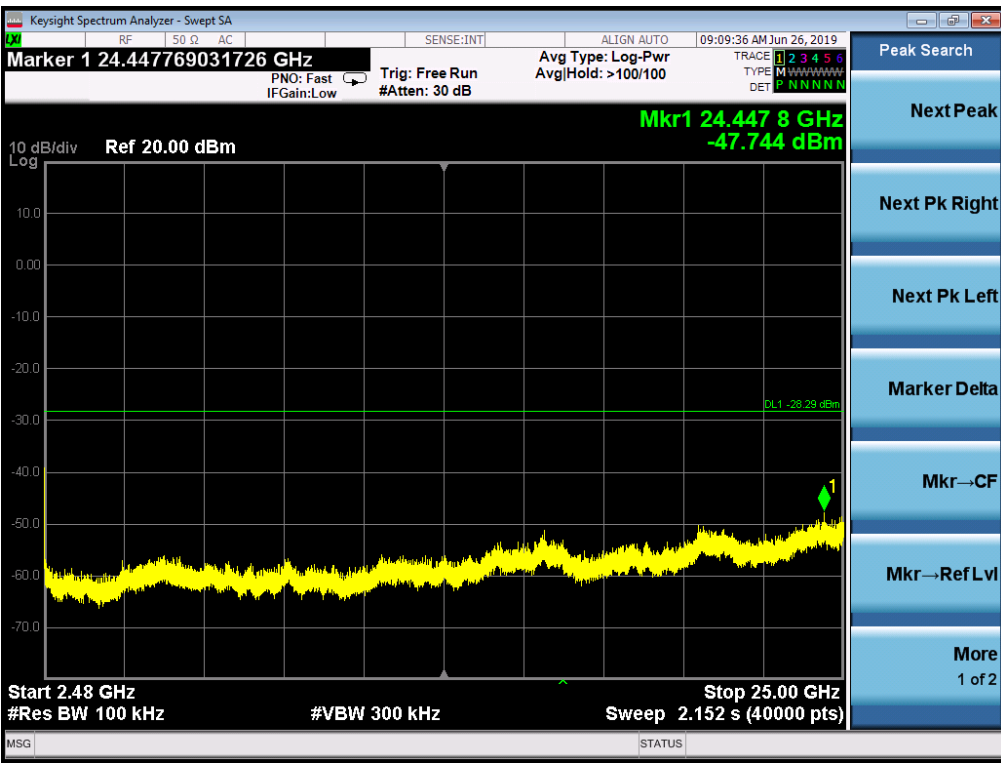
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF (802.11n20 with data rate 6.5) FOR MODULATION IN MIDDLE CHANNEL



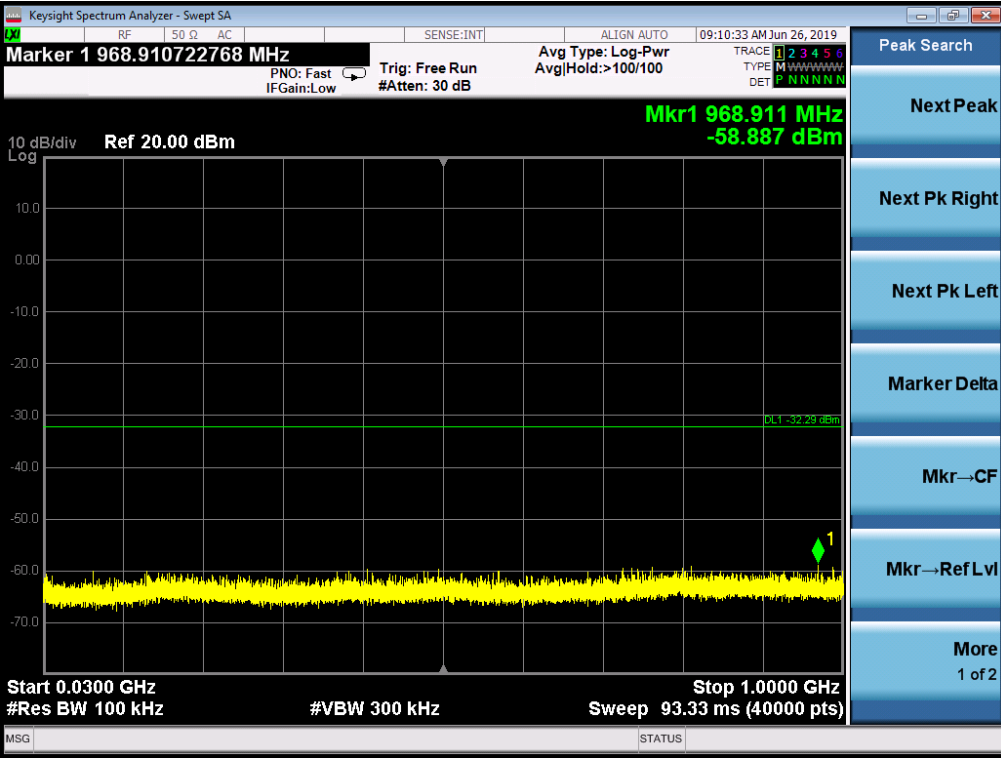


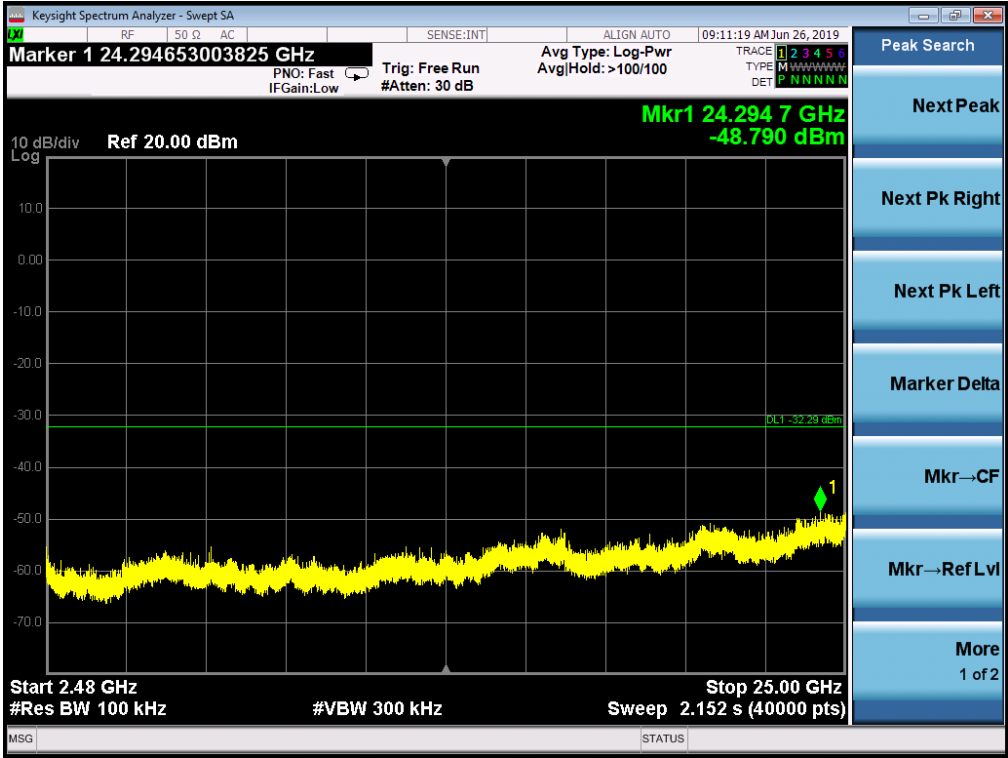
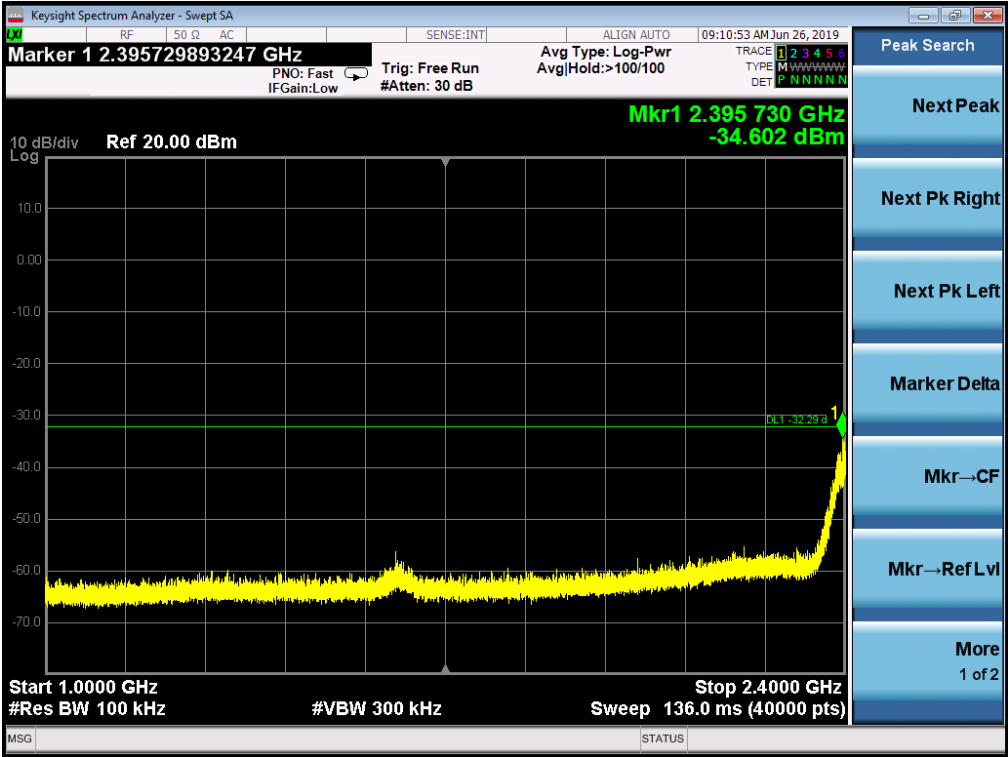
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE  
OF (802.11n20 with data rate 6.5) FOR MODULATION IN HIGH CHANNEL



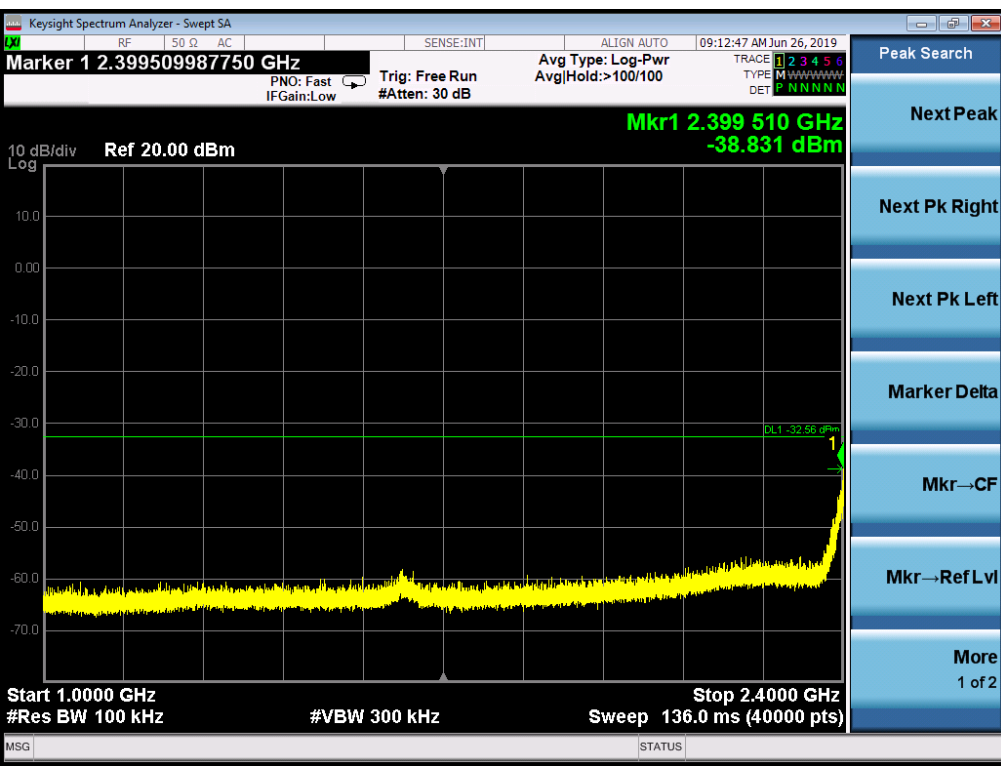
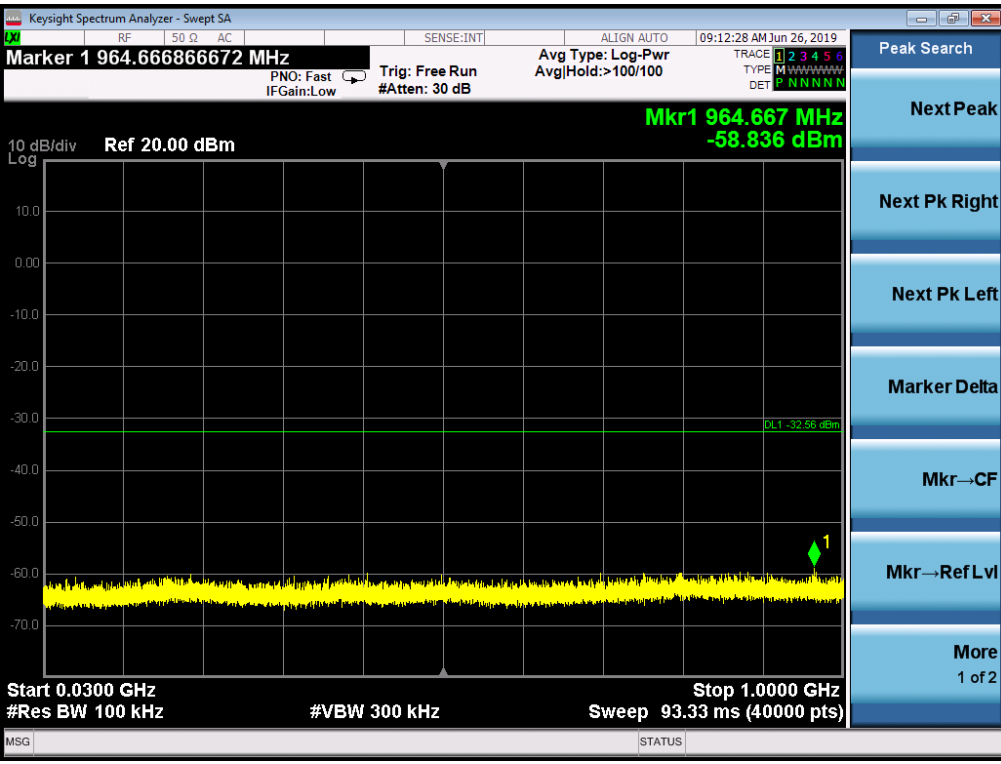


TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF (802.11n40 with data rate 13.5) FOR MODULATION IN LOW CHANNEL



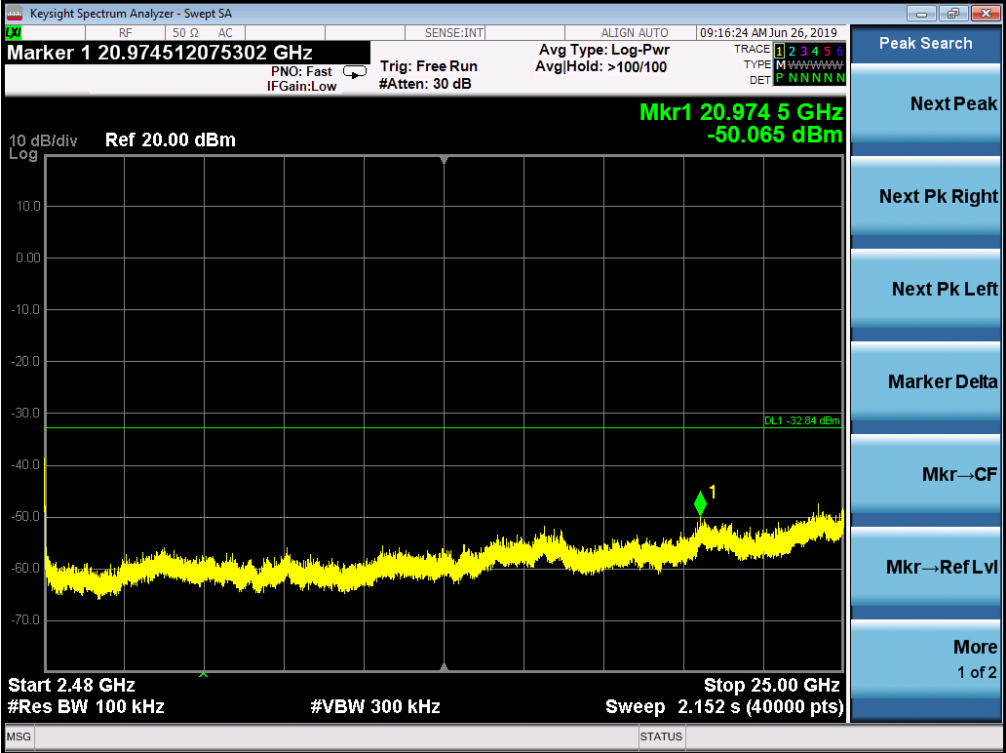
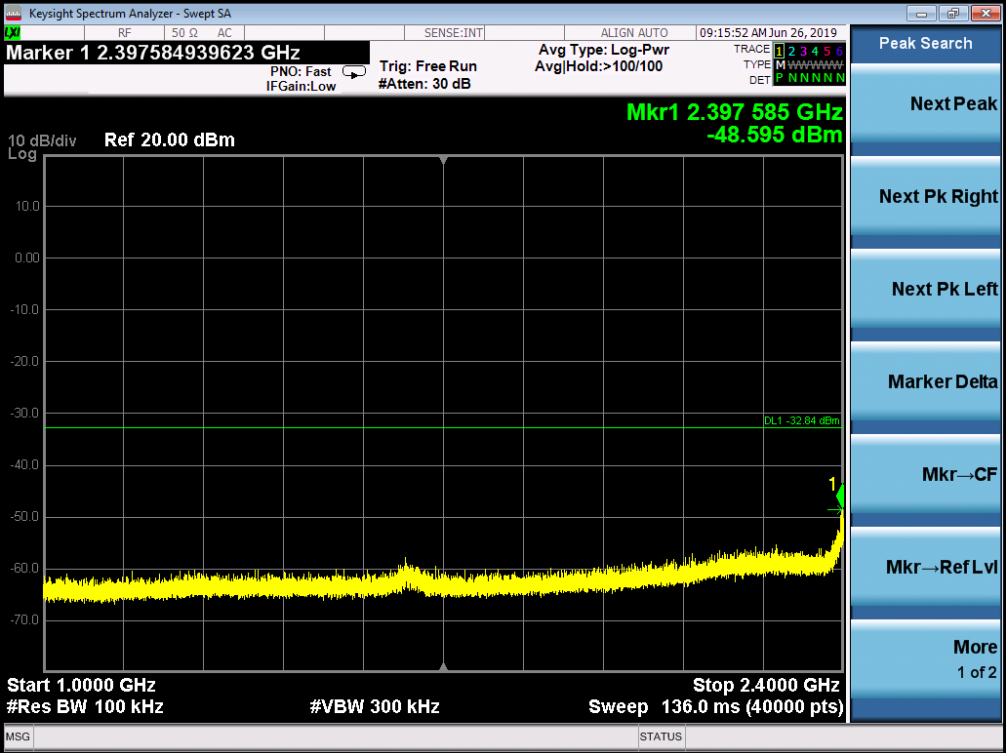


TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE  
OF (802.11n40 with data rate 13.5) FOR MODULATION IN MIDDLE CHANNEL









## 10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

### 10.1 MEASUREMENT PROCEDURE

- (1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- (2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- (3). Set SPA Trace 1 Max hold, then View.

Note: The method of AVGPS-1 in the ANSI C63.10 (2013) item 11.10 was used in this testing.

### 10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer To Section 8.2.

### 10.3 MEASUREMENT EQUIPMENT USED

Refer To Section 6.

### 10.4 LIMITS AND MEASUREMENT RESULT

<b>TEST ITEM</b>	POWER SPECTRAL DENSITY
<b>TEST MODE</b>	802.11b with data rate 1

Channel No.	Power density (dBm/20kHz)	Limit (dBm/3kHz)	Result
Low Channel	2.035	8	Pass
Middle Channel	1.757	8	Pass
High Channel	1.740	8	Pass

<b>TEST ITEM</b>	POWER SPECTRAL DENSITY
<b>TEST MODE</b>	802.11g with data rate 6

Channel No.	Power density (dBm/20kHz)	Limit (dBm/3kHz)	Result
Low Channel	-4.660	8	Pass
Middle Channel	-4.220	8	Pass
High Channel	-3.797	8	Pass

<b>TEST ITEM</b>	POWER SPECTRAL DENSITY
<b>TEST MODE</b>	802.11n 20 with data rate 6.5

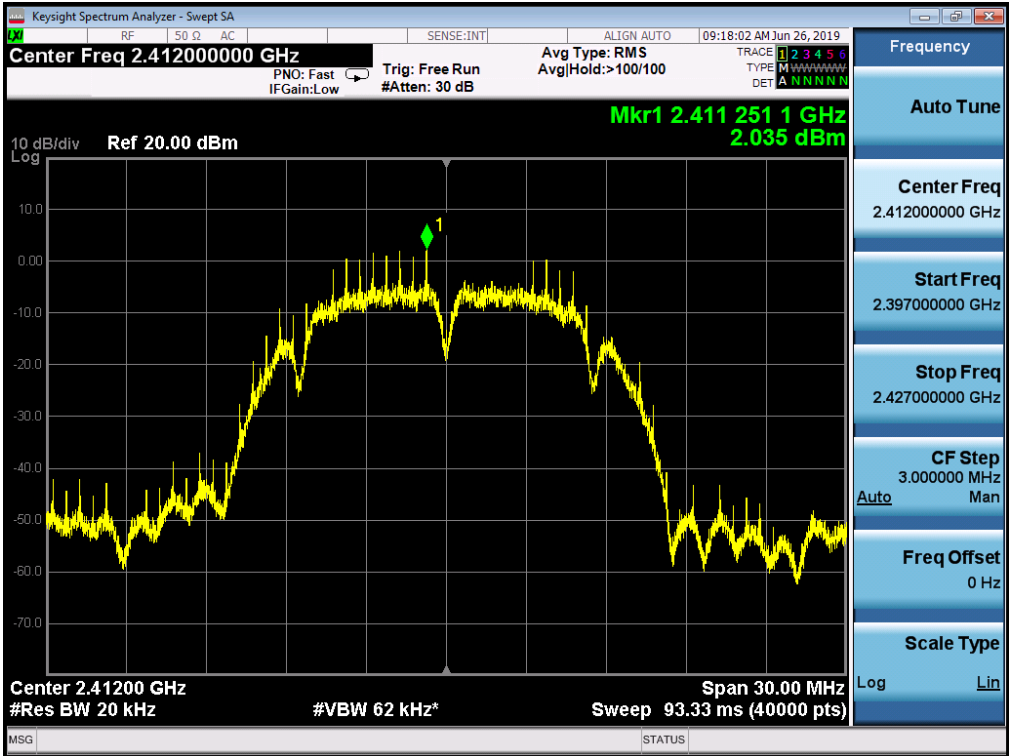
Channel No.	Power density (dBm/20kHz)	Limit (dBm/3kHz)	Result
Low Channel	-3.706	8	Pass
Middle Channel	-3.996	8	Pass
High Channel	-3.969	8	Pass

<b>TEST ITEM</b>	POWER SPECTRAL DENSITY
<b>TEST MODE</b>	802.11n 40 with data rate 13.5

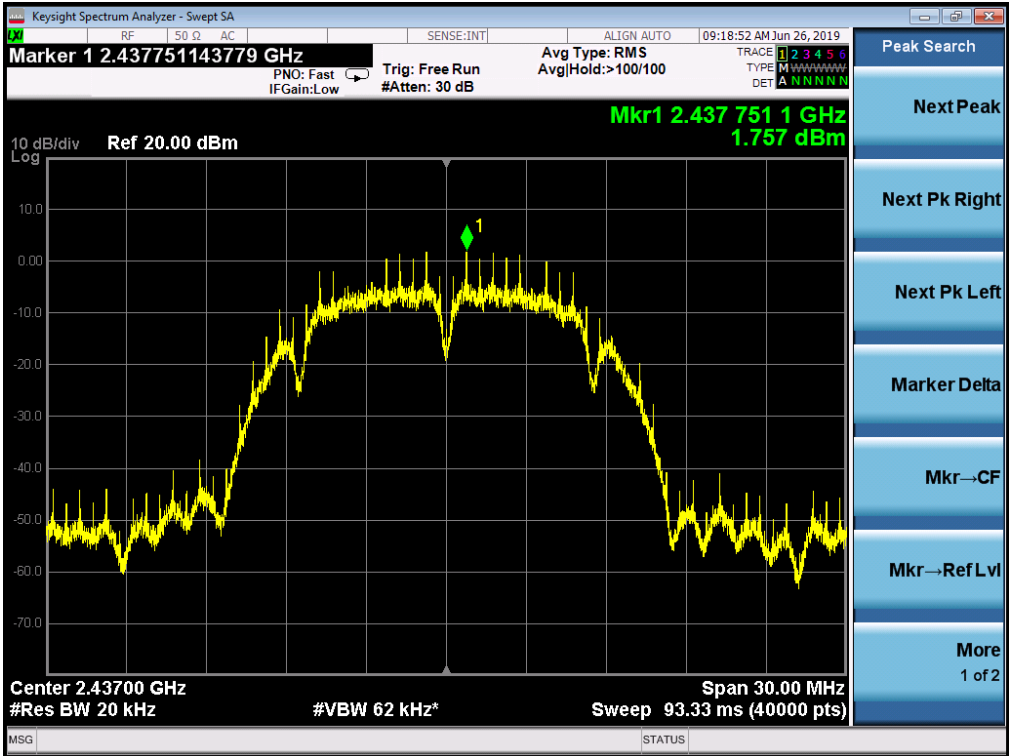
Channel No.	Power density (dBm/20kHz)	Limit (dBm/3kHz)	Result
Low Channel	-7.346	8	Pass
Middle Channel	-7.364	8	Pass
High Channel	-7.487	8	Pass

### 802.11b TEST RESULT

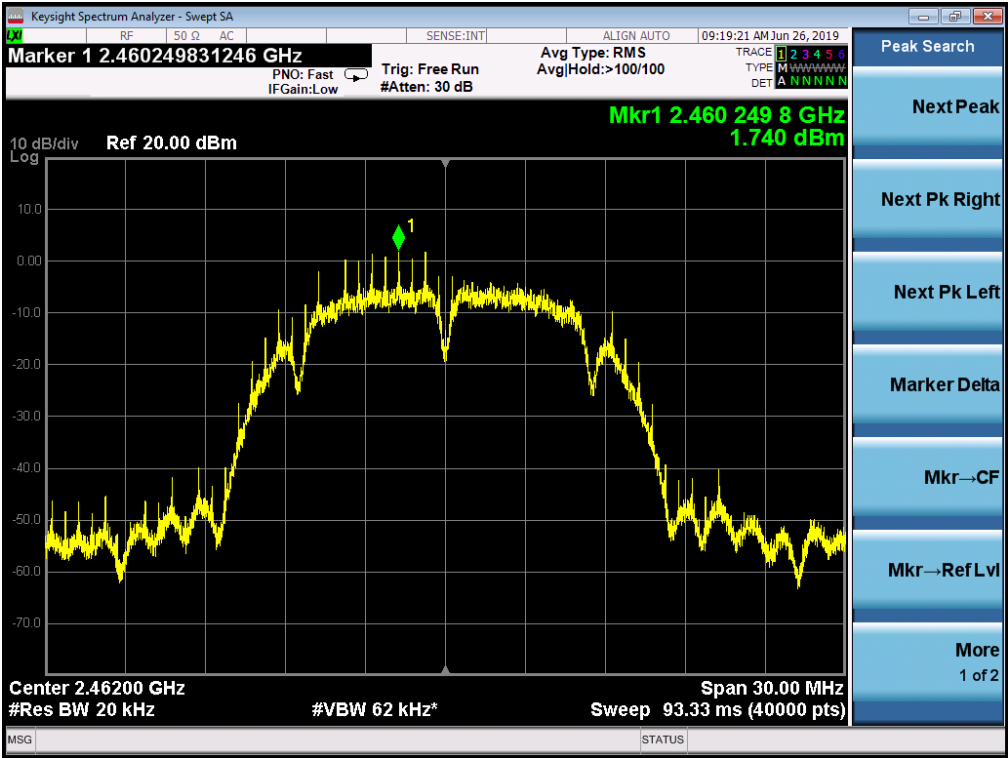
#### TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



#### TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL

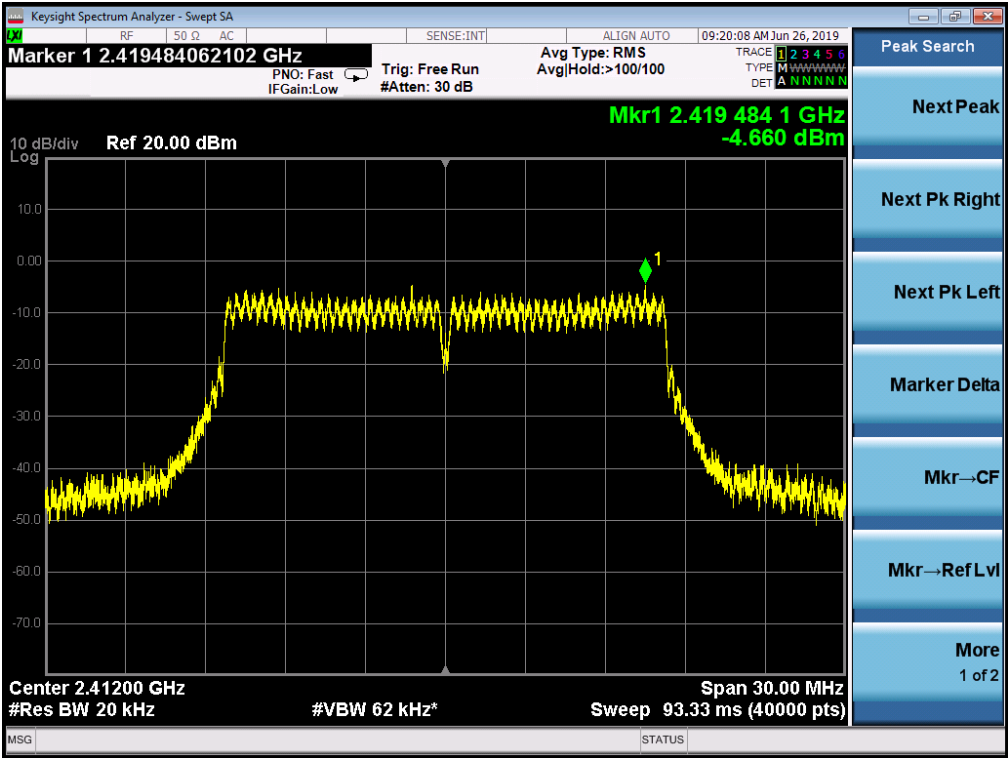


TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL

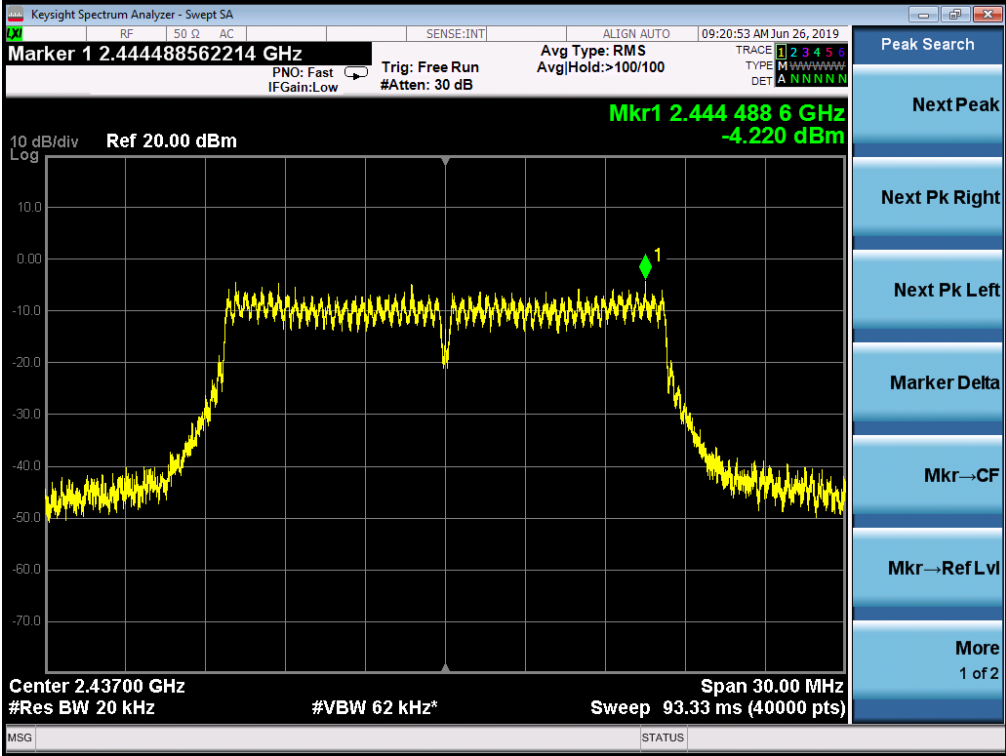


802.11g TEST RESULT

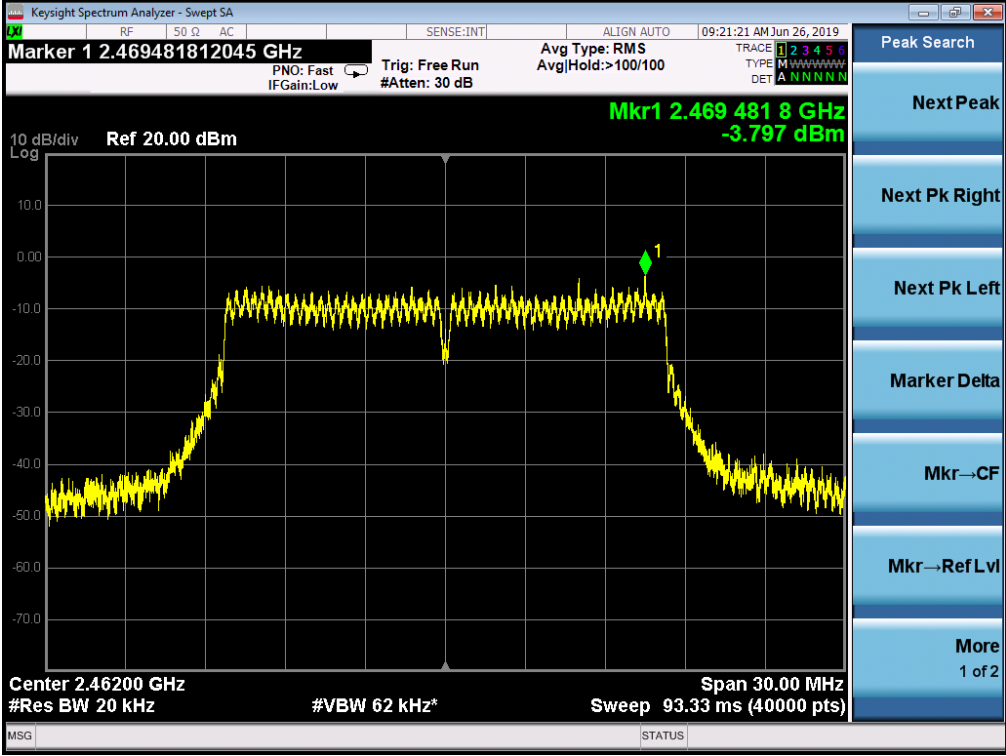
TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL

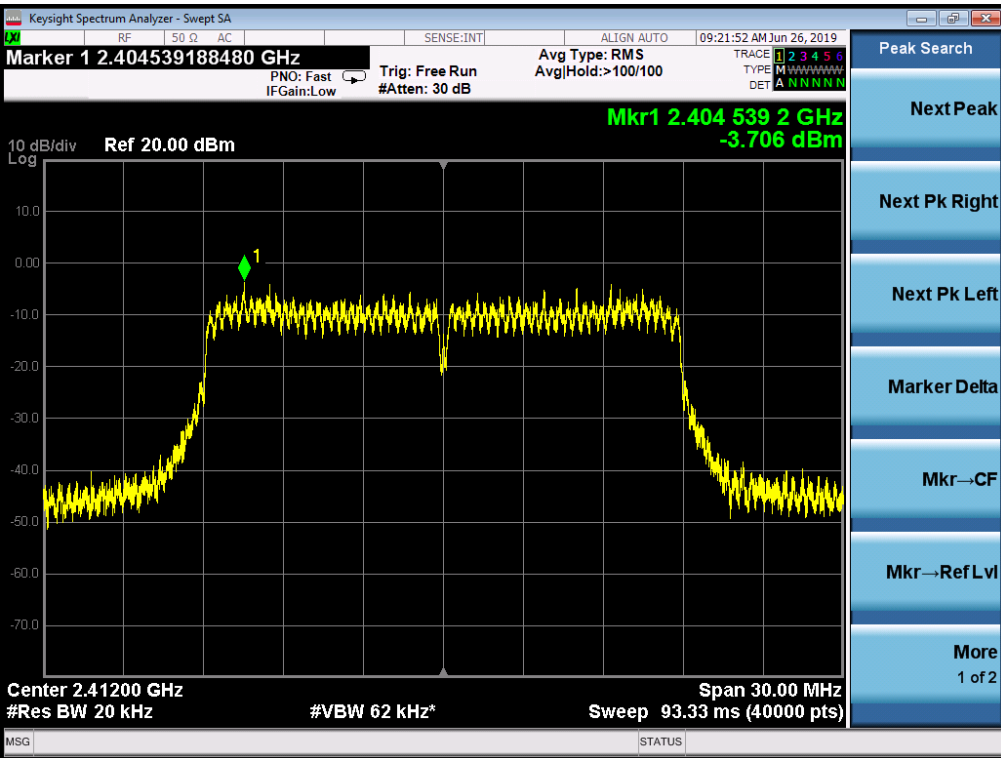


TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL

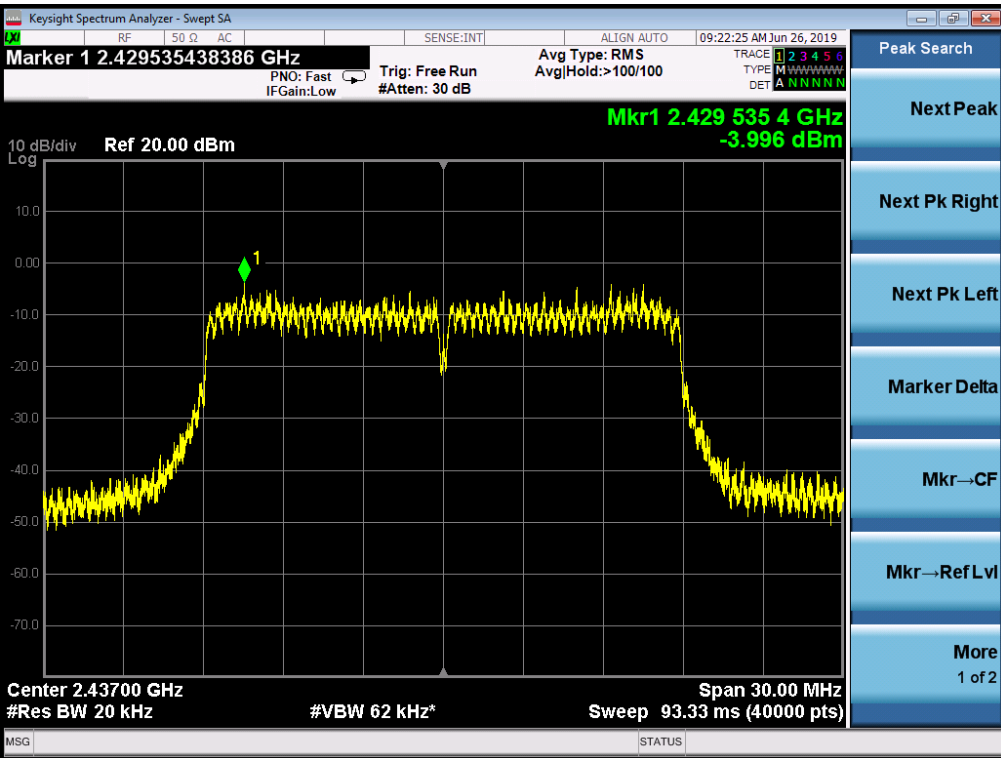


### 802.11n 20 TEST RESULT

#### TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



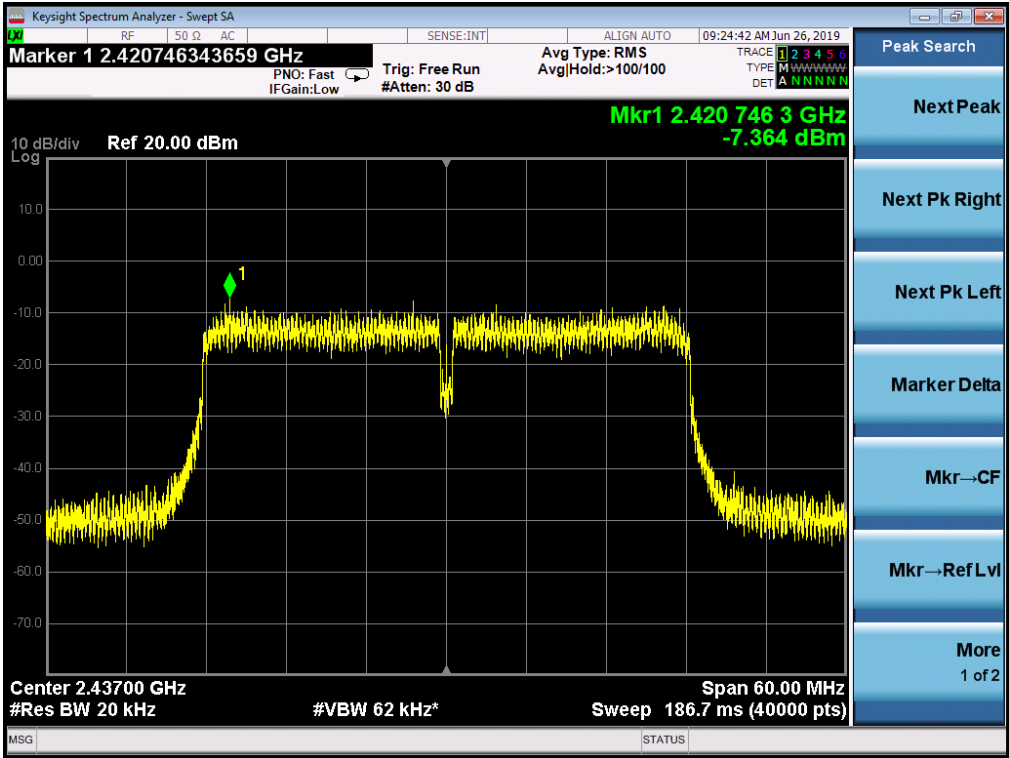
#### TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



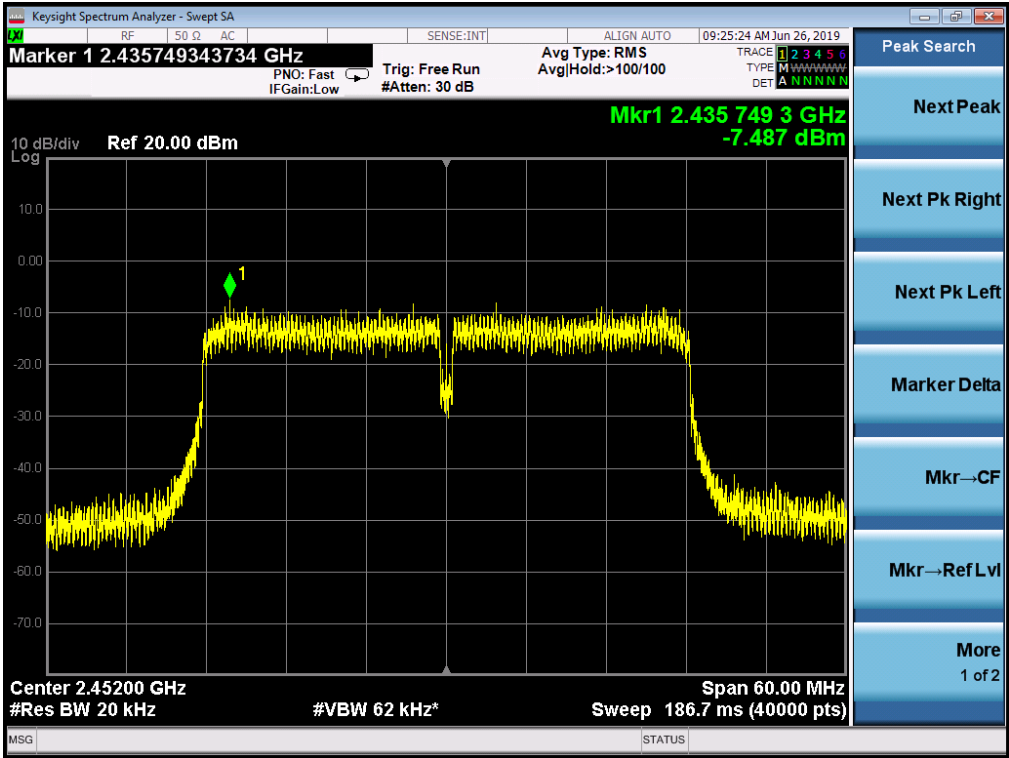




TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



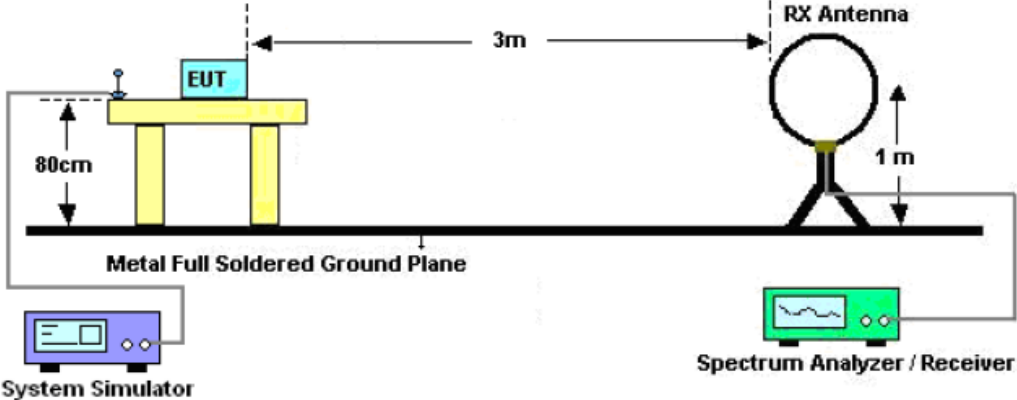
## 11. RADIATED EMISSION

### 11.1. MEASUREMENT PROCEDURE

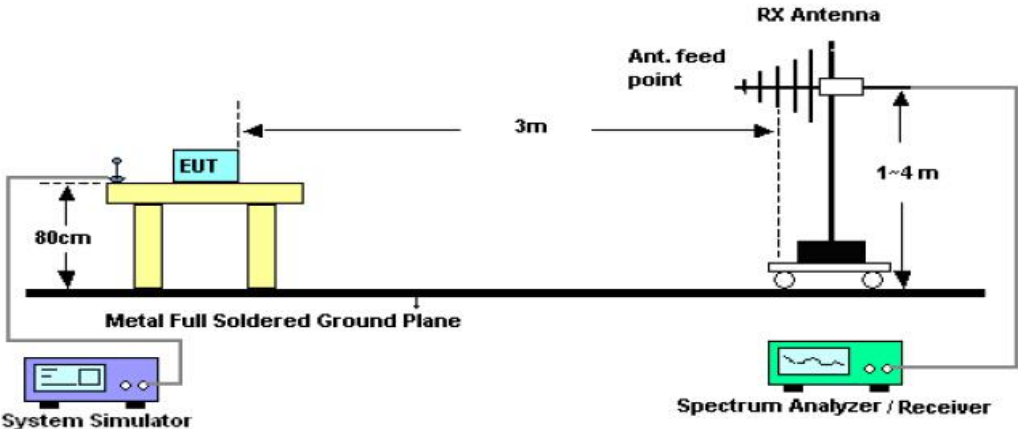
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. 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.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

11.2. TEST SETUP

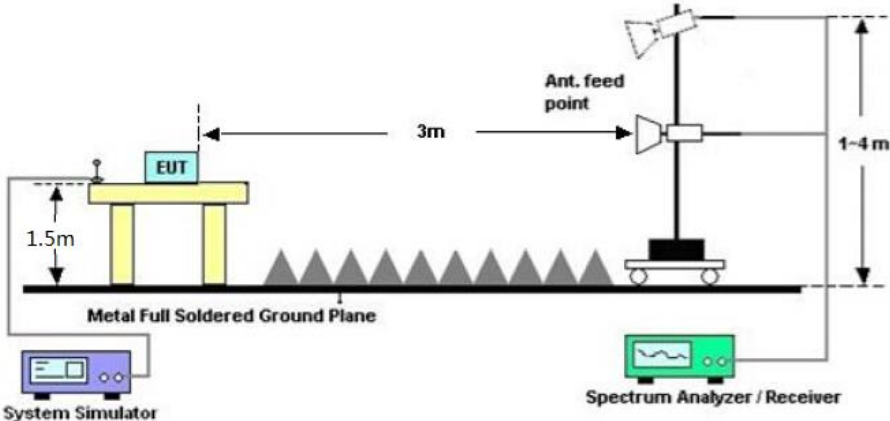
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



### 11.3. LIMITS AND MEASUREMENT RESULT

15.209(a) Limit in the below table has to be followed

<b>Frequencies (MHz)</b>	<b>Field Strength (micorvolts/meter)</b>	<b>Measurement Distance (meters)</b>
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested For restricted band radiated emission,  
the test records reported below are the worst result compared to other modes.

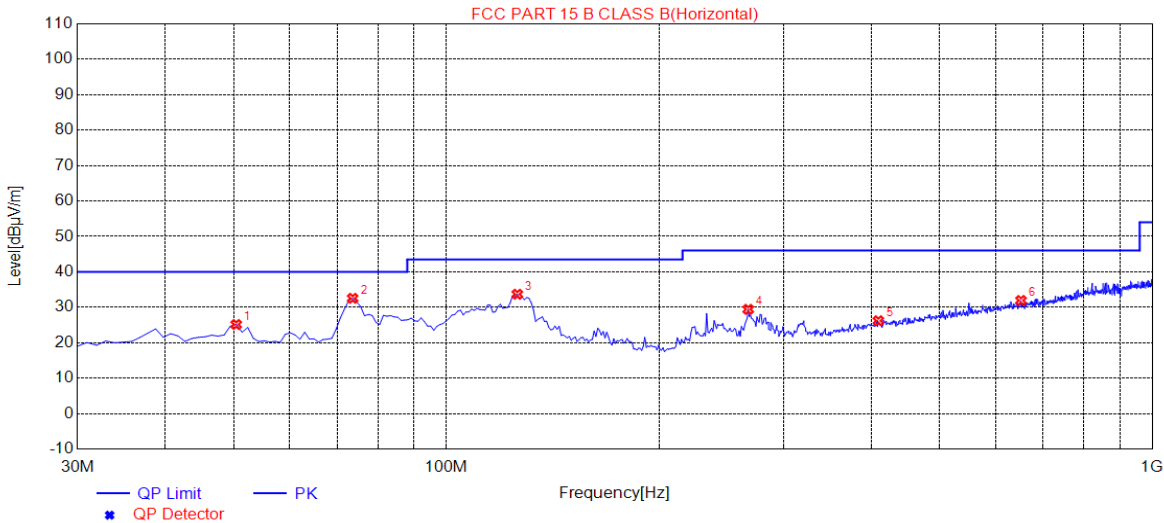
### 11.4. TEST RESULT

#### **RADIATED EMISSION BELOW 30MHZ**

No emission found between lowest internal used/generated frequencies to 30MHz.

**RADIATED EMISSION BELOW 1GHZ**

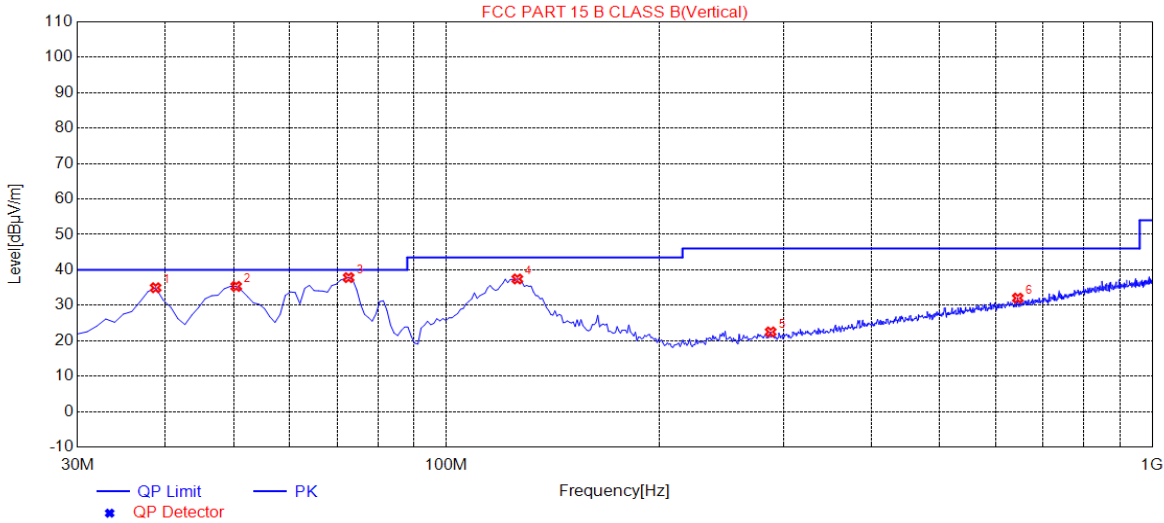
<b>EUT</b>	2.4G Camera	<b>Model Name</b>	WJ11
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	802.11b with date rate 1 2412MHZ	<b>Antenna</b>	Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	50.3700	25.14	14.64	40.00	14.86	100	279	Horizontal
2	73.6500	32.54	11.47	40.00	7.46	200	224	Horizontal
3	126.0300	33.69	13.88	43.50	9.81	150	219	Horizontal
4	267.6500	29.43	15.21	46.00	16.57	100	286	Horizontal
5	409.2700	26.21	20.01	46.00	19.79	100	84	Horizontal
6	651.7700	31.93	25.19	46.00	14.07	100	346	Horizontal

**RESULT: PASS**

<b>EUT</b>	2.4G Camera	<b>Model Name</b>	WJ11
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	802.11b with date rate 1 2412MHZ	<b>Antenna</b>	Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	38.7300	34.95	14.63	40.00	5.05	100	226	Vertical
2	50.3700	35.34	14.64	40.00	4.66	100	230	Vertical
3	72.6800	37.82	11.67	40.00	2.18	100	291	Vertical
4	126.0300	37.43	13.88	43.50	6.07	100	183	Vertical
5	288.0200	22.49	16.16	46.00	23.51	200	208	Vertical
6	644.9800	32.03	25.05	46.00	13.97	100	298	Vertical

**RESULT: PASS**

- Note:** 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.  
 2. The “Factor” value can be calculated automatically by software of measurement system.  
 3. All test modes had been pre-tested. The 802.11b at low channel is the worst case and recorded in the report.