

## FCC RADIO TEST REPORT

### No. 170801919SHA-001

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Manufacturing site : PartnerX(Changzhou) Robotics Co., Ltd.  
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Rd., Wujin High-tech Industrial Zone, Changzhou City,  
Jiangsu Province, China.

Product Name : Abilix Educational Robot Module Series

Type/Model : Boya 3, Boya 4, Boya 5, Boya 6, Boya 7, Boya 8

**TEST RESULT : PASS**

#### SUMMARY

The equipment complies with the requirements according to the following standard(s) or specification:

**47CFR Part 15 (2016): Radio Frequency Devices (Subpart C)**

**ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices**

**RSS-247 Issue 2 (February 2017): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices**

**RSS-Gen Issue 4 (December 2014): General Requirements for Compliance of Radio Apparatus**

Date of issue: October 9, 2017

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## 1 GENERAL INFORMATION

### 1.1 Identification of the EUT

Product Name : Abilix Educational Robot Module Series  
Type/model : Boya 3, Boya 4, Boya 5, Boya 6, Boya 7, Boya 8  
FCC ID : 2AJ5L-S3  
IC : 22130-S3

### 1.2 Technical Specification

Operation Frequency : 2400~2483.5 MHz;  
Band  
Type of Modulation : DBPSK, DQPSK, CCK, BPSK, QPSK, 16QAM, 64QAM  
EUT Modes of Modulation : 802.11b, 802.11g, 802.11n(HT20), 802.11n(HT40)  
Channel Number : 11 Channel for 2412MHz~2462MHz for 802.11b, 802.11g,  
802.11n(HT20)  
7 Channel for 2422MHz~2452MHz for 802.11n(HT40)  
Description of EUT : EUT is a robot with WiFi function.  
Antenna : PCB antenna, -1dBi  
Rating : DC 7.4V  
Charging adaptor: XSG0841000US  
Input: 100-240V~ 50/60Hz 0.6A max  
Output: 8.4VDC 1.0A  
EUT type :  Table top  
 Floor standing  
Sample received date : August 4, 2017  
Date of test : August 4, 2017 ~ September 20, 2017

## 2 TEST SPECIFICATIONS

### 2.1 Standards or specification

47CFR Part 15 (2016)  
 ANSI C63.10 (2013)  
 KDB 558074 (v04)  
 RSS-247 Issue 2 (February 2017)  
 RSS-Gen Issue 4 (December 2014)

### 2.2 Mode of operation during the test

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

The lowest, middle and highest channel were tested as representatives.

Freq. Band	Modulation	Lowest(MHz)	Middle(MHz)	Highest(MHz)
2400-2483.5 MHz	802.11b	2412	2437	2462
	802.11g	2412	2437	2462
	802.11n(HT20)	2412	2437	2462
	802.11n(HT40)	2422	2437	2452

### Data rate VS Power

The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

After this pre-scan, we choose the following table of the data rata as the worst case.

Freq. Band	Modulation	Worst case data rate
2400-2483.5MHz	802.11b	1Mbps
	802.11g	6Mbps
	802.11n(HT20)	MCS0
	802.11n(HT40)	MCS0

**2.3 Test software list**

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

**2.4 Test peripherals list**

Item No.	Name	Band and Model	Description
1	Laptop computer	HP ProBook 6470b	100-240V AC, 50/60Hz

## 2.5 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESCS 30	EC 2107	2018-09-12
<input checked="" type="checkbox"/>	A.M.N.	R&S	ESH2-Z5	EC 3119	2017-12-01
<input type="checkbox"/>	A.M.N.	R&S	ENV 216	EC 3393	2018-07-30
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2018-09-12
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2018-05-30
<input checked="" type="checkbox"/>	Horn antenna	R&S	HF 906	EC 3049	2018-09-23
<input type="checkbox"/>	Horn antenna	ETS	3117	EC 4792-1	2018-08-24
<input checked="" type="checkbox"/>	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
<input checked="" type="checkbox"/>	Pre-amplifier	R&S	Pre-amp 18	EC5881	2018-06-19
<input checked="" type="checkbox"/>	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2018-01-25
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2018-09-10
<input type="checkbox"/>	Power sensor/ Power meter	Agilent	N1911A/ N1921A	EC4318	2018-05-12
<input type="checkbox"/>	Test Receiver	R&S	ESCI 7	EC 4501	2018-09-12
Test Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2018-01-08
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2018-03-09
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3323	2018-06-14
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3324	2018-04-09
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2018-03-23
<input checked="" type="checkbox"/>	Pressure meter	YM3	Shanghai Mengde	EC 3320	2018-06-28

## 2.6 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

TEST ITEM	MEASUREMENT UNCERTAINTY
Maximum peak output power	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Power line conducted emission	± 3.19dB

## 2.7 Test Summary

**This report applies to tested sample only. The test results have been compared directly with the limits, and the measurement uncertainty is recorded. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.**

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Minimum 6dB bandwidth	15.247(a)(2)	RSS-247 Issue 2 Clause 5.2	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)	RSS-247 Issue 2 Clause 5.4	Pass
Power Spectrum density	15.247(e)	RSS-247 Issue 2 Clause 5.2	Pass
Emission outside the frequency band	15.247(d)	RSS-247 Issue 2 Clause 5.5	Pass
Radiated Emissions in restricted frequency bands	15.205 & 15.209	RSS-Gen Issue 4 Clause 8.9 & 8.10	Pass
Power line conducted emission	15.207	RSS-Gen Issue 4 Clause 8.8	Pass
Antenna requirement	15.203	-	Pass
Occupied bandwidth	-	RSS-Gen Issue 4 Clause 6.6	Tested

Notes: 1: NA =Not Applicable

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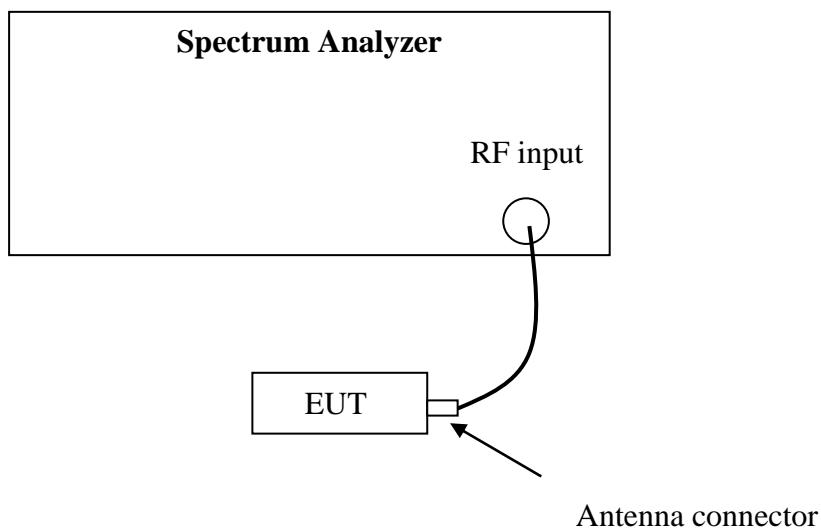
### 3 Minimum 6dB Bandwidth

Test result: Pass

#### 3.1 Limit

For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

#### 3.2 Test Configuration



#### 3.3 Test Procedure and test setup

The minimum 6dB bandwidth per FCC §15.247(a)(2) is measured using the Spectrum Analyzer according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance v04” for compliance to FCC 47CFR 15.247 requirements(clause 8.2).

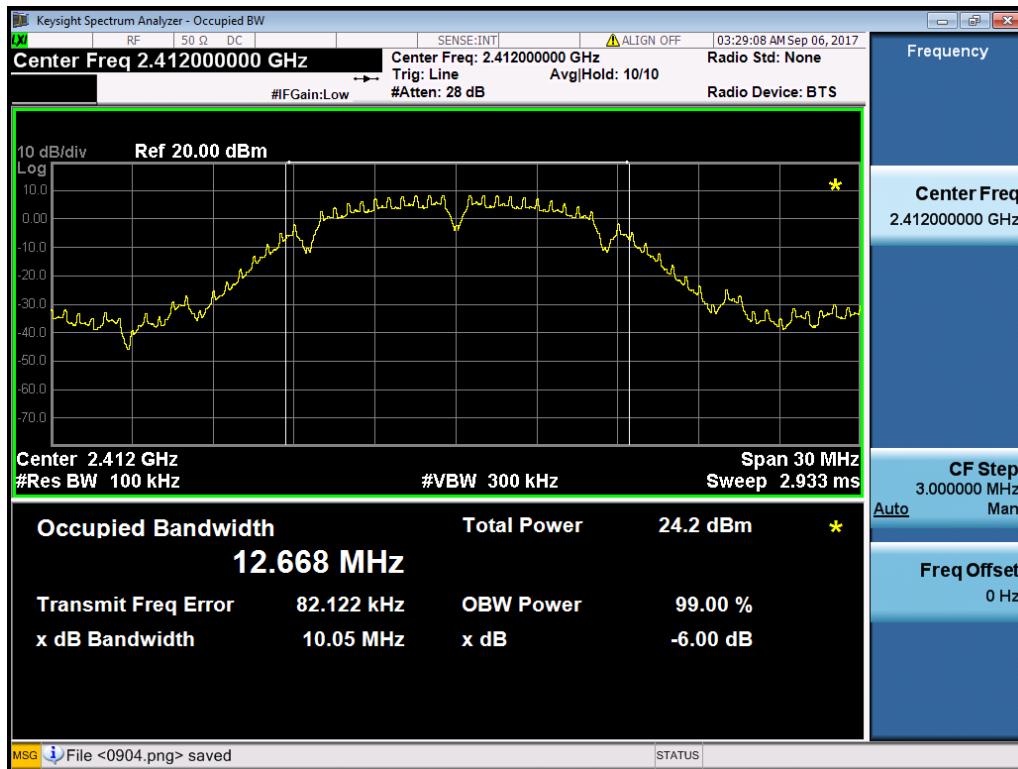
- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times \text{RBW}$ .
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 3.4 Test Protocol

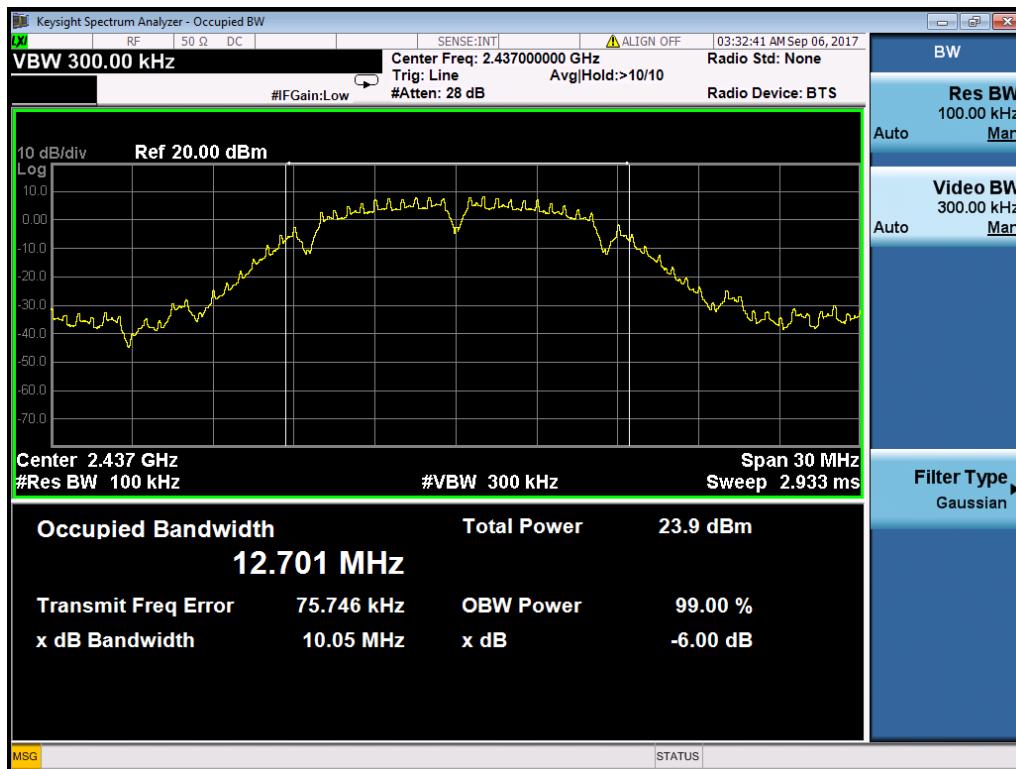
Temperature: 25 °C  
Relative Humidity: 55 %

Mode	Channel	Minimum 6dB Bandwidth (MHz)			Limits (MHz)
		Port0	-	-	
802.11b	L	10.05	-	-	> 0.5
	M	10.05	-	-	> 0.5
	H	10.04	-	-	> 0.5

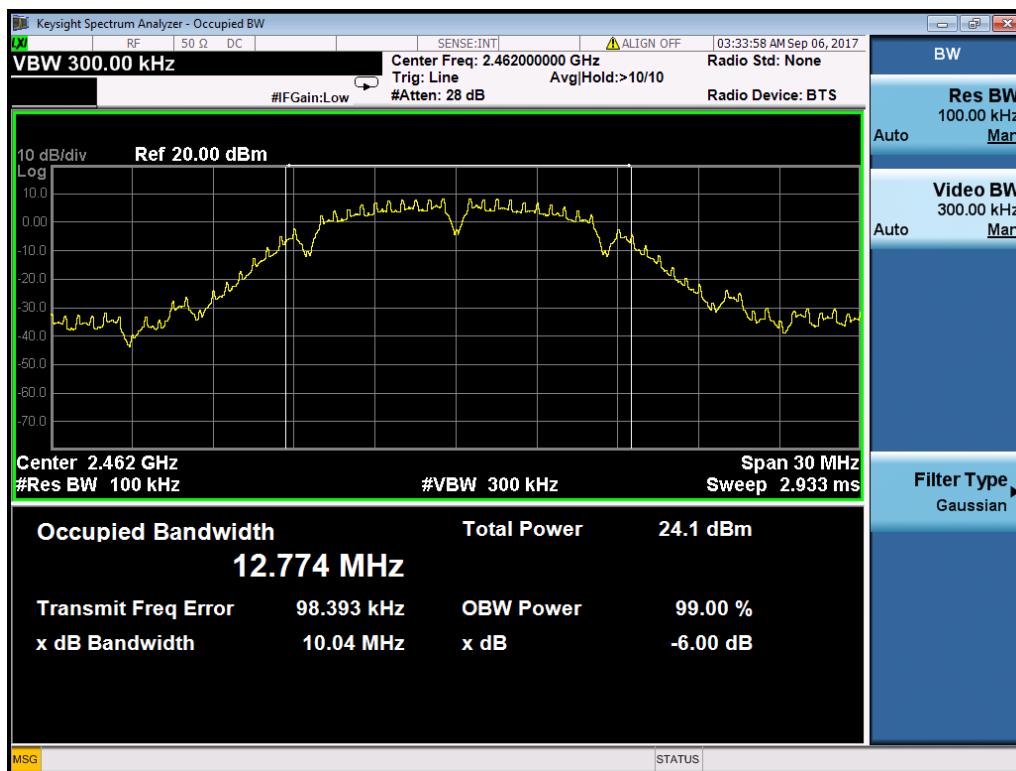
Channel L



## Channel M

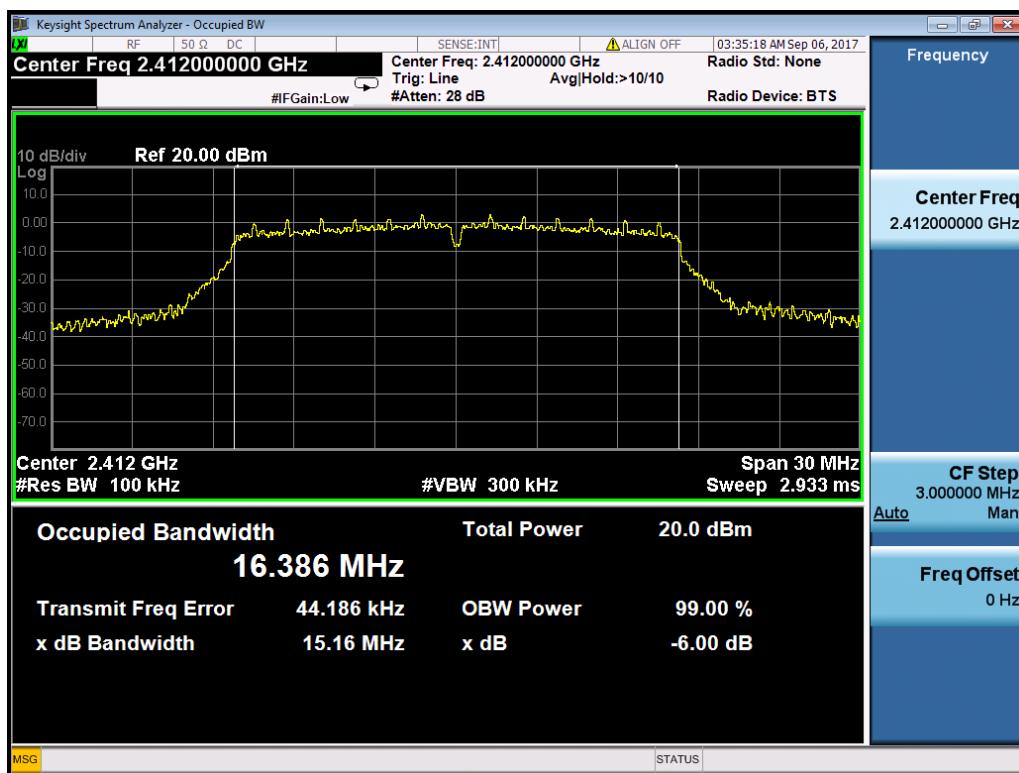


## Channel H

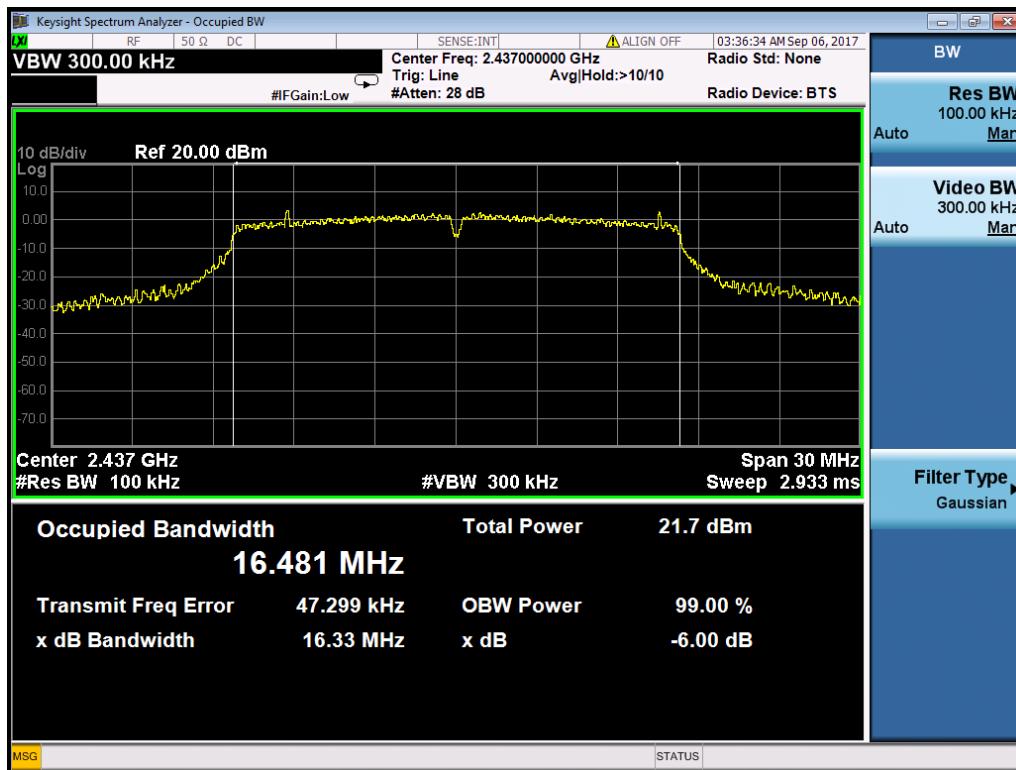


Mode	Channel	Minimum 6dB Bandwidth (MHz)			Limits (MHz)
		Port0	-	-	
802.11g	L	15.16	-	-	> 0.5
	M	16.33	-	-	> 0.5
	H	15.47	-	-	> 0.5

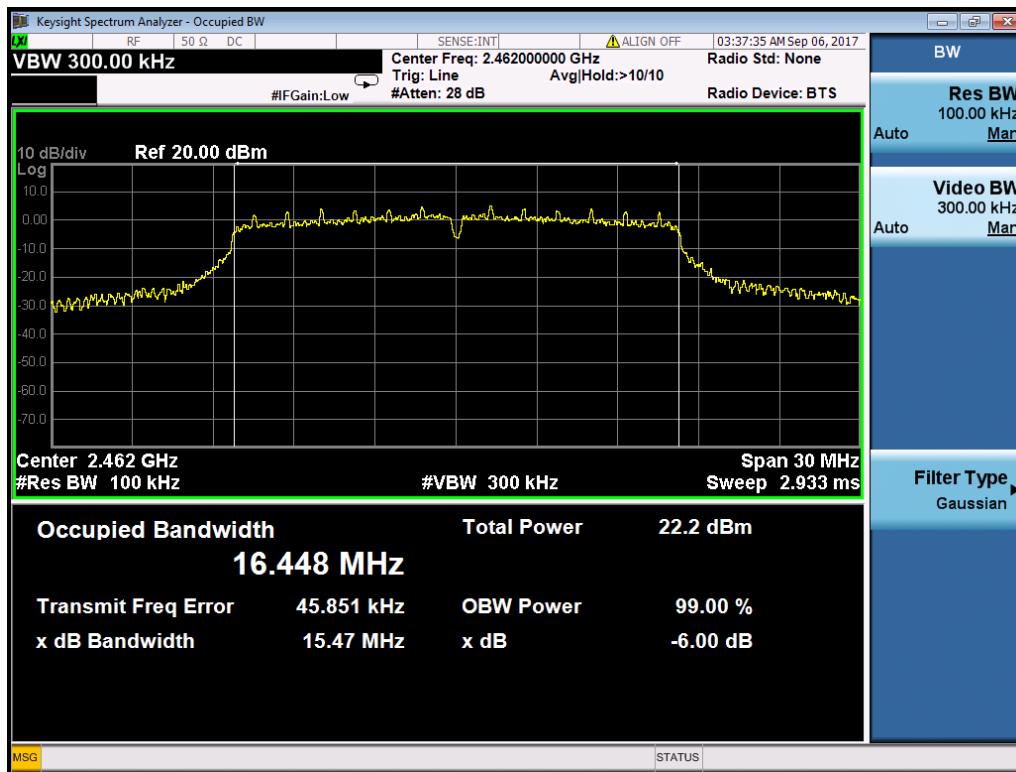
### Channel L



## Channel M

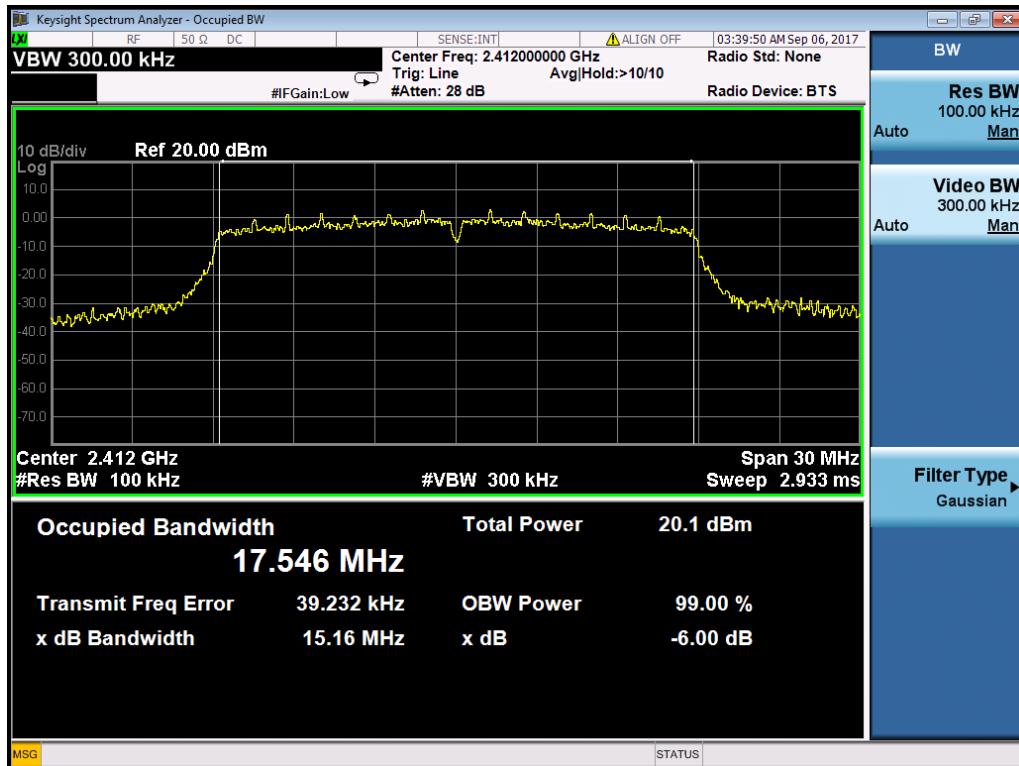


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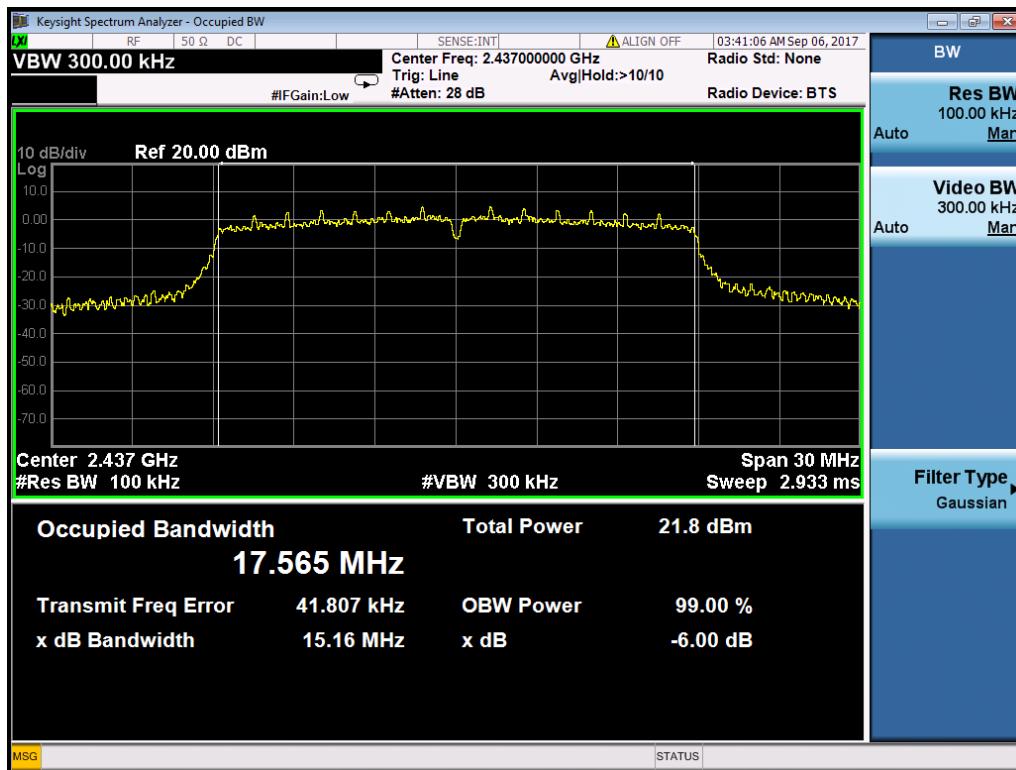


Mode	Channel	Minimum 6dB Bandwidth (MHz)			Limits (MHz)
		Port0	-	-	
802.11n(HT20)	L	15.16	-	-	> 0.5
	M	15.16	-	-	> 0.5
	H	15.47	-	-	> 0.5

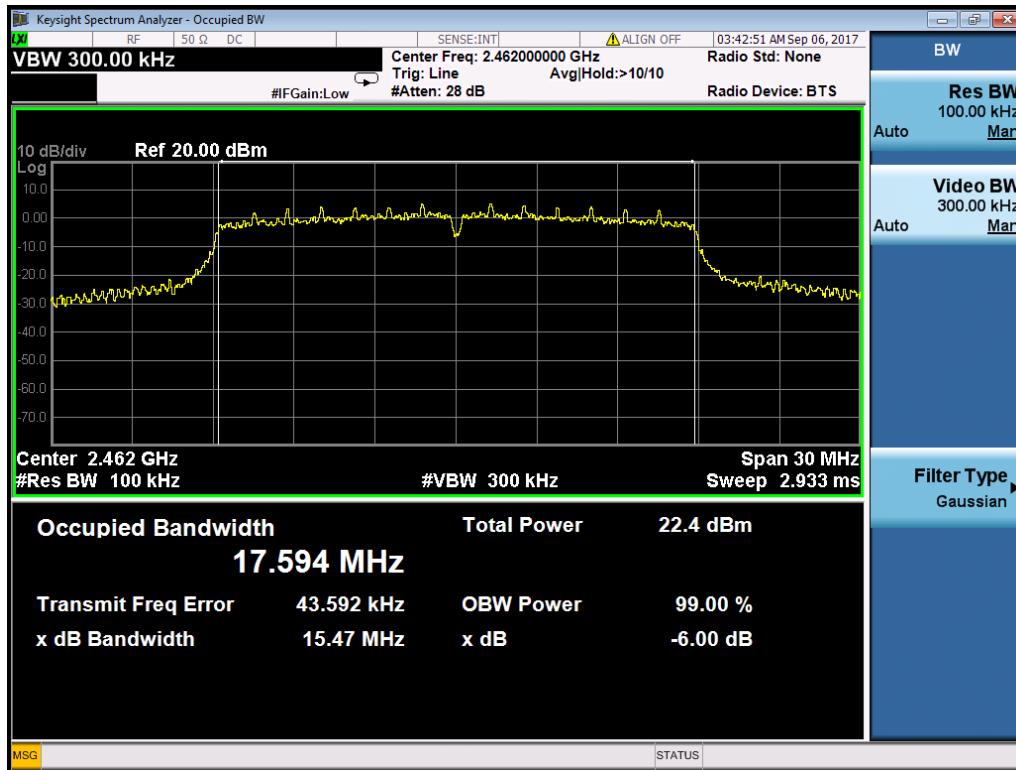
### Channel L



## Channel M

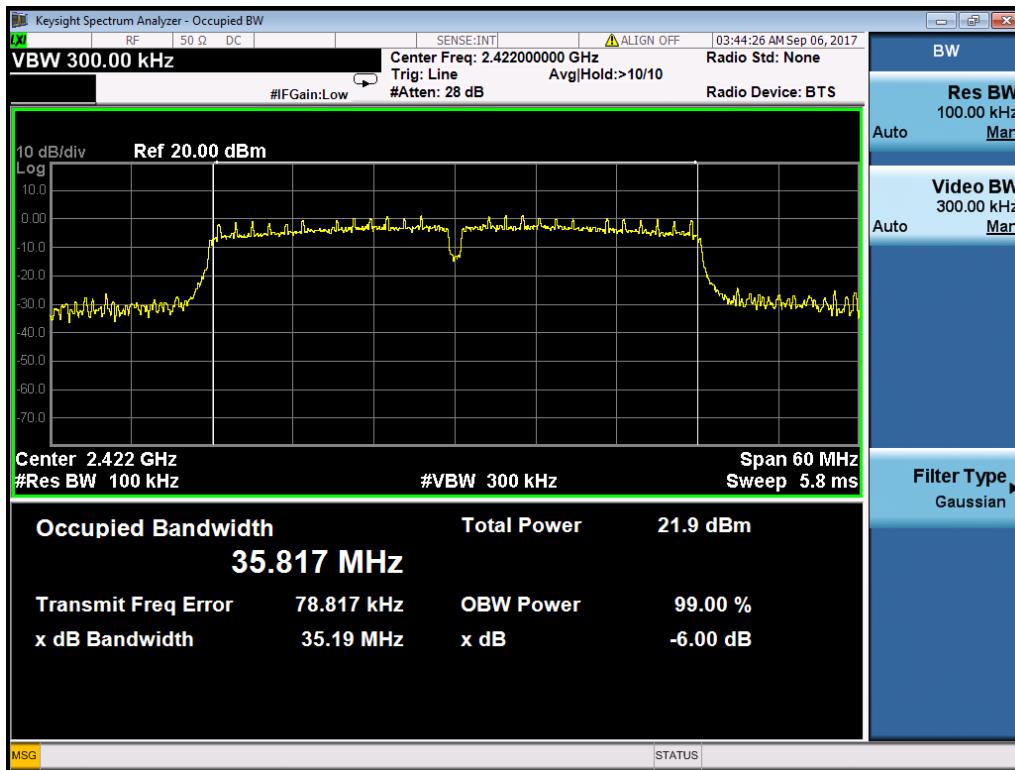


## Channel H

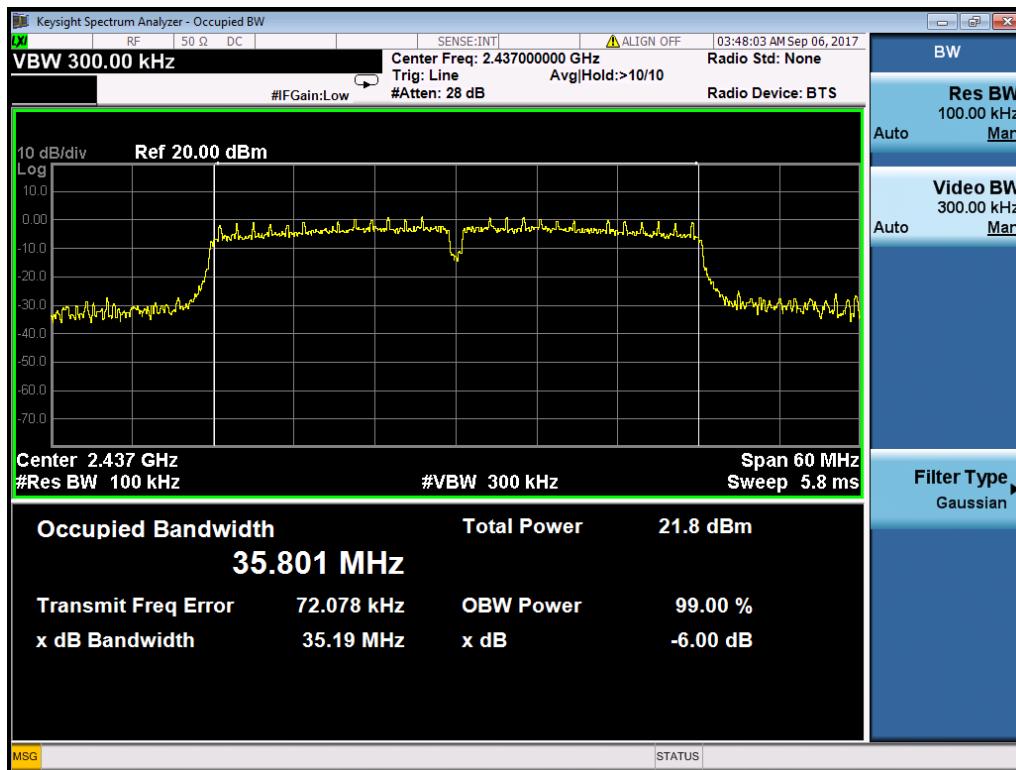


Mode	Channel	Minimum 6dB Bandwidth (MHz)			Limits (MHz)
		Port0	-	-	
802.11n(HT40)	L	35.19	-	-	> 0.5
	M	35.19	-	-	> 0.5
	H	35.19	-	-	> 0.5

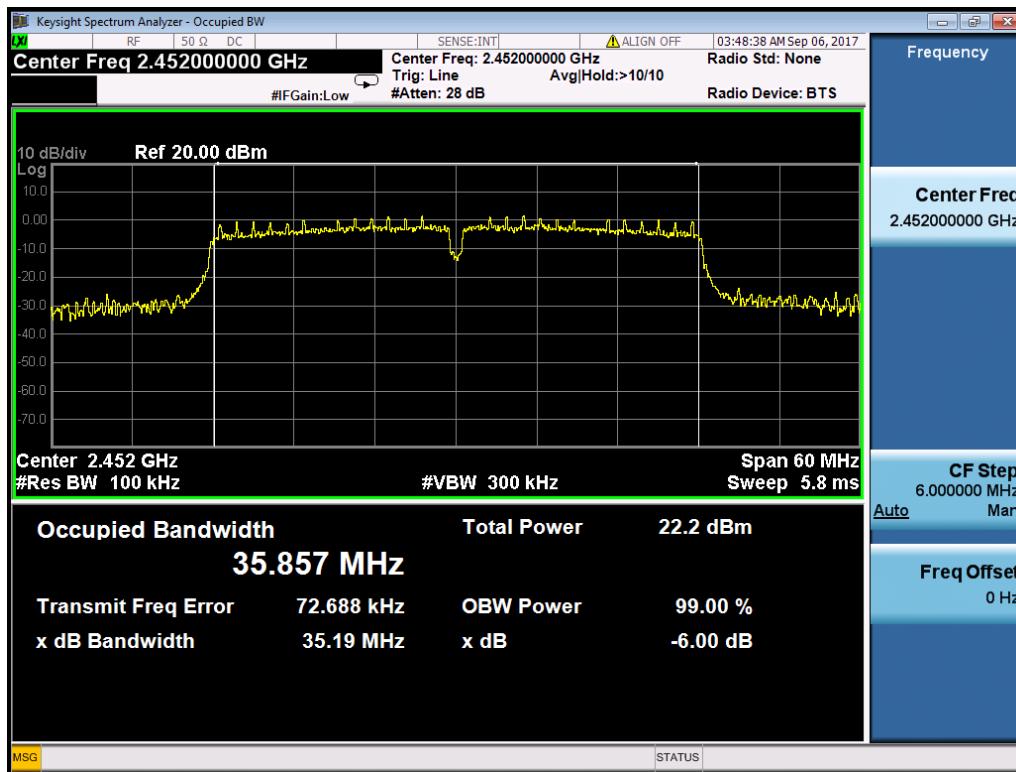
## Channel L



## Channel M



## Channel H



## 4 Maximum Conducted Output power and e.i.r.p.

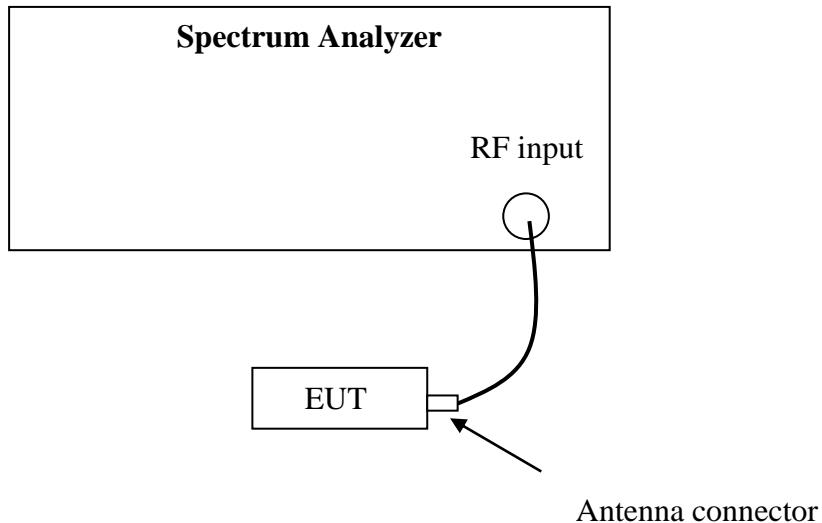
Test result: Pass

### 4.1 Test limit

- For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt
- For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts
- For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt (EIRP: 4 watt).

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

### 4.2 Test Configuration



#### 4.3 Test procedure and test setup

The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v04" for compliance to FCC 47CFR 15.247 requirements (clause 9.1.2).

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

#### 4.4 Test protocol

Temperature: 25 °C

Relative Humidity: 55 %

Mode	Channel	Reading (dBm)			Total Power (dBm)	Limit (dBm)
		Port0	-	-		
802.11b	L	21.58	-	-	21.58	30
	M	21.45	-	-	21.45	30
	H	21.57	-	-	21.57	30

Mode	Channel	Reading (dBm)			Total Power (dBm)	Limit (dBm)
		Port0	-	-		
802.11g	L	23.29	-	-	23.29	30
	M	24.31	-	-	24.31	30
	H	24.44	-	-	24.44	30

Mode	Channel	Reading (dBm)			Total Power (dBm)	Limit (dBm)
		Port0	-	-		
802.11n (HT20)	L	23.55	-	-	23.55	30
	M	24.24	-	-	24.24	30
	H	24.21	-	-	24.21	30

Mode	Channel	Reading (dBm)			Total Power (dBm)	Limit (dBm)
		Port0	-	-		
802.11n (HT40)	L	23.86	-	-	23.86	30
	M	23.96	-	-	23.96	30
	H	23.88	-	-	23.88	30

**The maximum EIRP of the EUT = 24.44dBm + (-1dB) = 23.44dBm = 220.80mW which is lower than the EIRP limit of RSS-247.**

Note:

$$\text{Reading port } x \text{ (mW)} = 10^x \times (\text{reading port } x \text{ (dBm)})/10$$

$$x = 0, 1, 2.$$

$$\text{Total Power (mW)} = \text{reading port 0 (mW)} + \text{reading port 1 (mW)} + \text{reading port 2 (mW)}$$

$$\text{Total power (dBm)} = 10 * \log (\text{Total power (mW)})$$

## 5 Power spectrum density

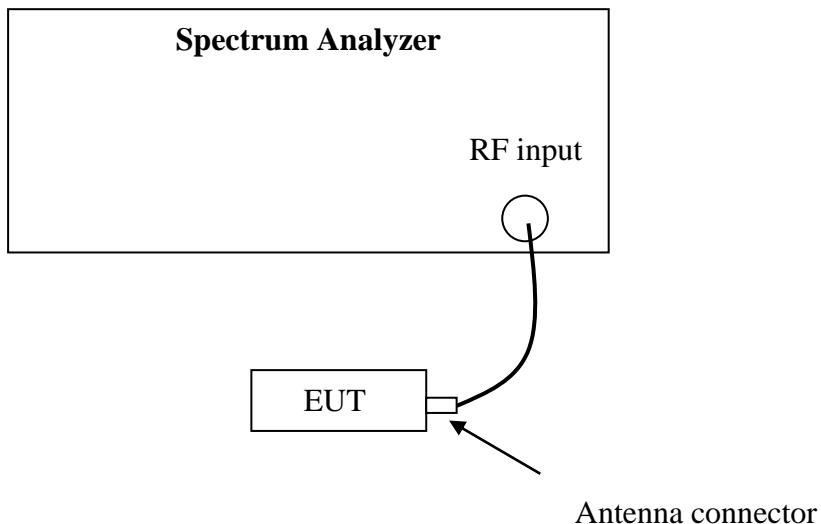
**Test result:** Pass

### 5.1 Test limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

### 5.2 Test Configuration



### 5.3 Test procedure and test setup

The power output per FCC §15.247(e) was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance v04” (clause 10.2) for compliance to FCC 47CFR 15.247 requirements.

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the *DTS bandwidth*.
- c) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq 3 \times \text{RBW}$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

## 5.4 Test Protocol

Temperature: 25 °C

Relative Humidity: 55 %

Mode	Channel	PSD (dBm)			Total PSD (dBm)	Limit (dBm)
		Port 0	-	-		
802.11b	L	6.281	-	-	6.281	8
	M	6.808	-	-	6.808	8
	H	6.746	-	-	6.746	8

Note 1:

$$\text{PSD port } x \text{ (mW)} = 10^{\frac{x}{10}} (\text{PSD port } x \text{ (dBm)}) / 10; x = 0, 1, 2.$$

$$\text{Total PSD (mW)} = \text{PSD port 0 (mW)} + \text{PSD port 1 (mW)} + \text{PSD port 2 (mW)}$$

$$\text{Total PSD (dBm)} = 10 * \log(\text{Total PSD (mW)})$$

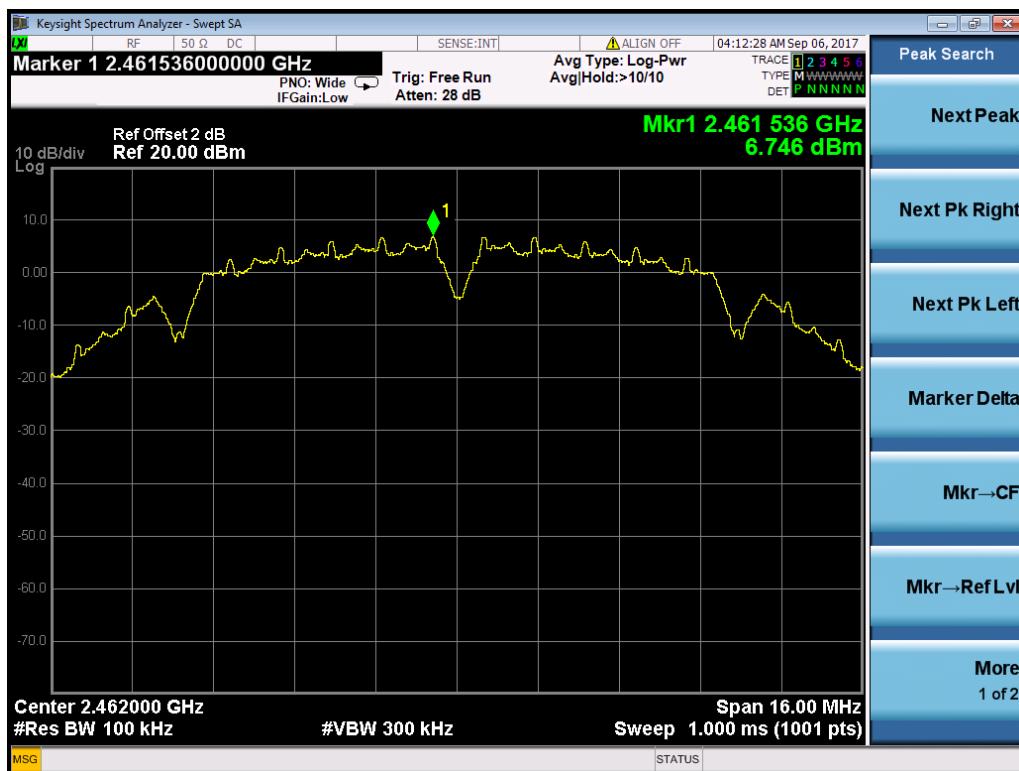
Channel L



### Channel M



### Channel H



Mode	Channel	PSD (dBm)			Total PSD (dBm)	Limit (dBm)
		Port 0	-	-		
802.11g	L	2.822	-	-	2.822	8
	M	4.599	-	-	4.599	8
	H	5.150	-	-	5.150	8

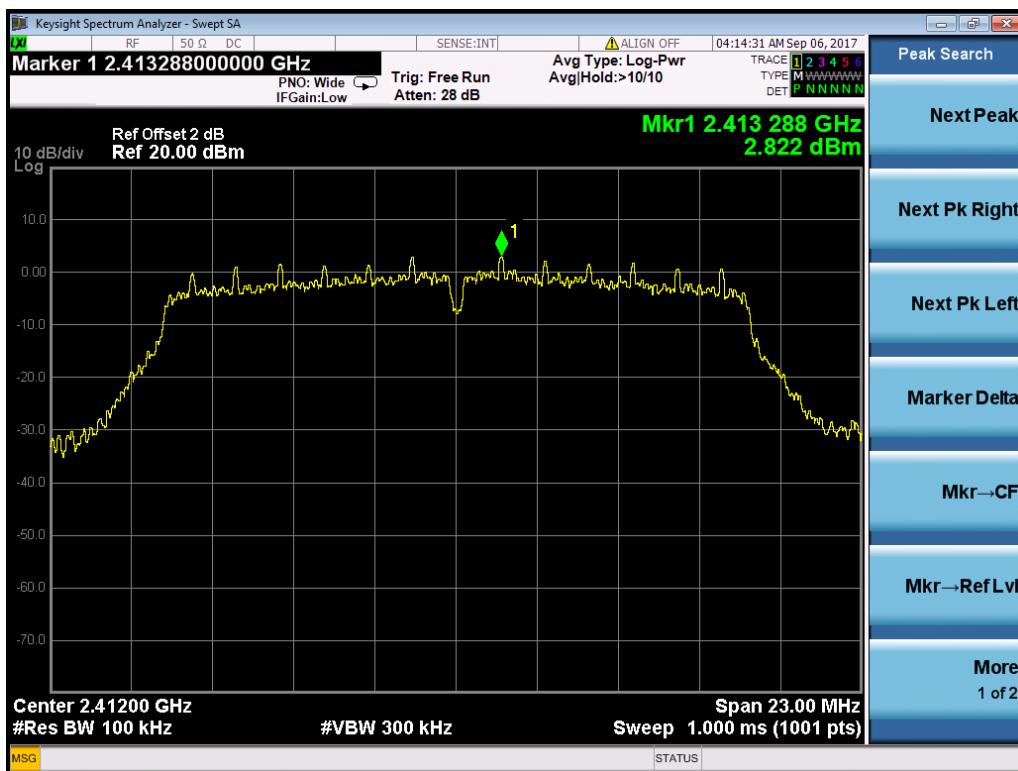
Note 1:

$$\text{PSD port } x \text{ (mW)} = 10^{\frac{x}{10}} (\text{PSD port } x \text{ (dBm)})$$

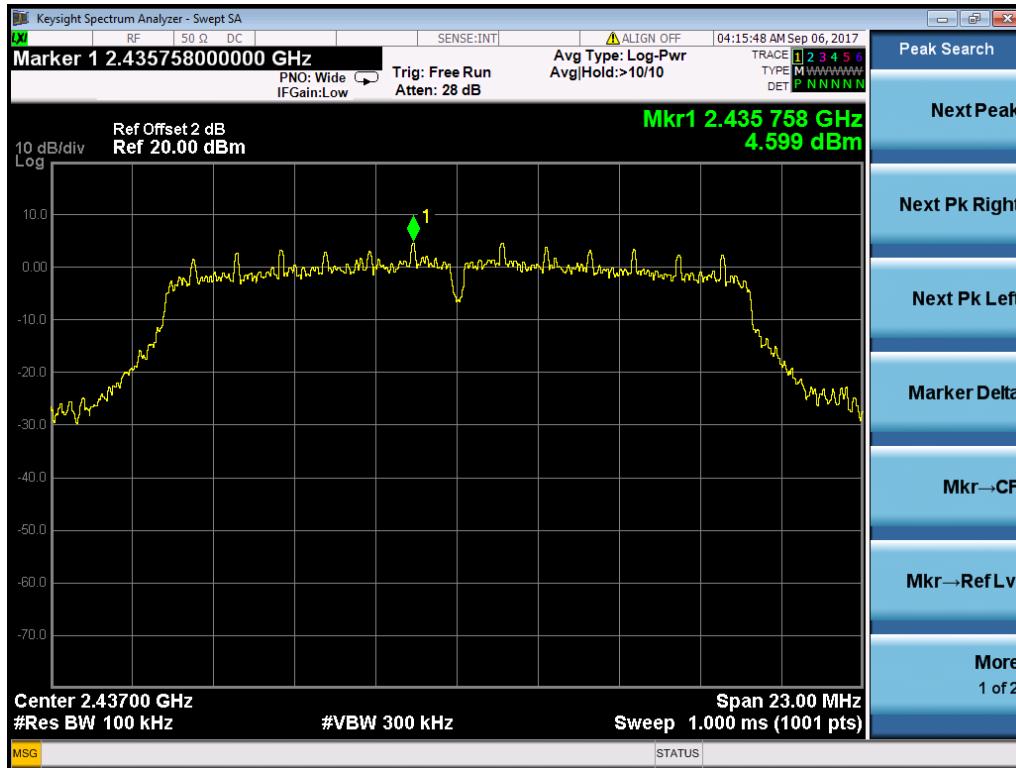
$$\text{Total PSD (mW)} = \text{PSD port 0 (mW)} + \text{PSD port 1 (mW)} + \text{PSD port 2 (mW)}$$

$$\text{Total PSD (dBm)} = 10 * \log(\text{Total PSD (mW)})$$

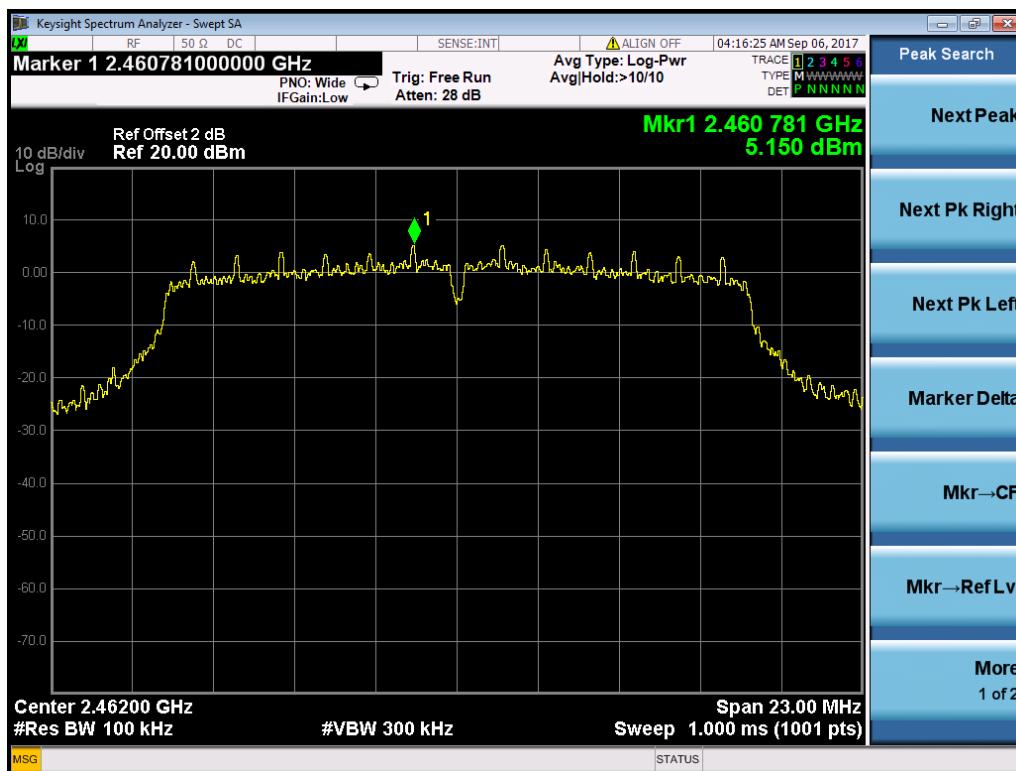
Channel L



### Channel M



### Channel H



Mode	Channel	PSD (dBm)			Total PSD (dBm)	Limit (dBm)
		Port 0	-	-		
802.11n (HT20)	L	3.053	-	-	3.053	8
	M	4.557	-	-	4.557	8
	H	5.115	-	-	5.115	8

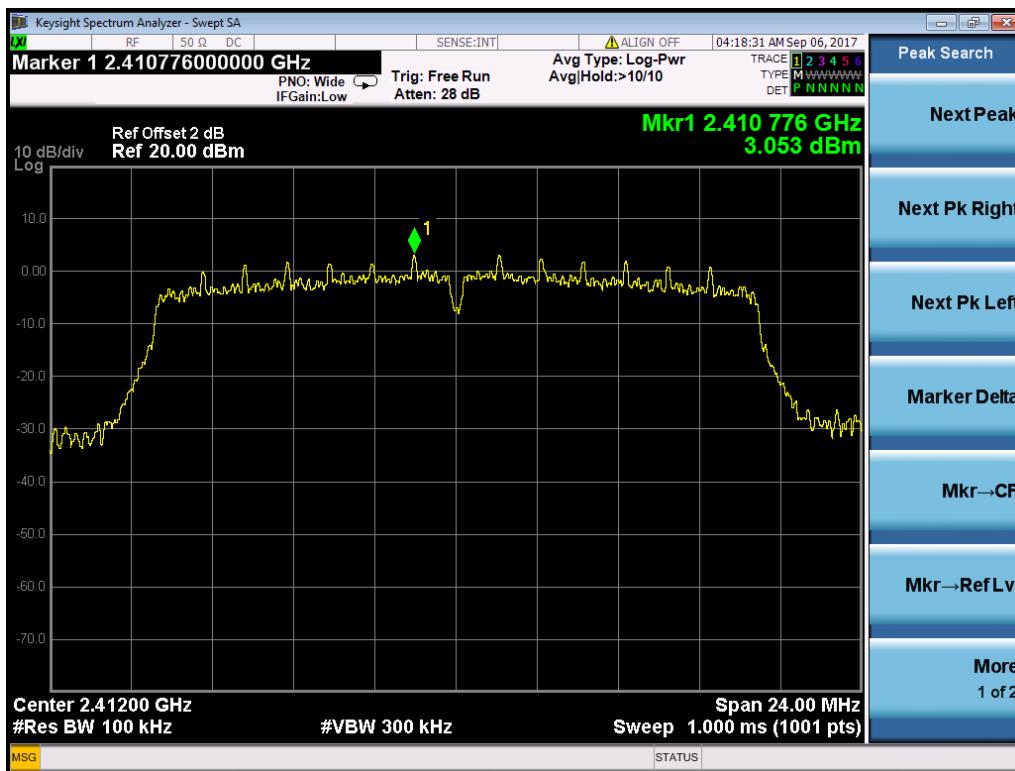
Note 1:

$$\text{PSD port } x \text{ (mW)} = 10^{\frac{x}{10}} \text{ (PSD port } x \text{ (dBm))} / 10; x = 0, 1, 2.$$

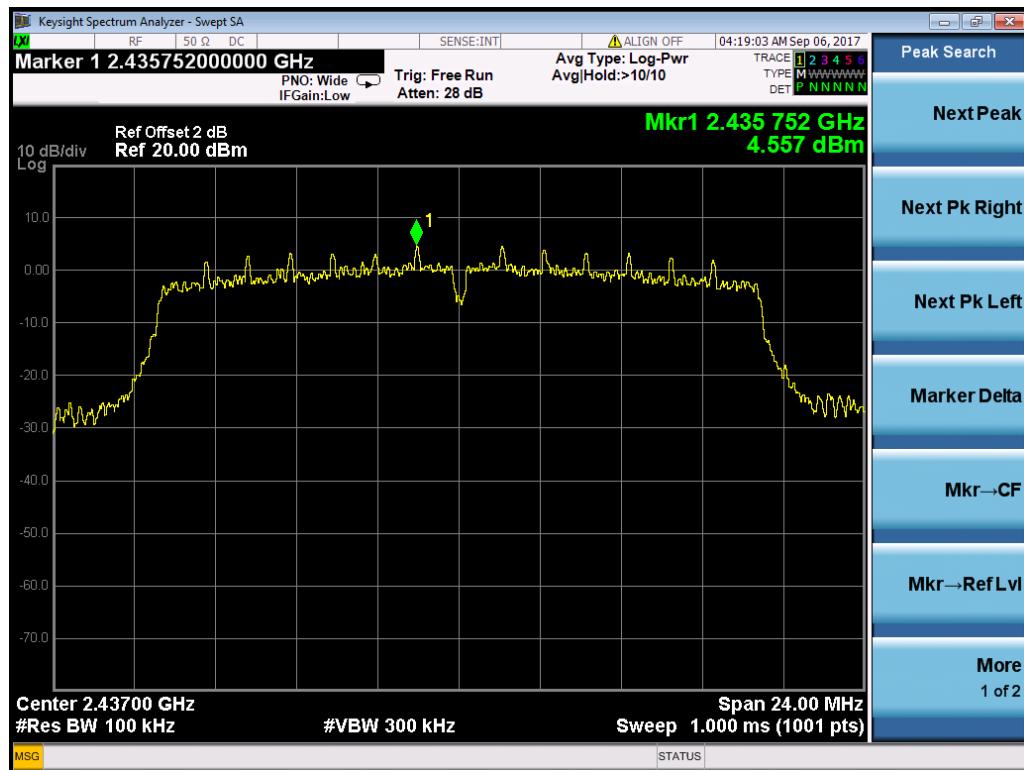
$$\text{Total PSD (mW)} = \text{PSD port 0 (mW)} + \text{PSD port 1 (mW)} + \text{PSD port 2 (mW)}$$

$$\text{Total PSD (dBm)} = 10 * \log(\text{Total PSD (mW)})$$

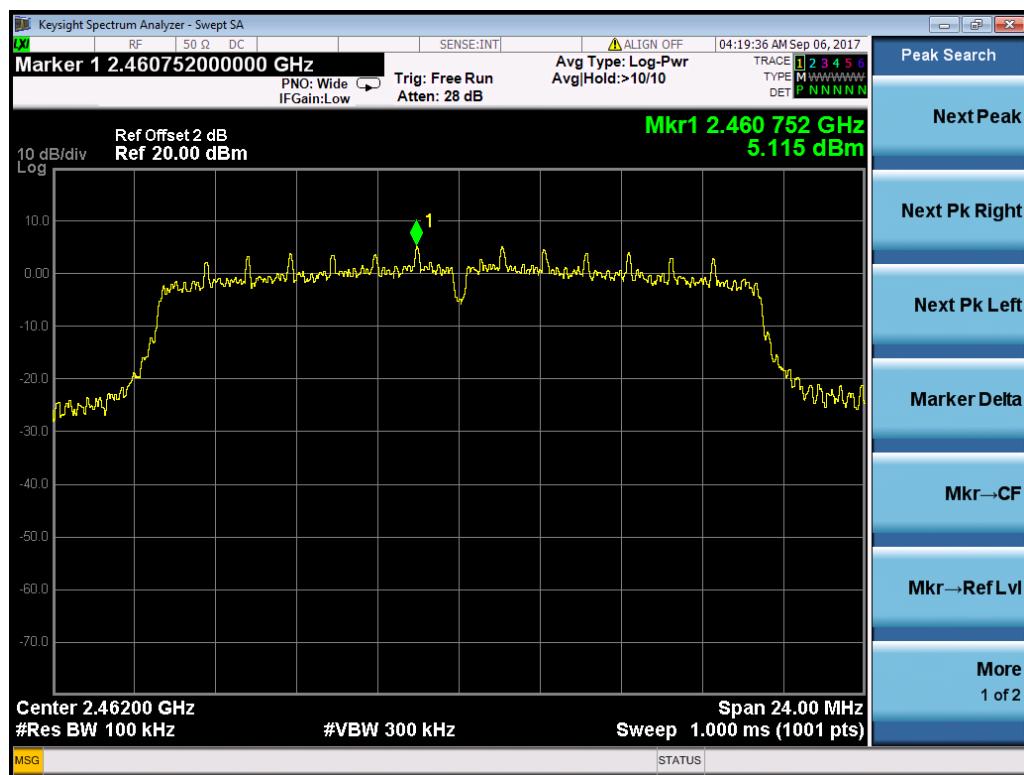
Channel L



### Channel M



### Channel H



Mode	Channel	PSD (dBm)			Total PSD (dBm)	Limit (dBm)
		Port 0	-	-		
802.11n (HT40)	L	1.093	-	-	1.093	8
	M	1.066	-	-	1.066	8
	H	1.450	-	-	1.450	8

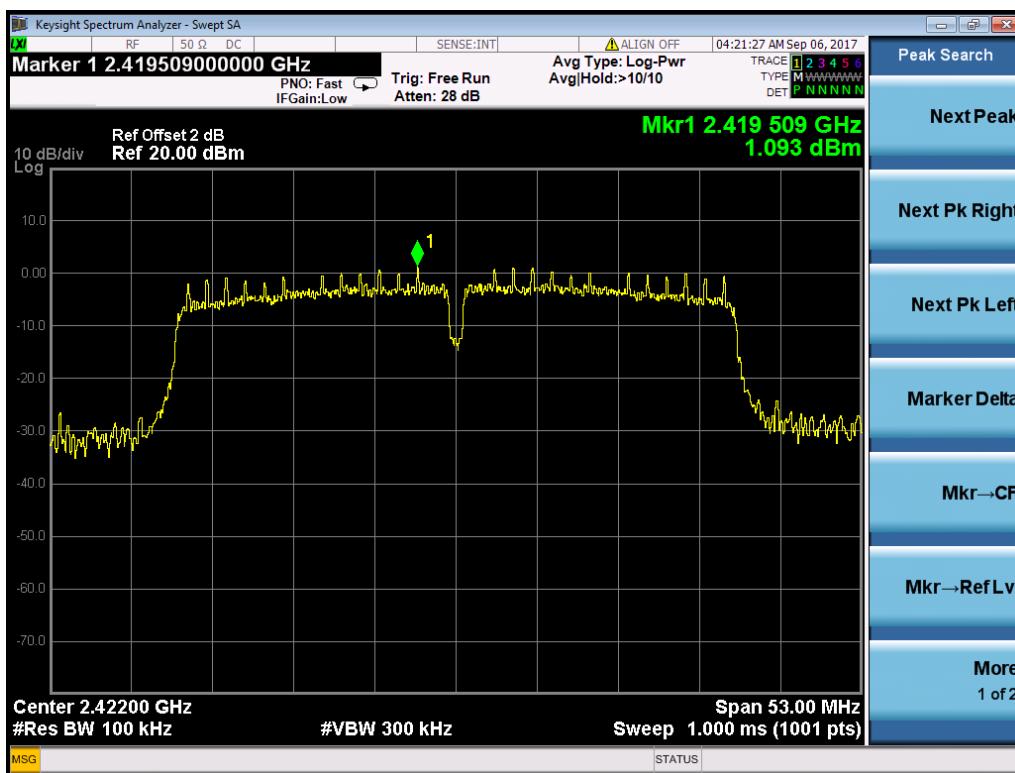
## Note 1:

PSD port x (mW) =  $10^{\frac{PSD \text{ port } x \text{ (dBm)}}{10}}$ ; x = 0, 1, 2.

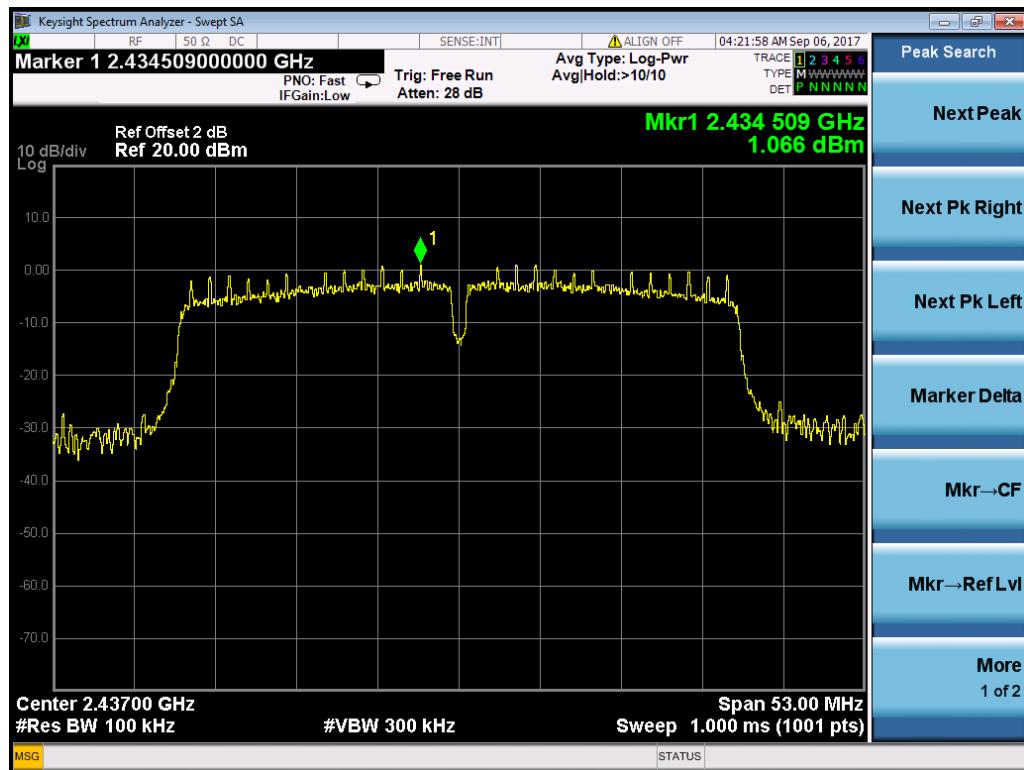
Total PSD (mW) = PSD port 0 (mW) + PSD port 1 (mW) + PSD port 2 (mW)

Total PSD (dBm) =  $10 * \log(\text{Total PSD (mW)})$

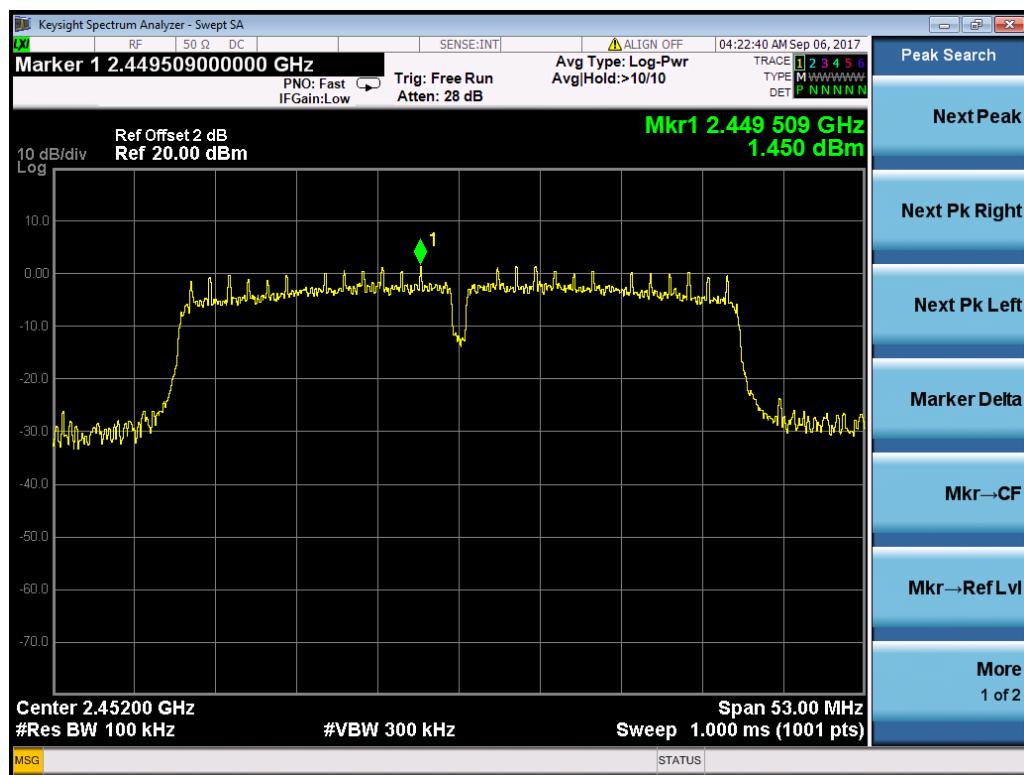
Channel L



### Channel M



### Channel H



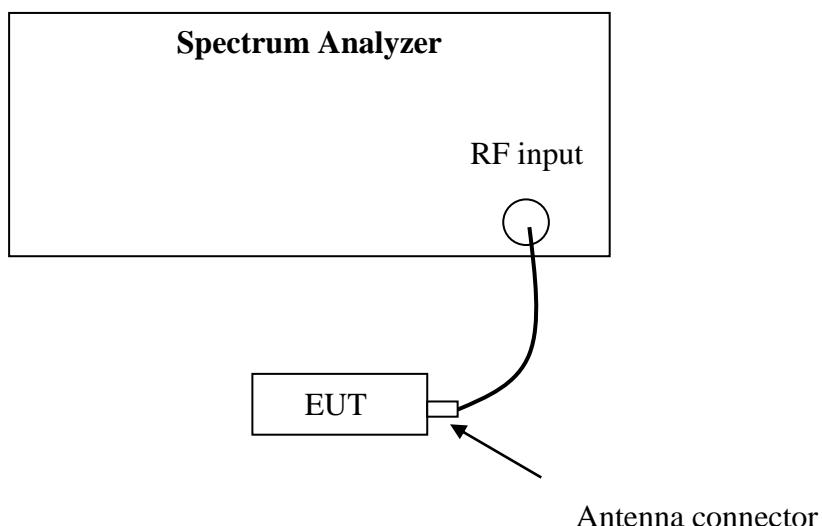
## 6 Emission outside the frequency band

**Test result:** Pass

### 6.1 Test 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.

### 6.2 Test Configuration



### 6.3 Test procedure and test setup

The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v04" (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

#### Reference level measurement

Establish a reference level by using the following procedure:

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to  $\geq 1.5$  times the *DTS bandwidth*.
- c) Set the RBW = 100 kHz.
- d) Set the VBW  $\geq 3 \times$  RBW.
- e) Detector = peak.
- f) Sweep time = auto couple.

- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

**Emission level measurement**

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW  $\geq 3 \times$  RBW.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

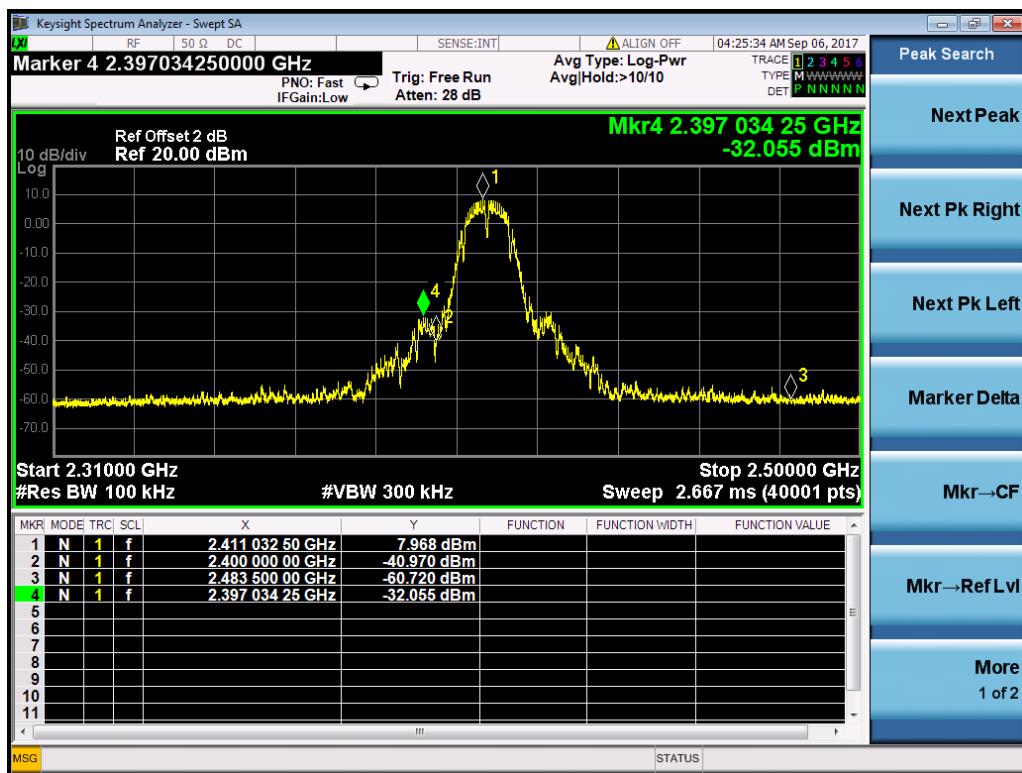
## 6.4 Test Protocol

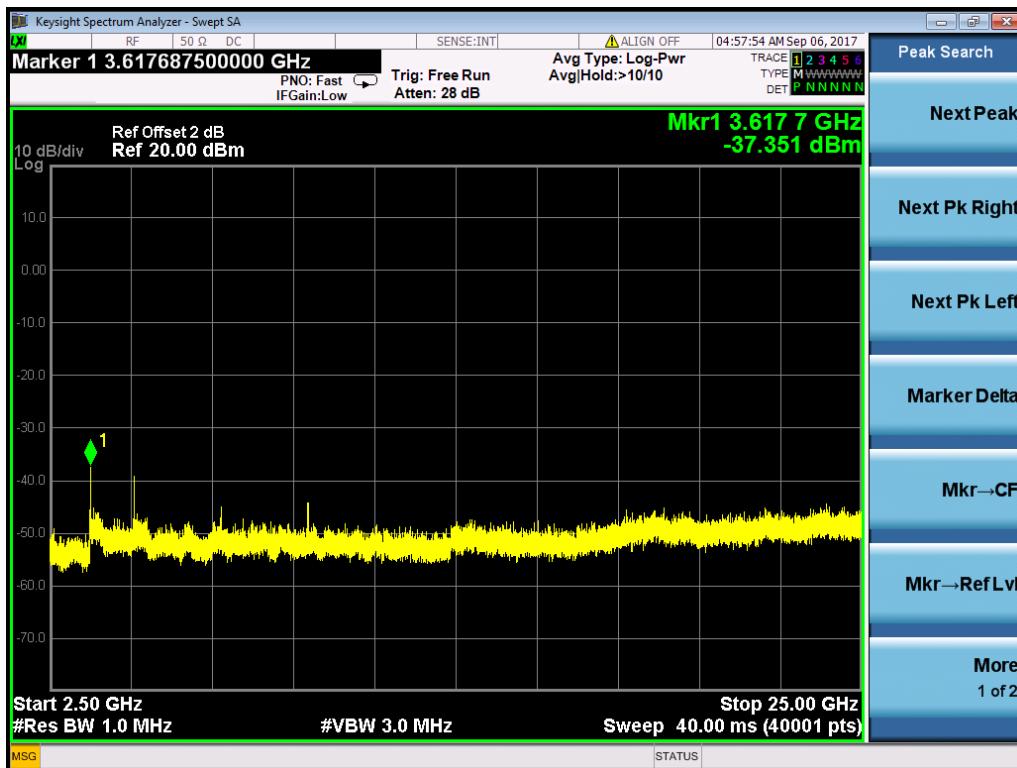
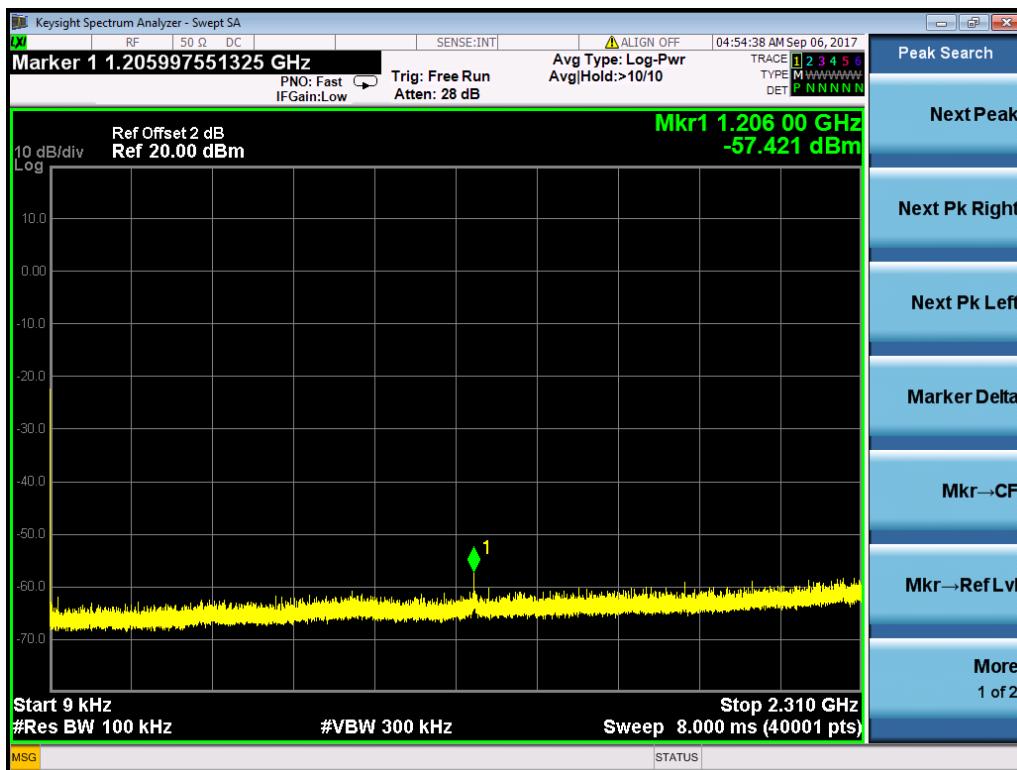
Temperature: 25 °C

Relative Humidity: 55 %

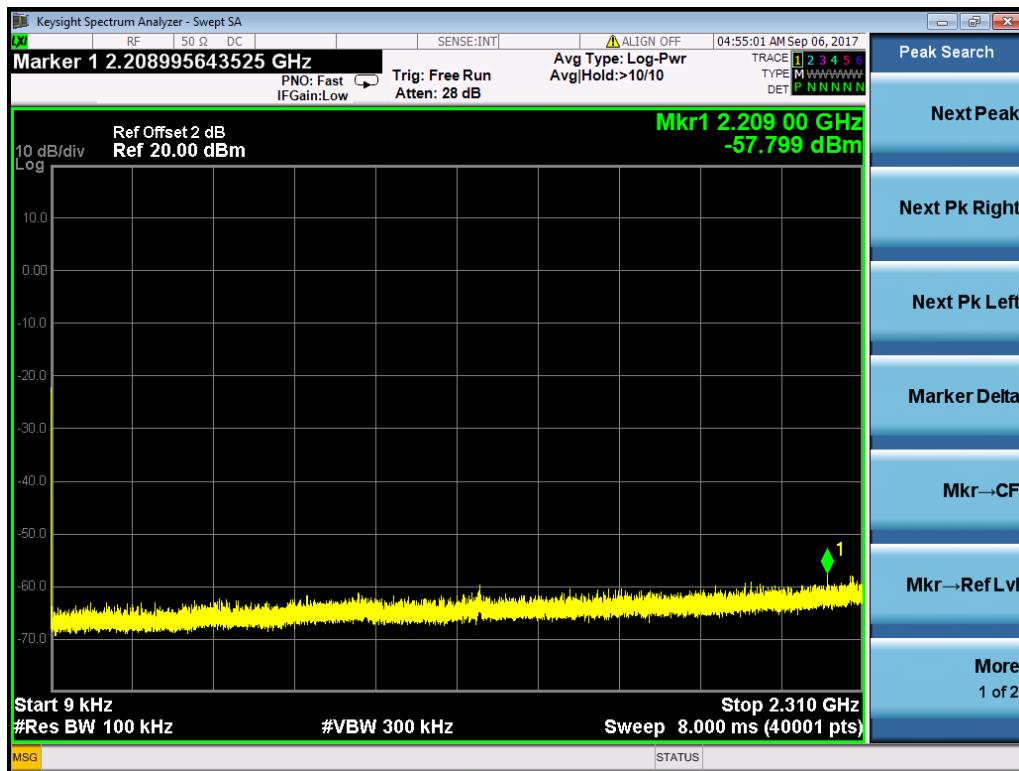
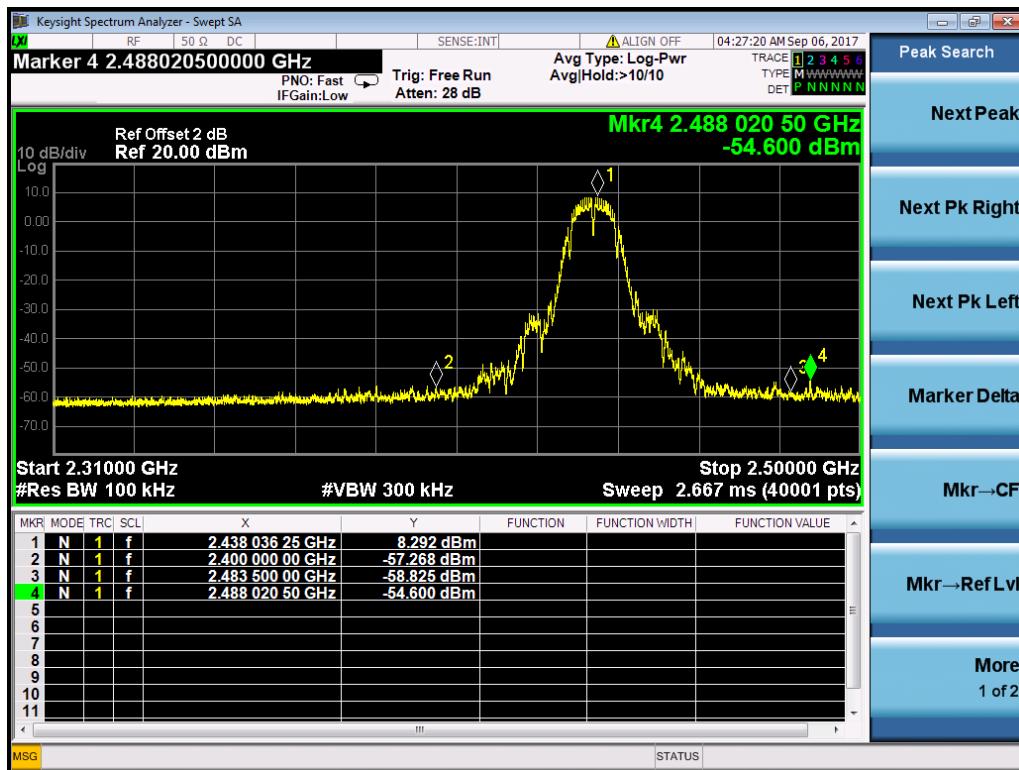
Mode	Channel	Result			Limits (dB)
		Port0	-	-	
802.11b	L	Pass	-	-	≥20
	M	Pass	-	-	≥20
	H	Pass	-	-	≥20

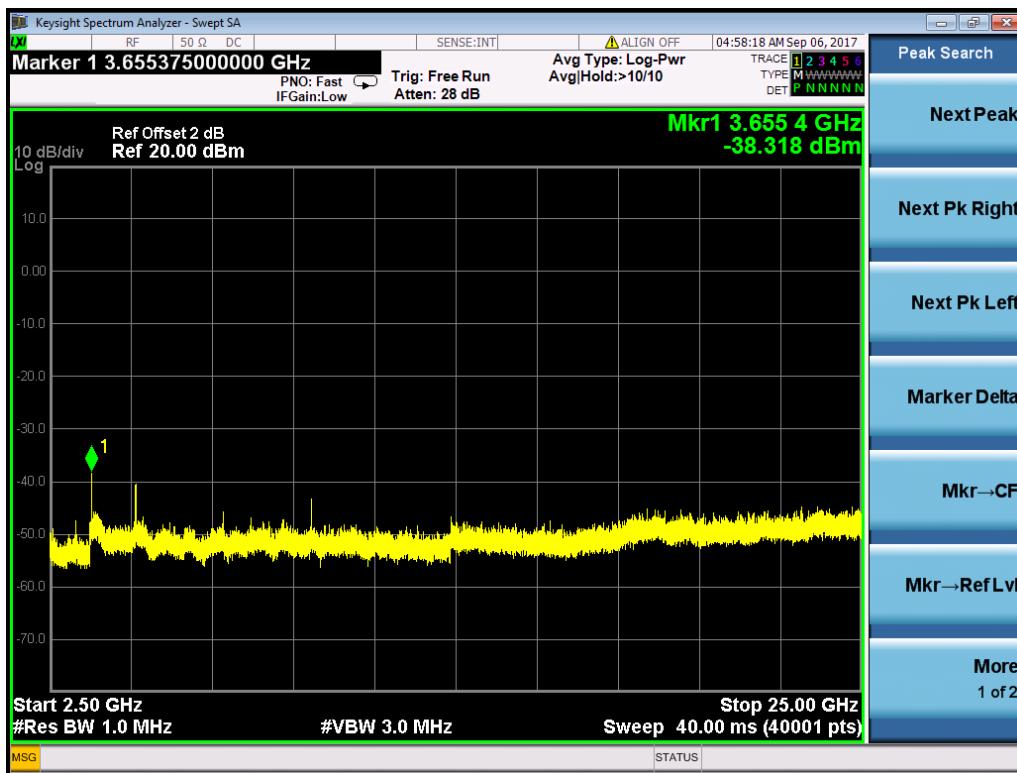
Channel L



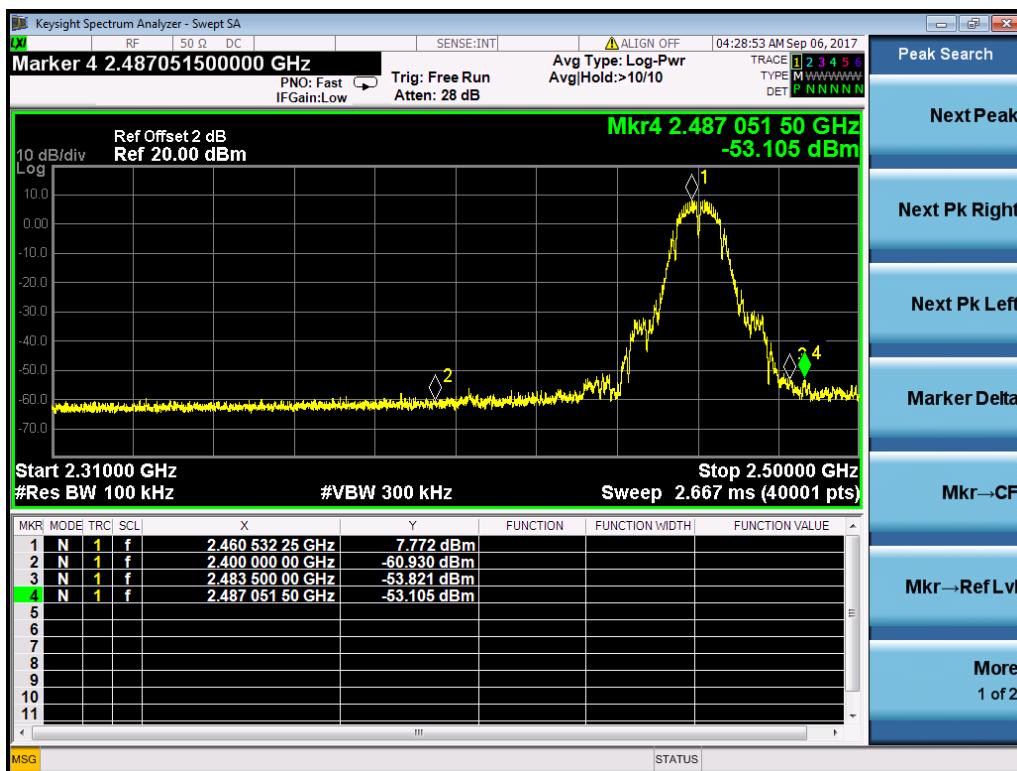


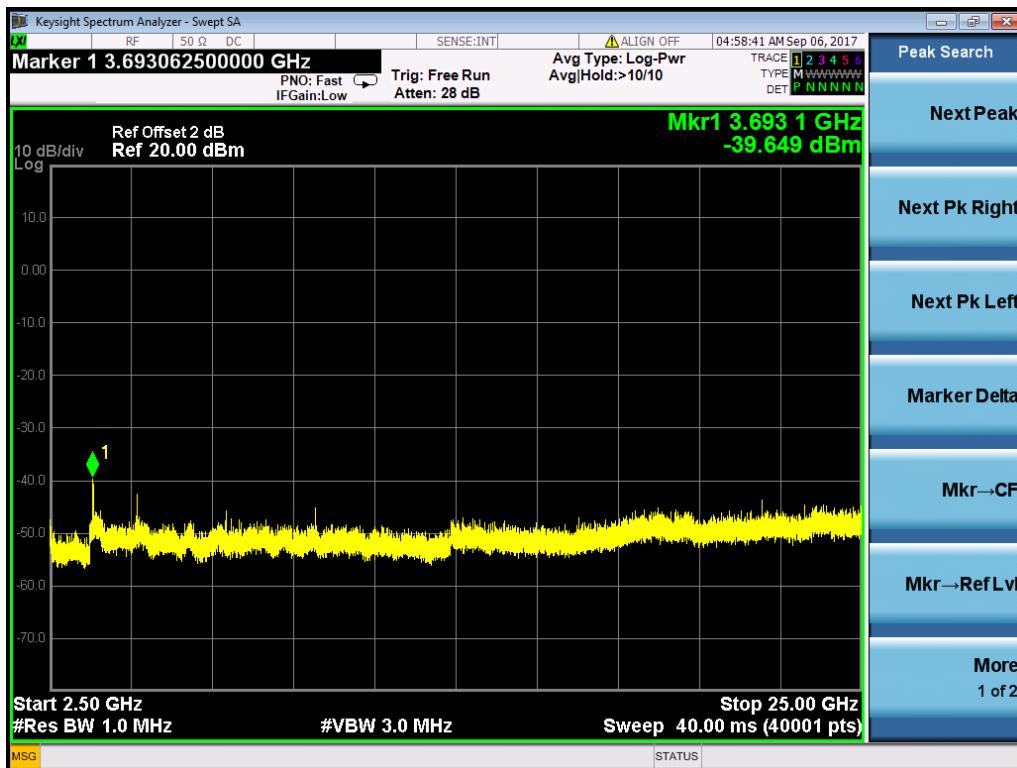
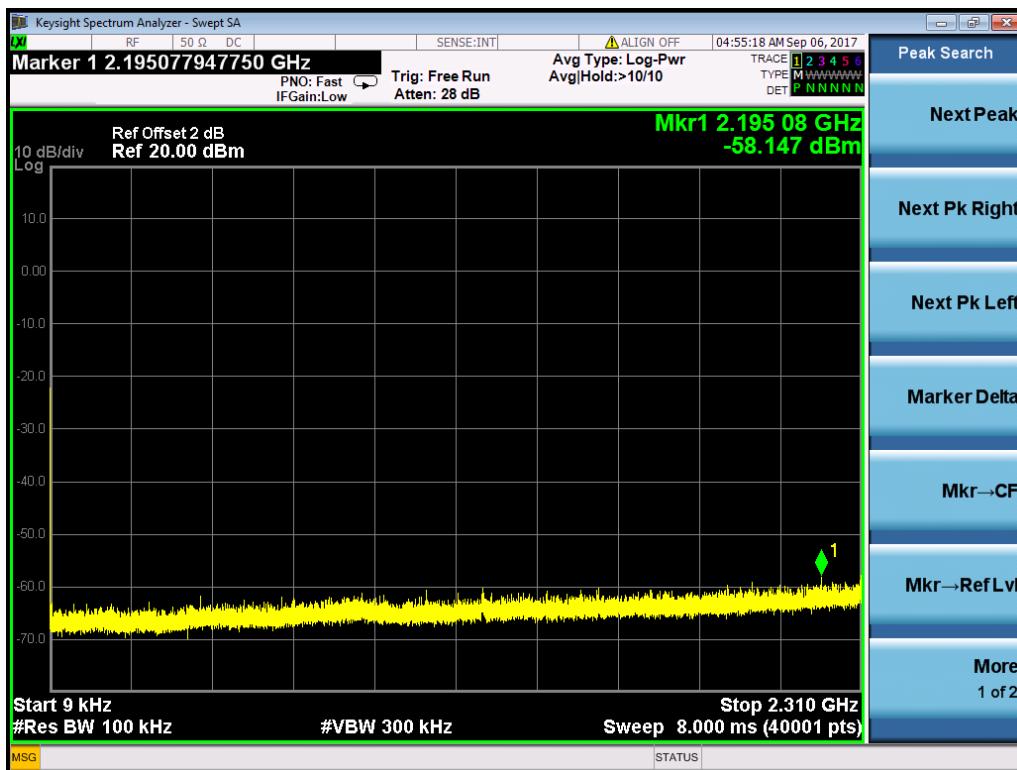
## Channel M





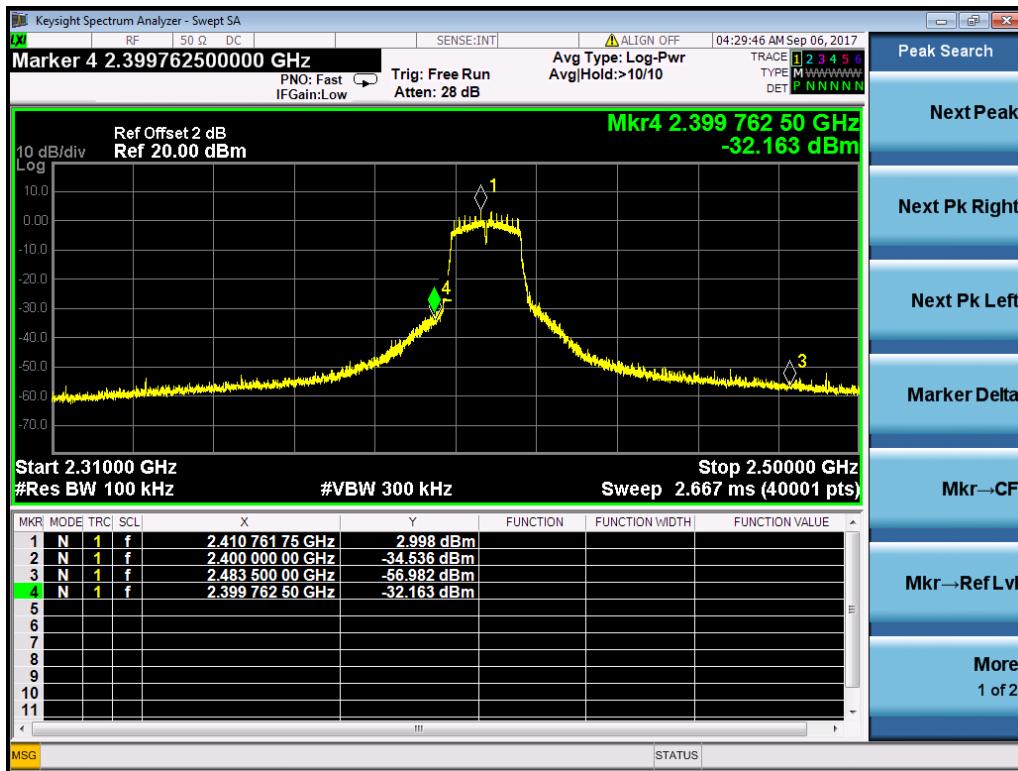
### Channel H

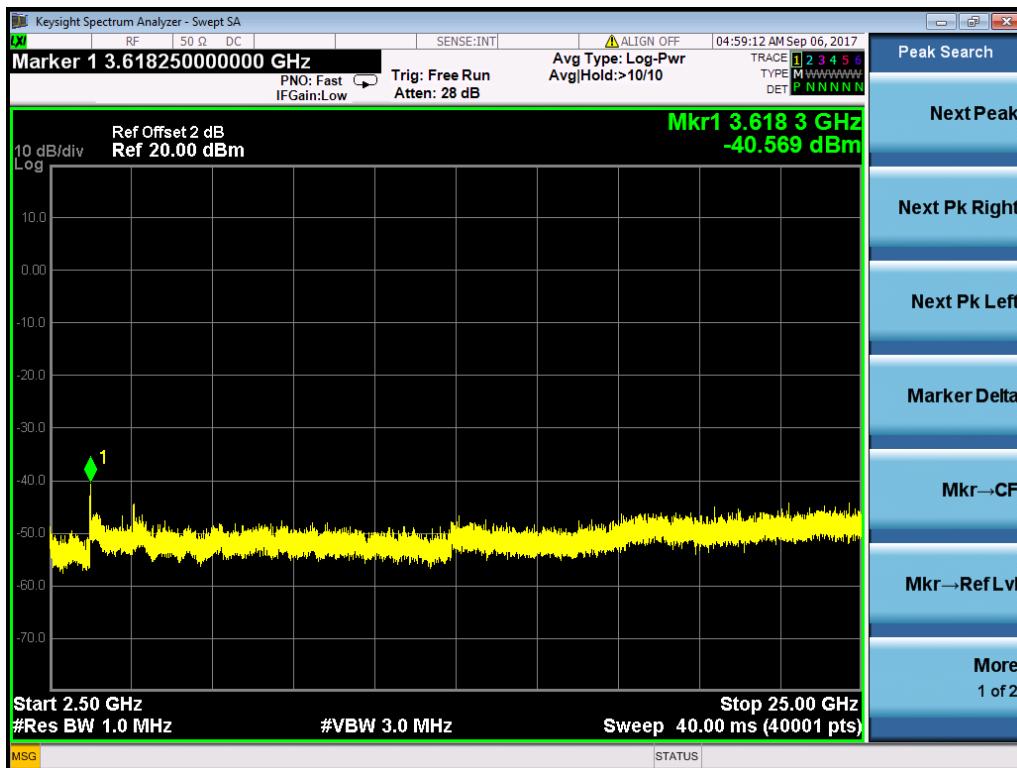
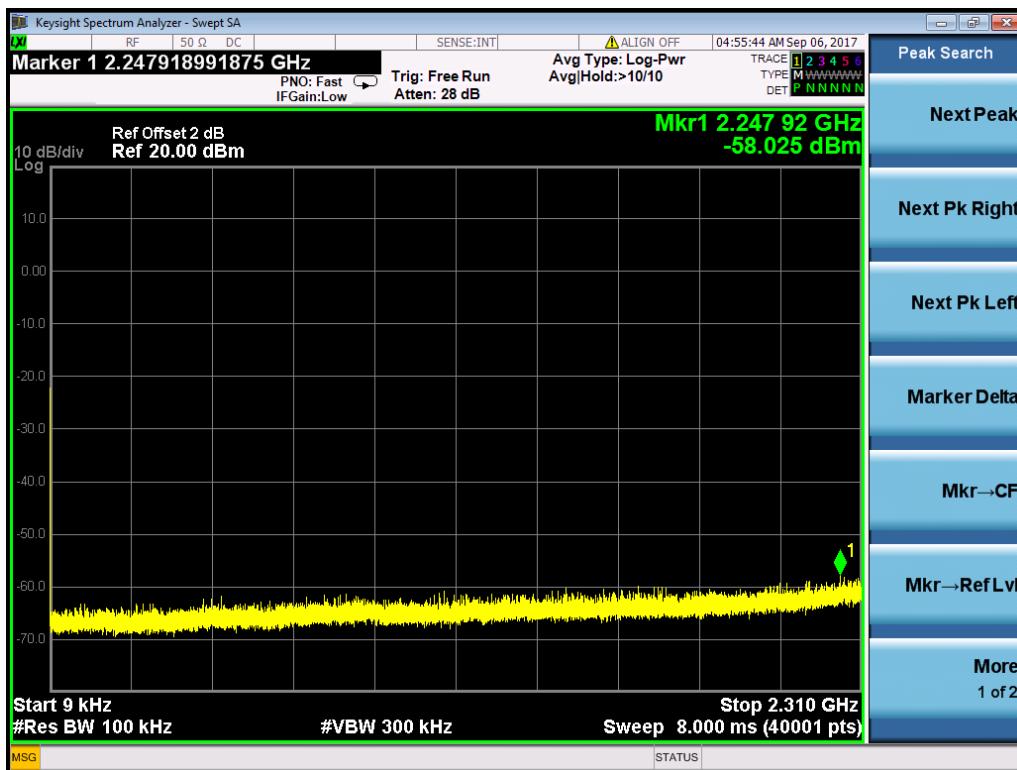




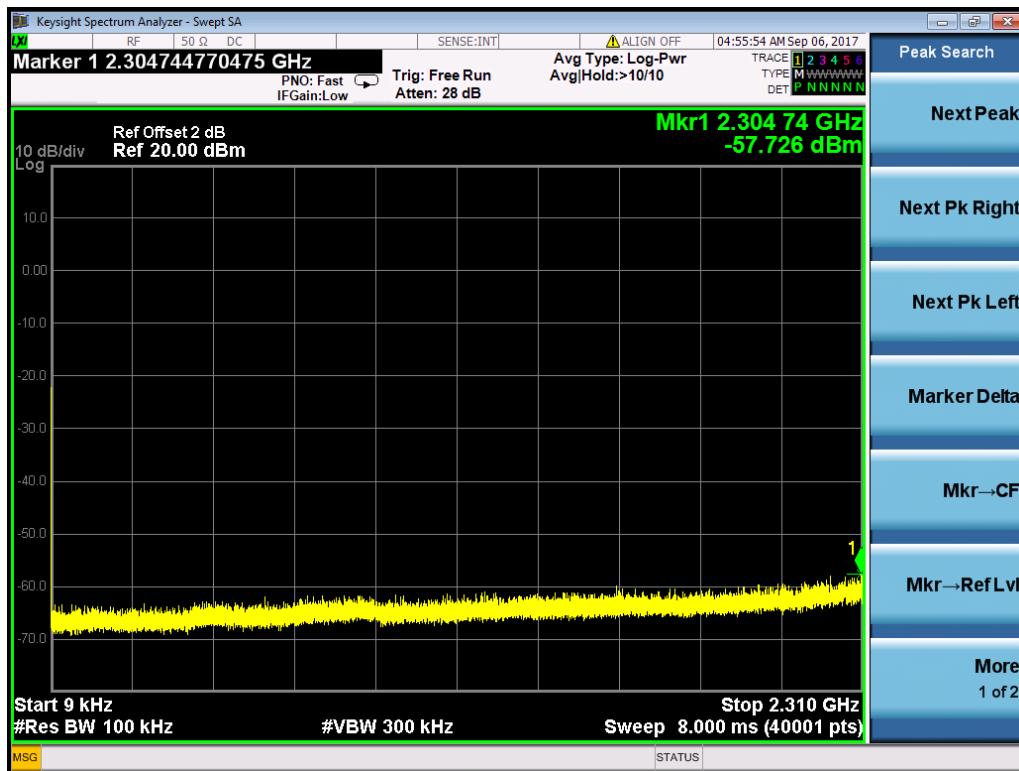
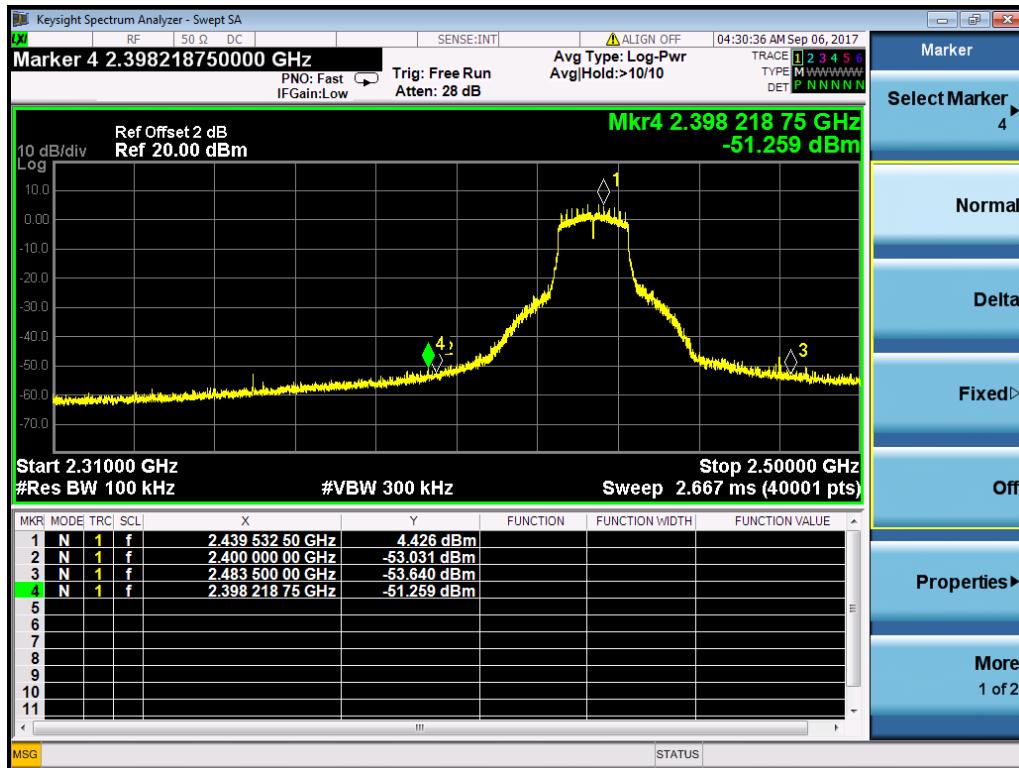
Mode	Channel	Result			Limits (dB)
		Port0	-	-	
802.11g	L	Pass	-	-	≥20
	M	Pass	-	-	≥20
	H	Pass	-	-	≥20

## Channel L



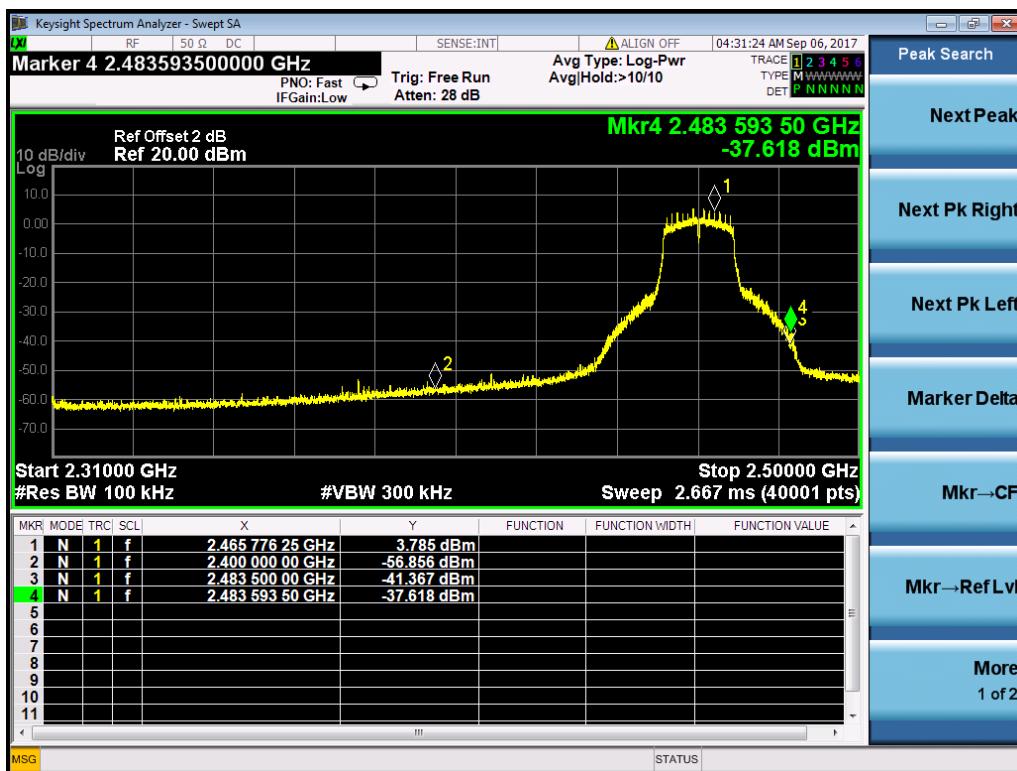


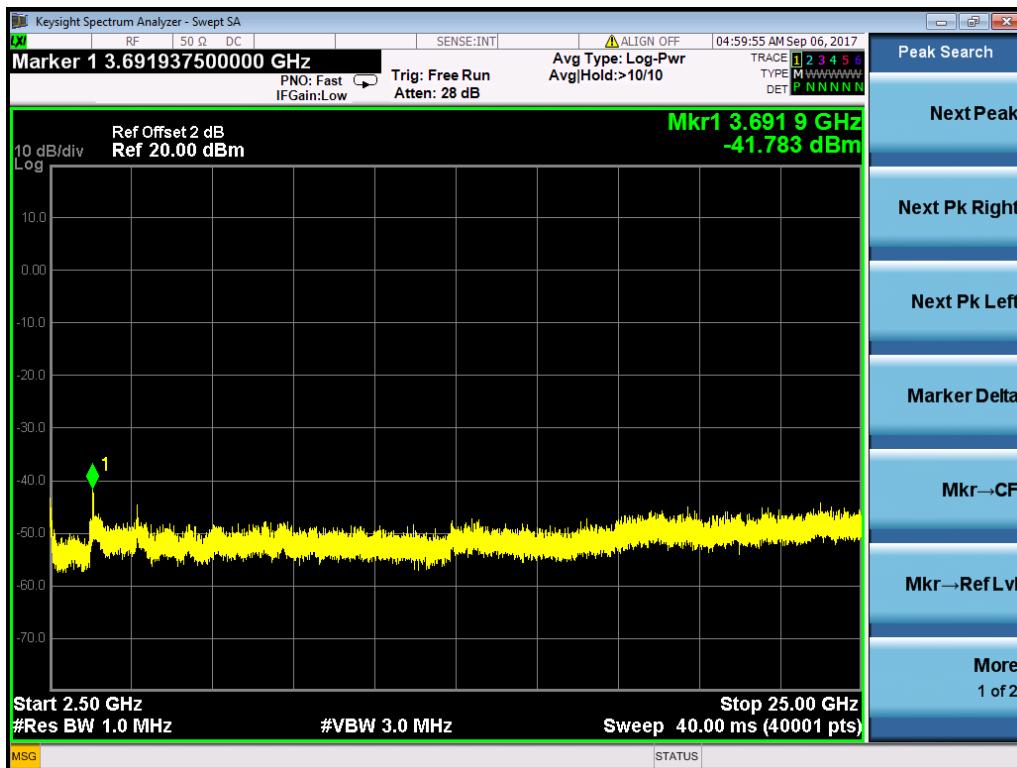
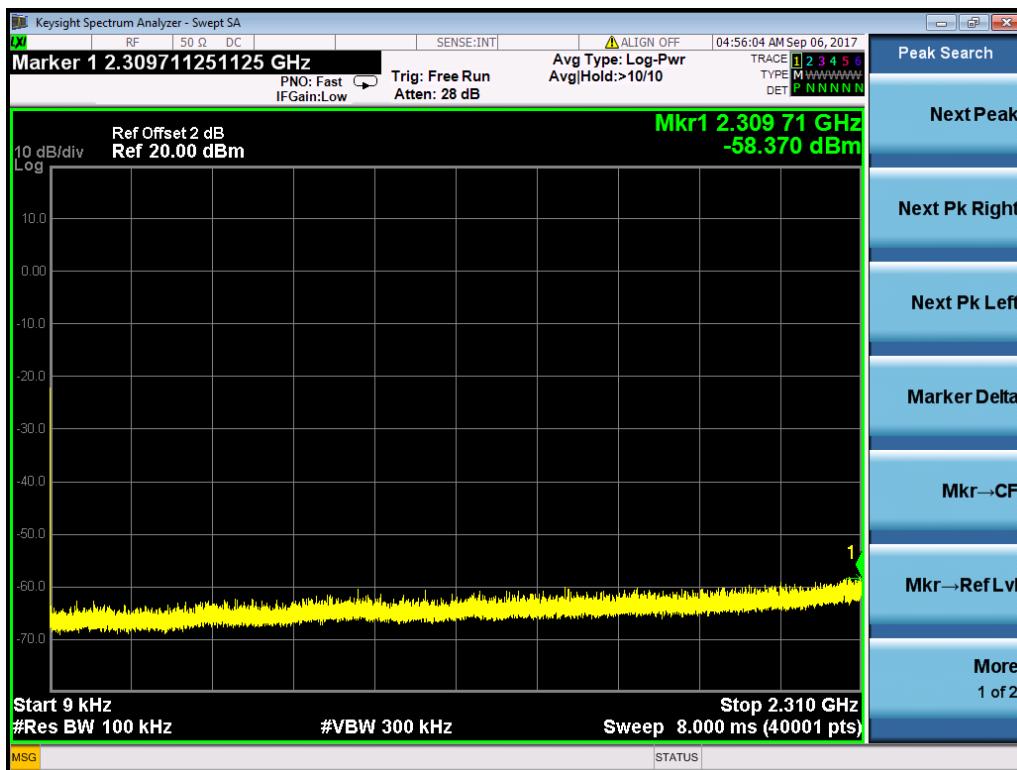
### Channel M





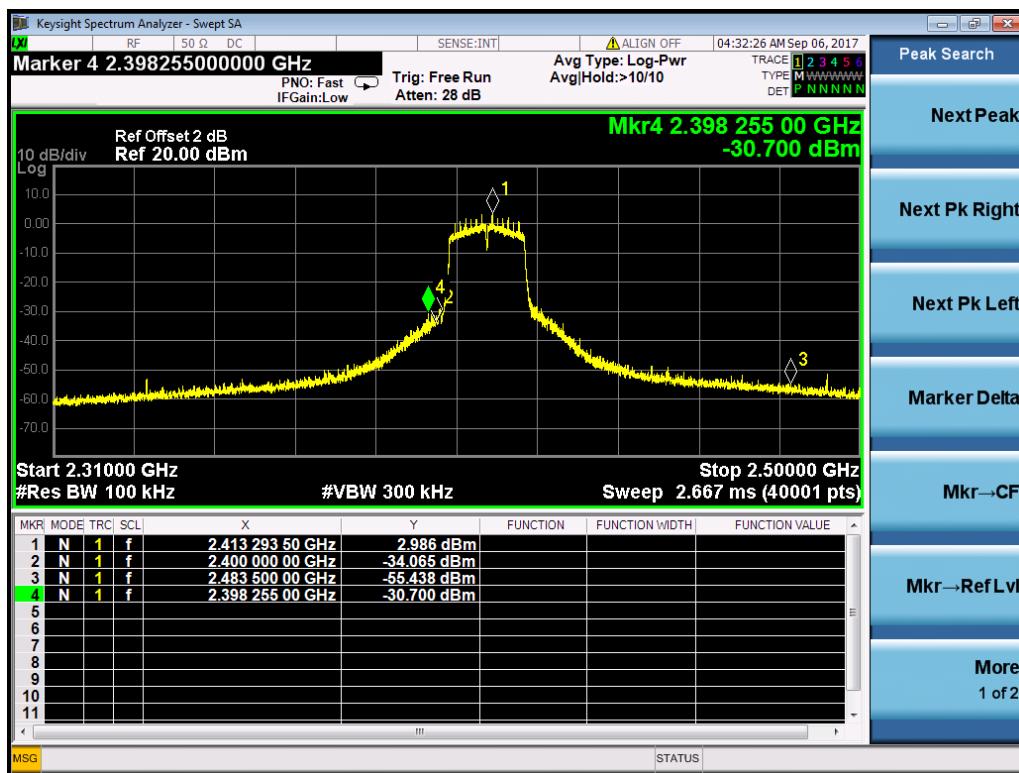
### Channel H

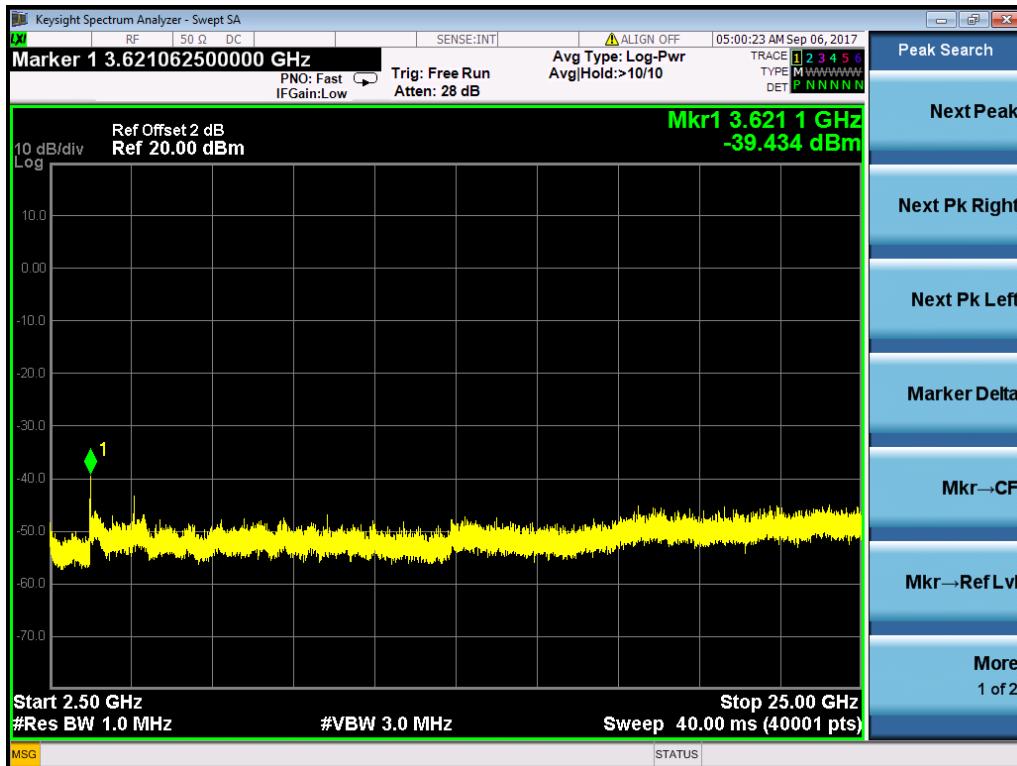
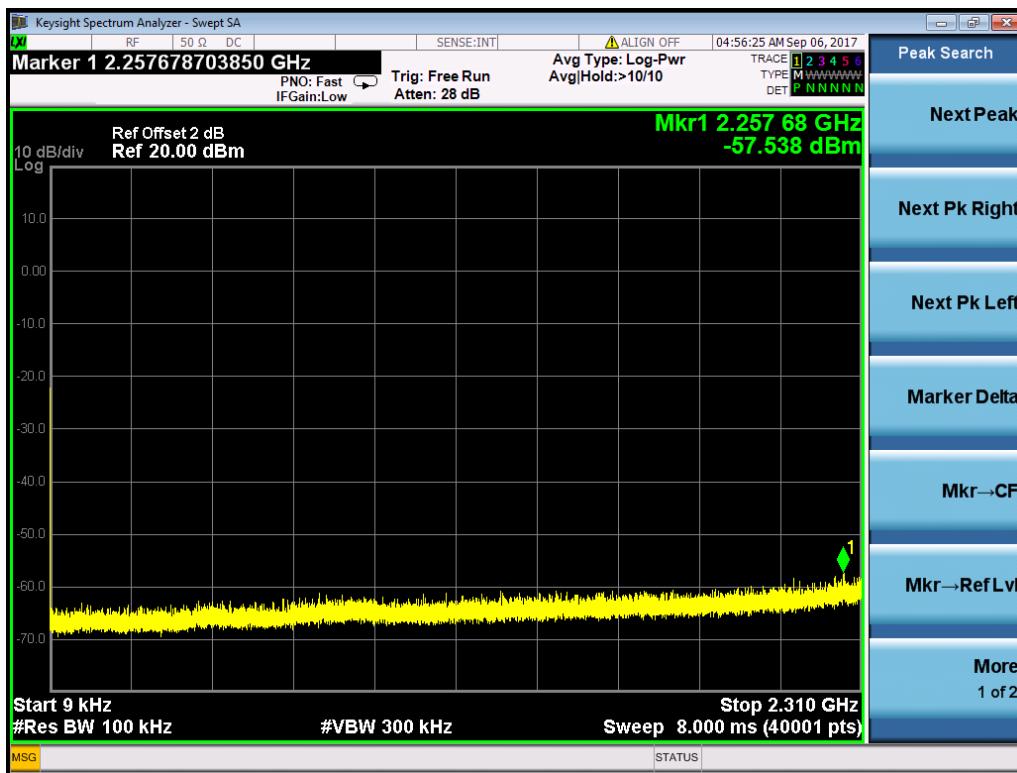




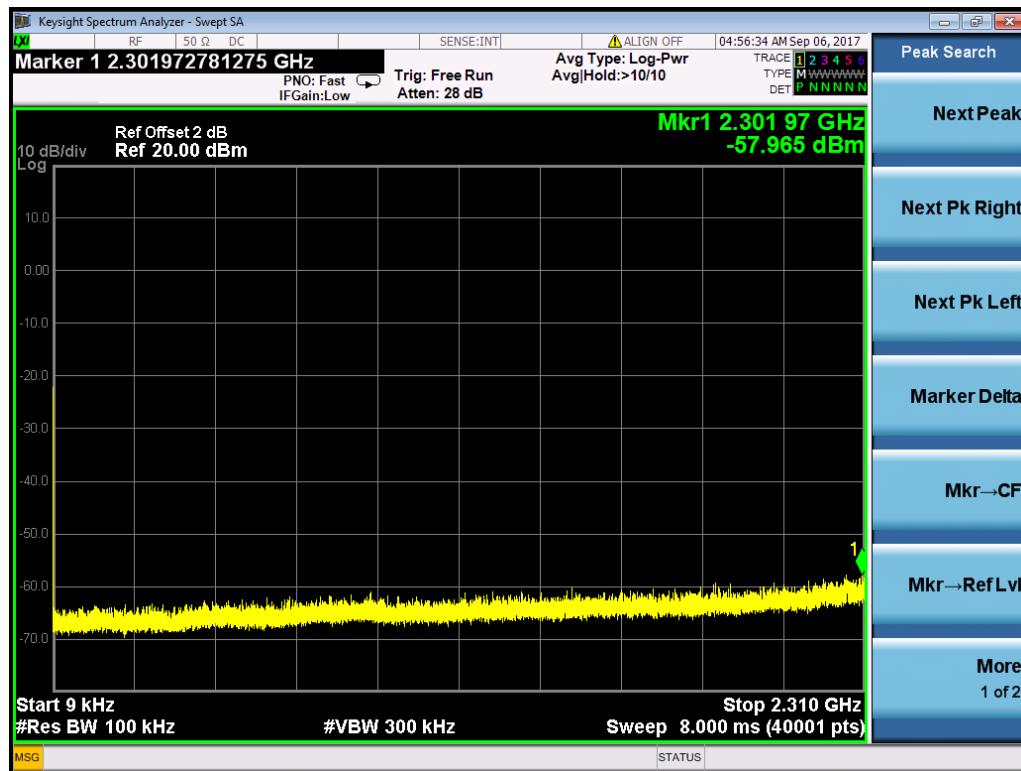
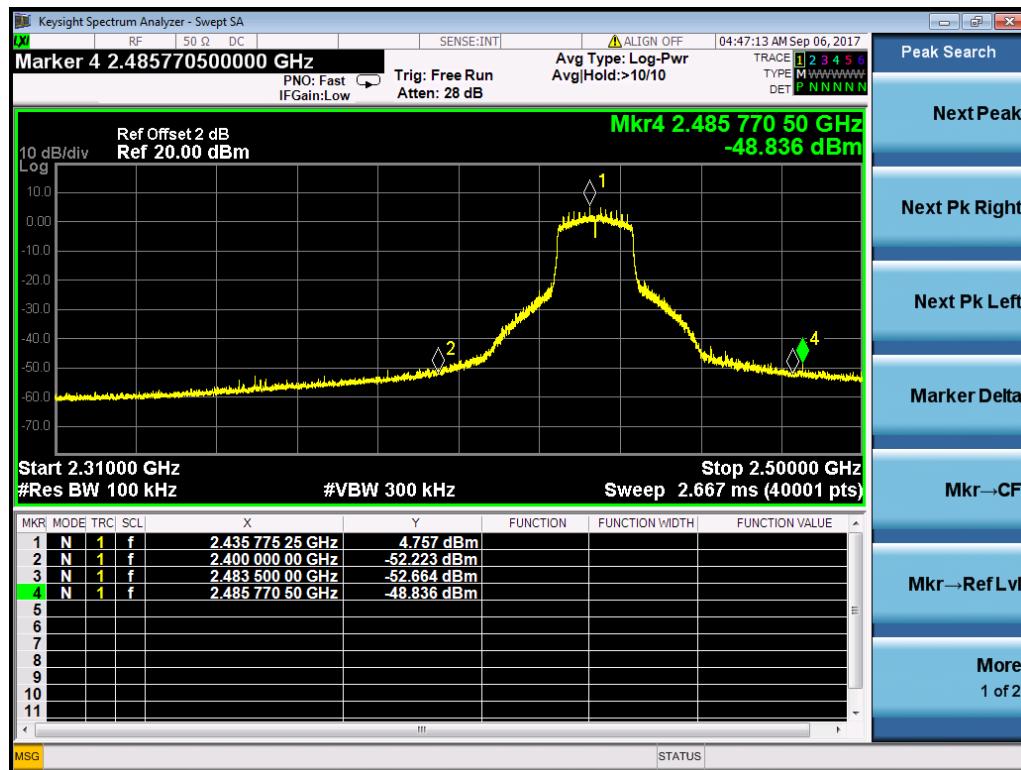
Mode	Channel	Result			Limits (dB)
		Port0	-	-	
802.11n (HT20)	L	Pass	-	-	≥20
	M	Pass	-	-	≥20
	H	Pass	-	-	≥20

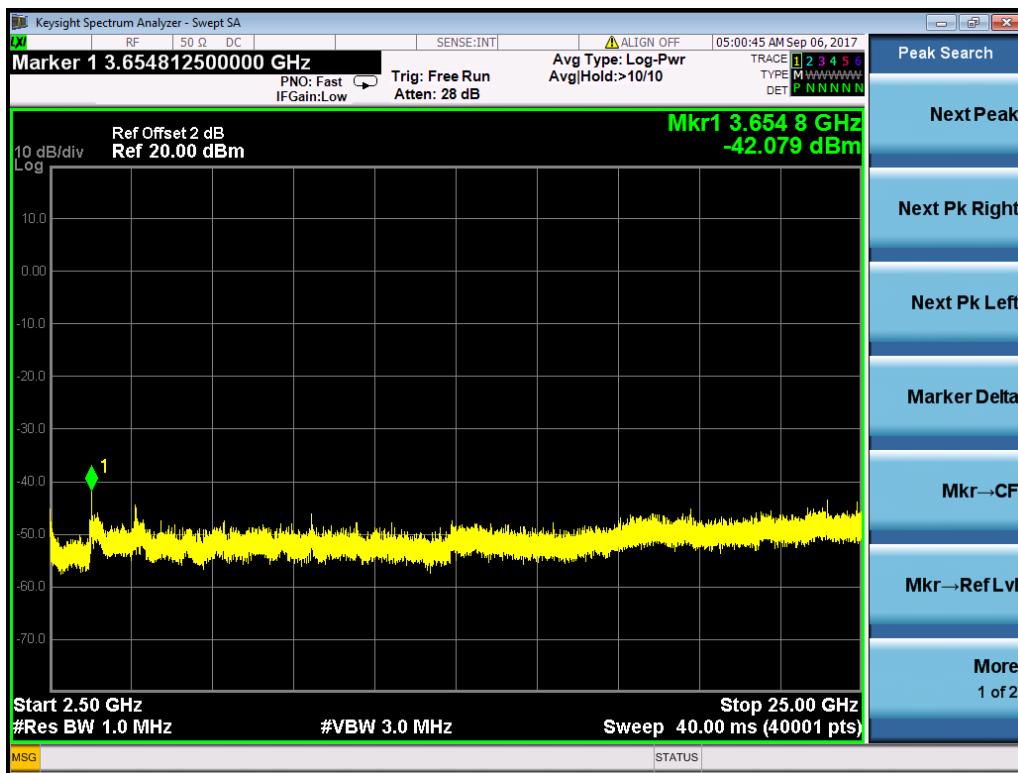
## Channel L



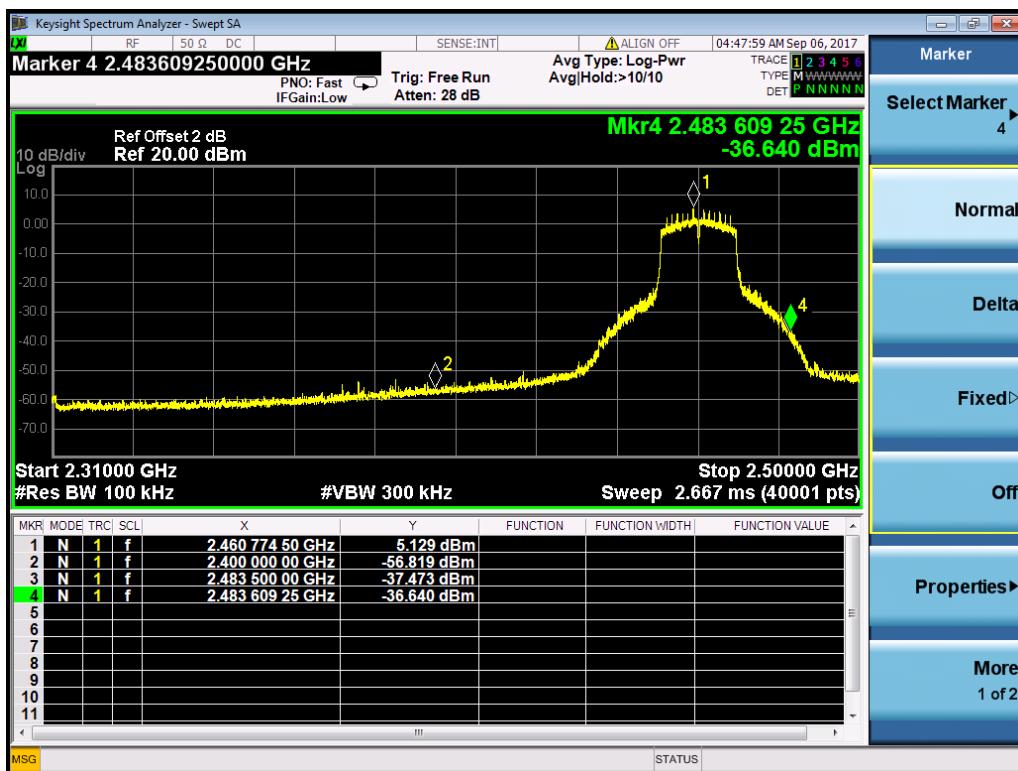


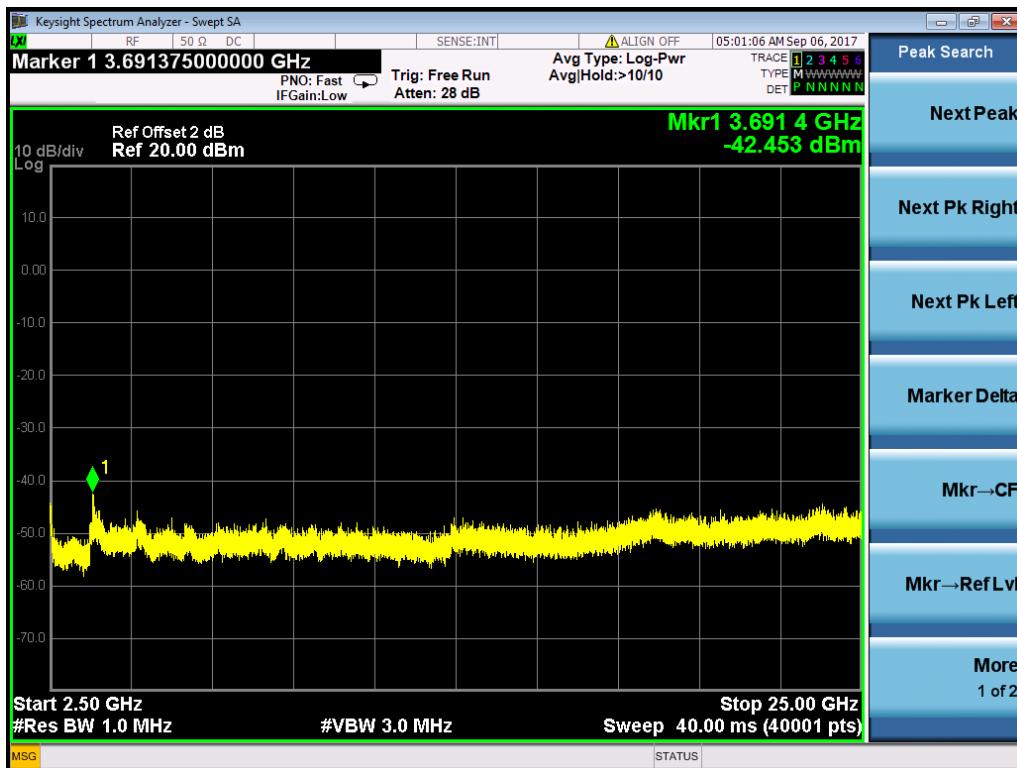
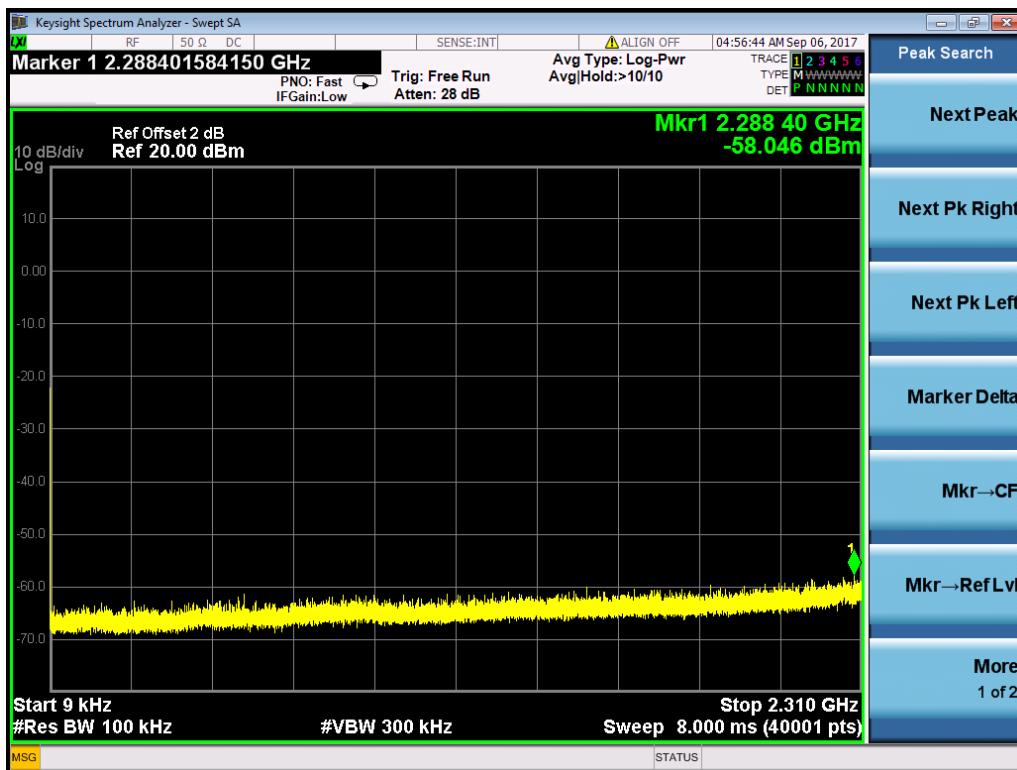
### Channel M





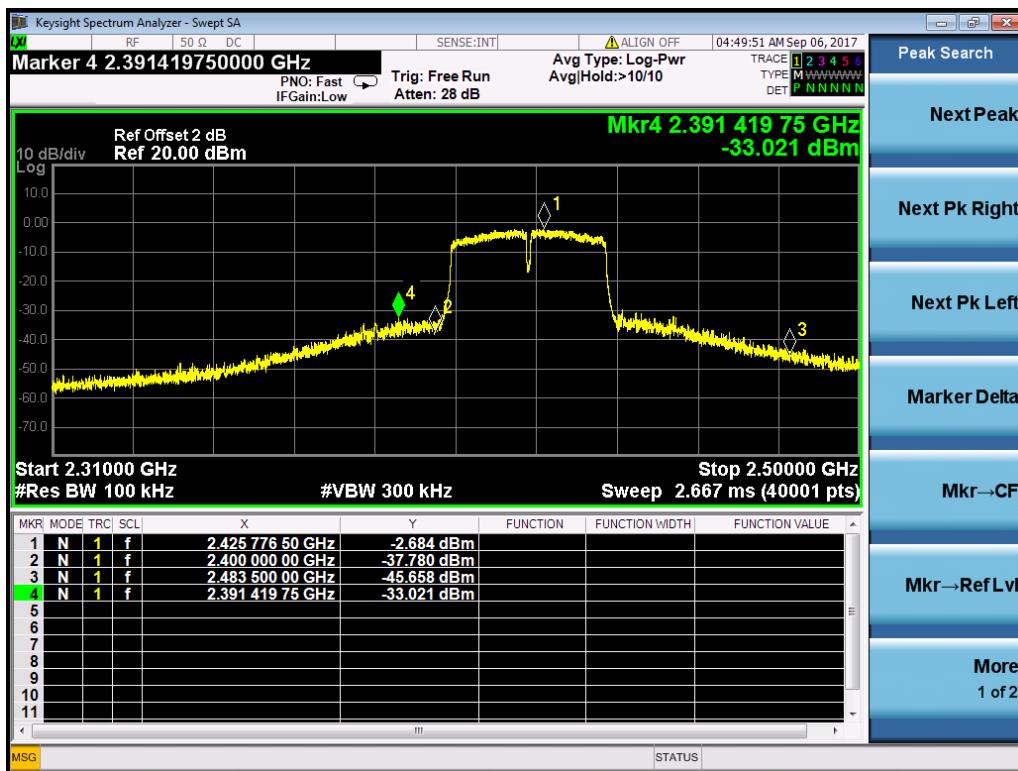
### Channel H

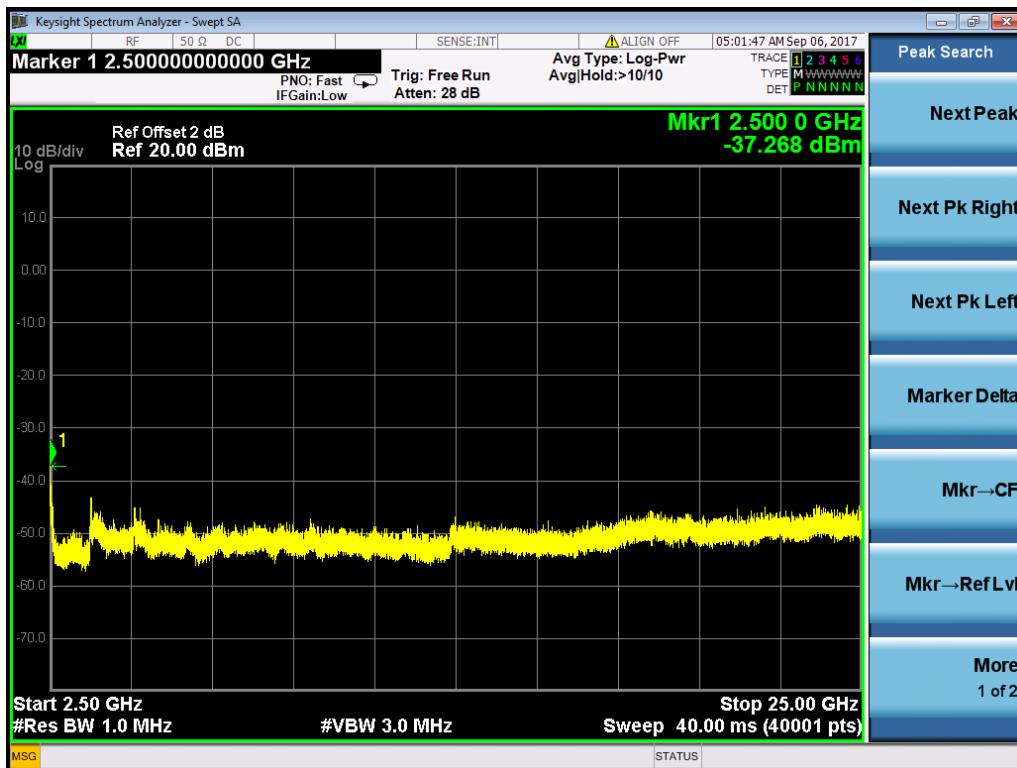
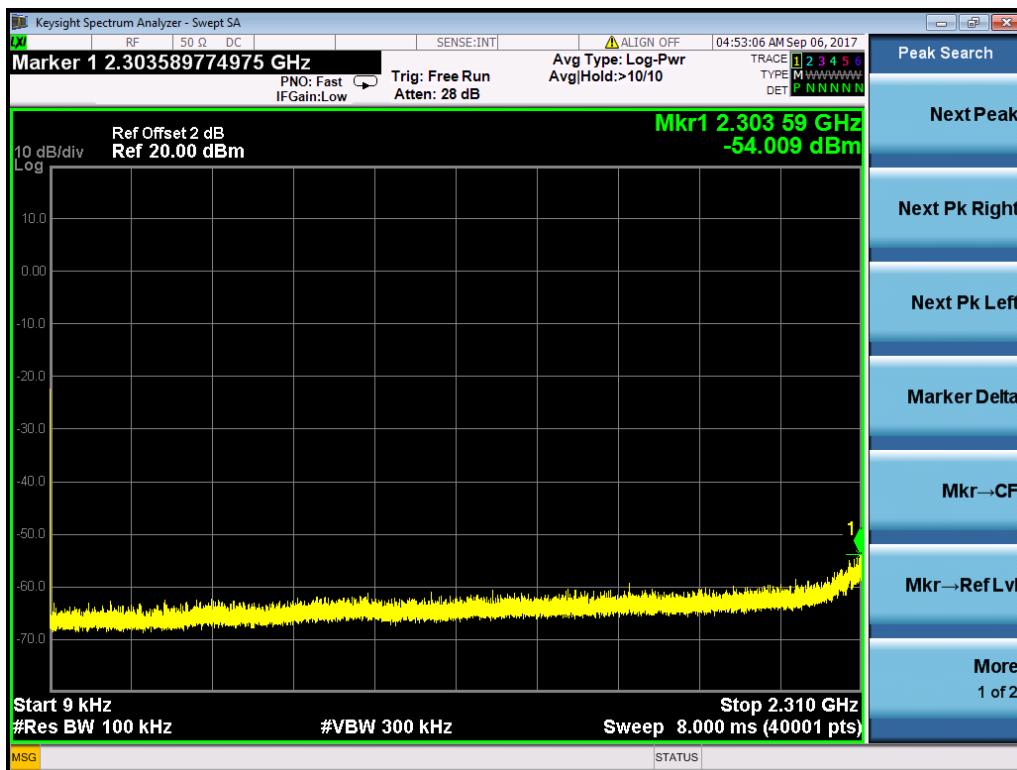




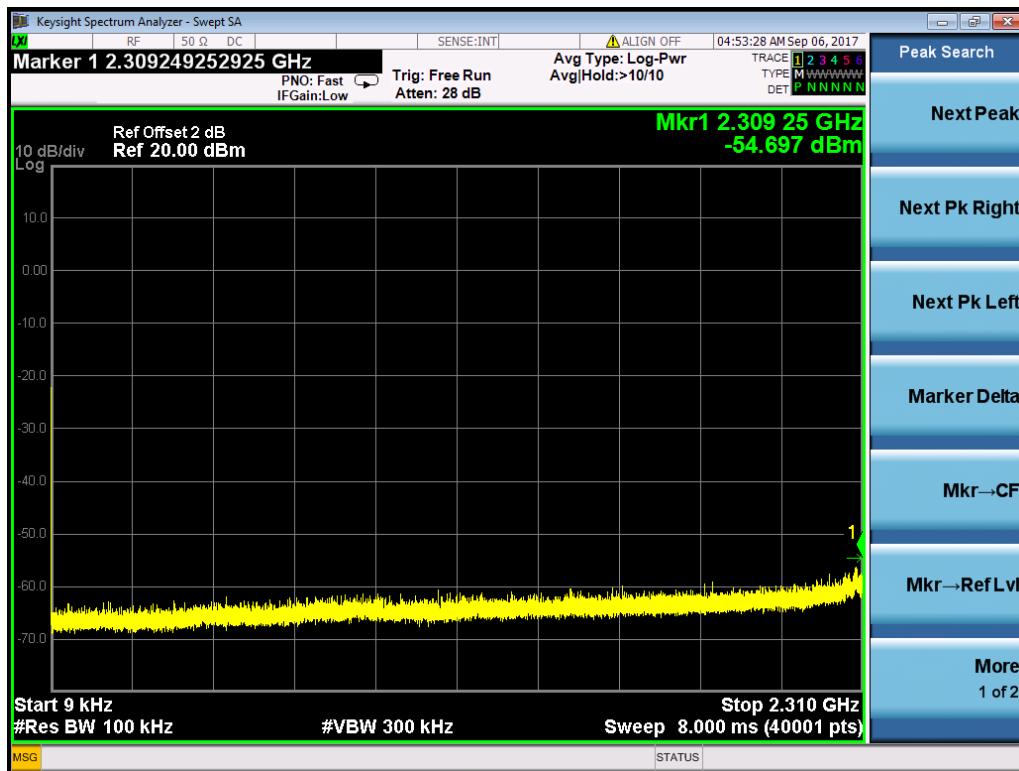
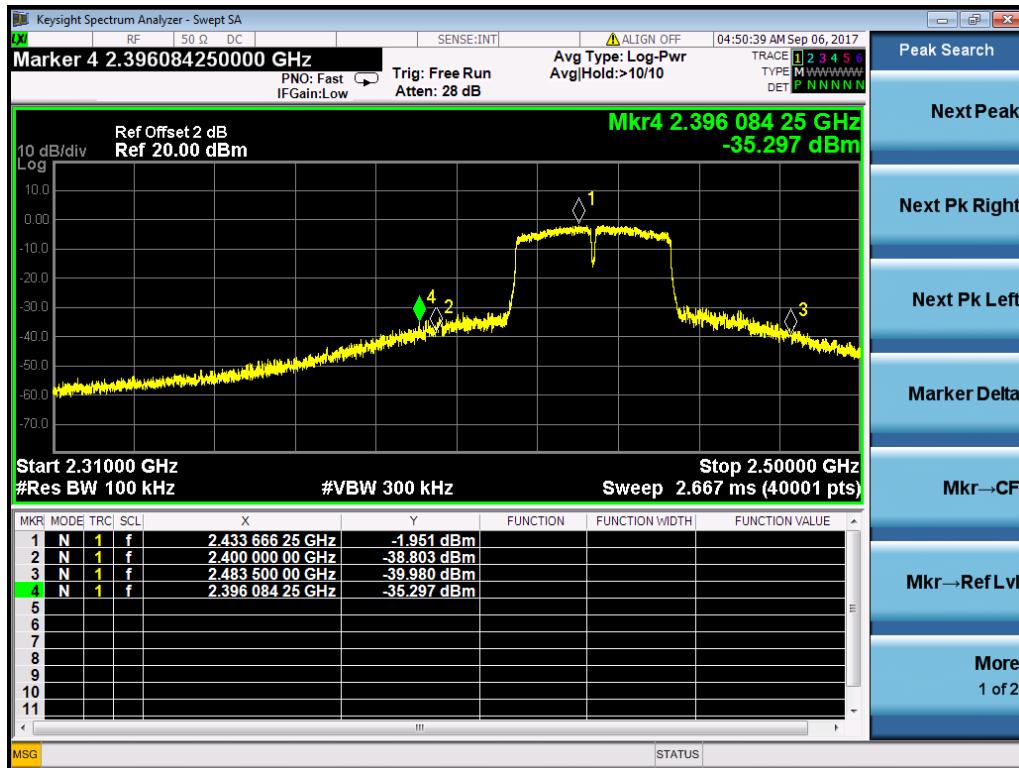
Mode	Channel	Result			Limits (dB)
		Port0	-	-	
802.11n (HT40)	L	Pass	-	-	≥20
	M	Pass	-	-	≥20
	H	Pass	-	-	≥20

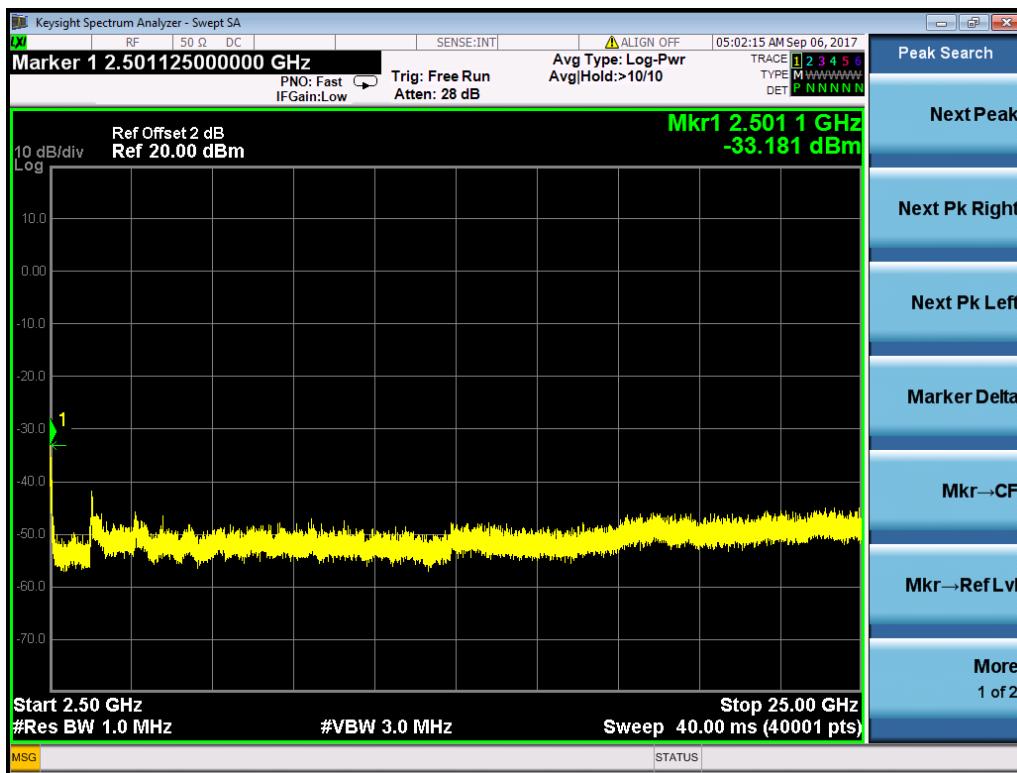
## Channel L



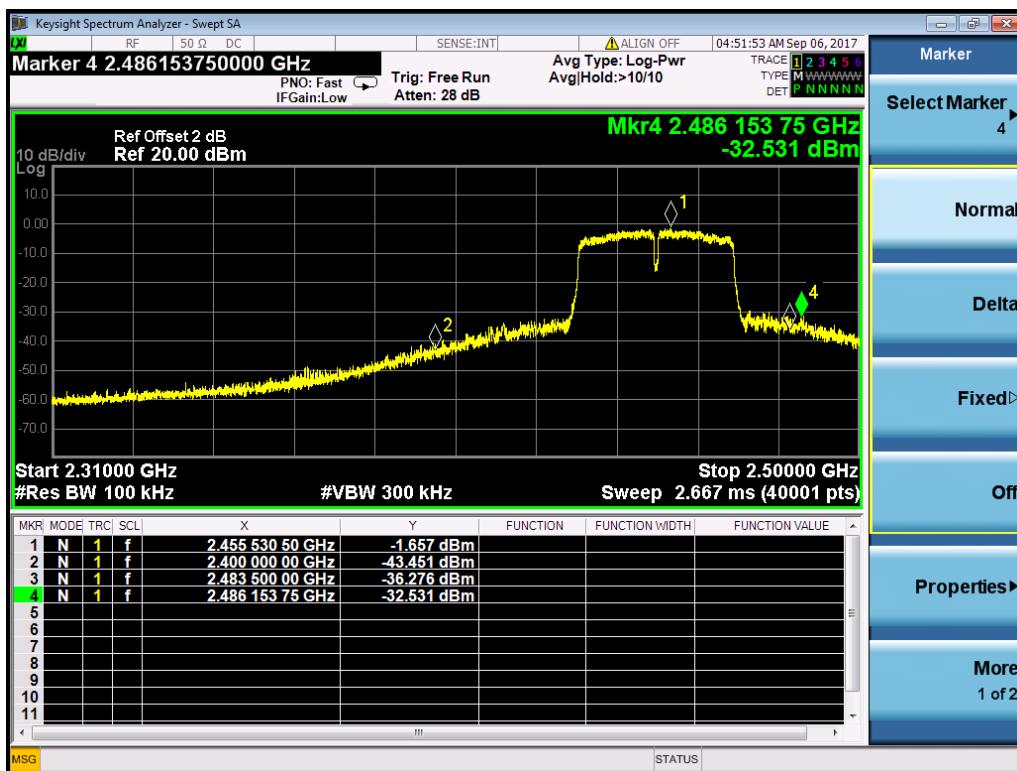


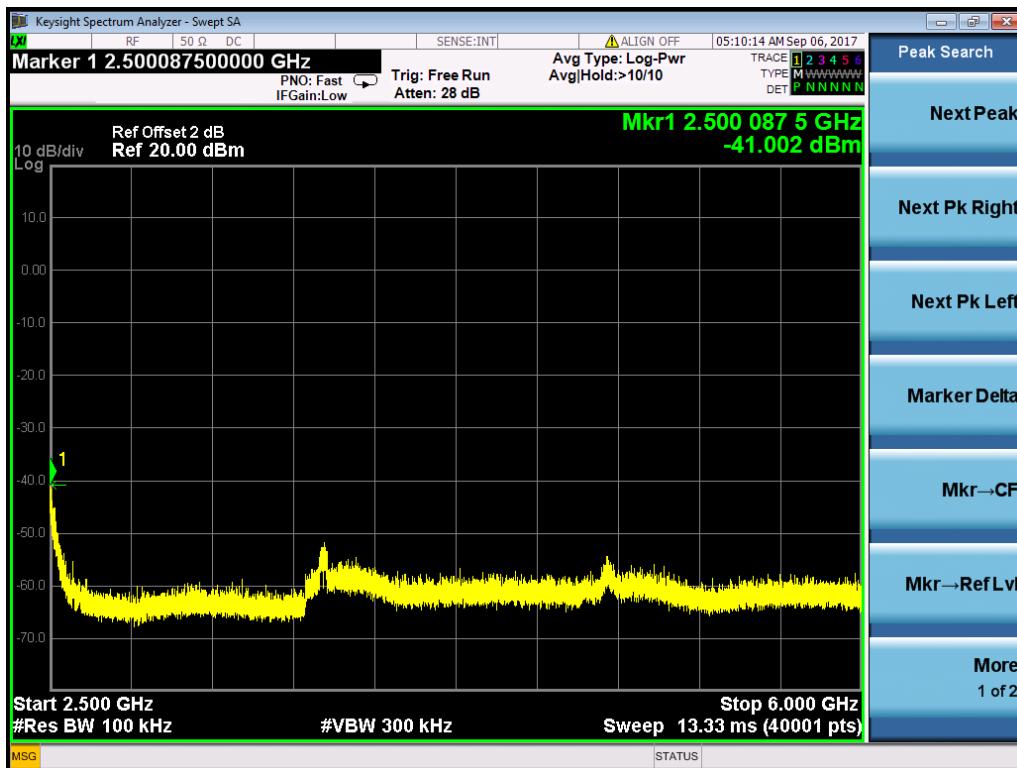
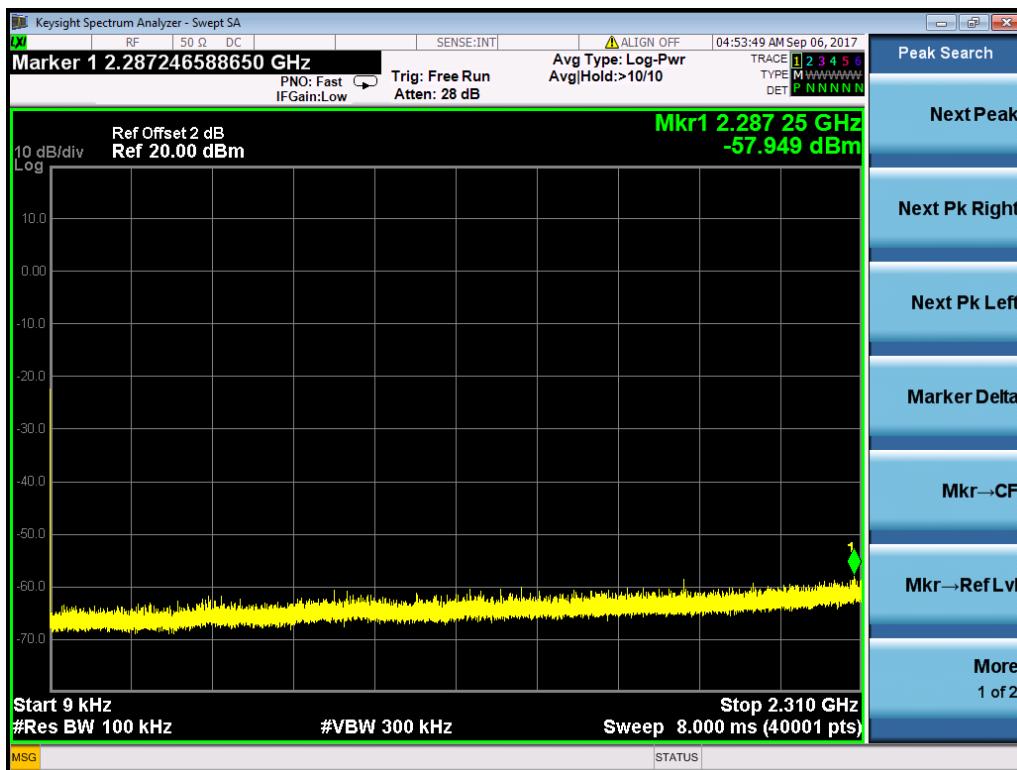
### Channel M

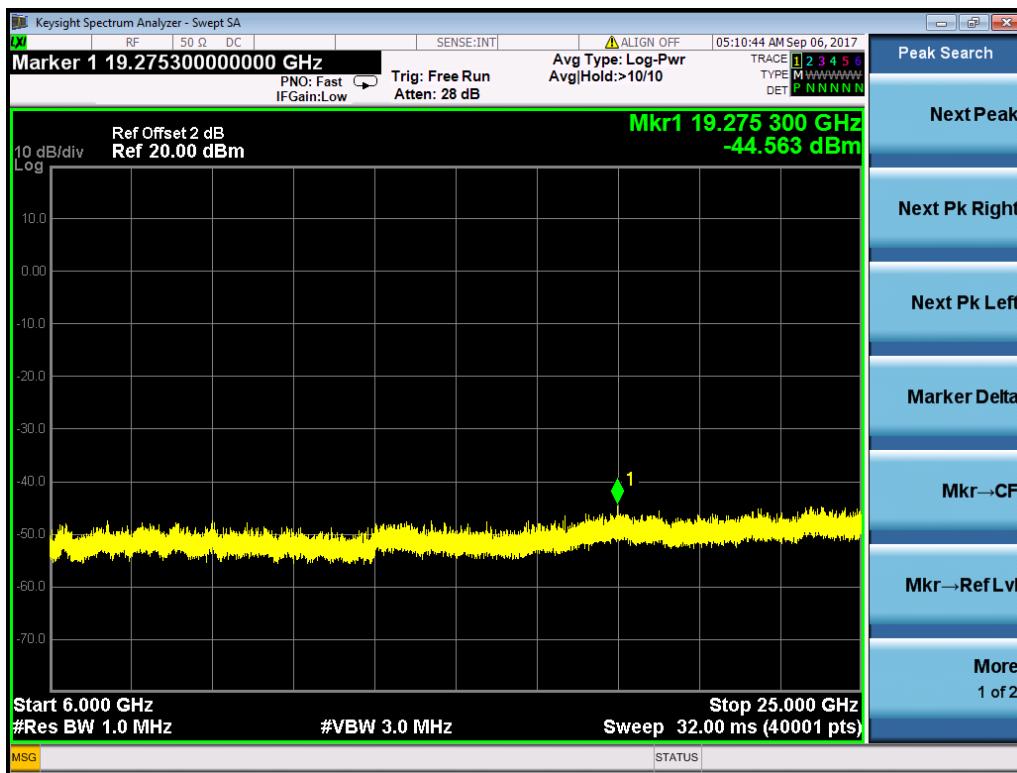




### Channel H







## 7 Radiated Emissions in restricted frequency bands

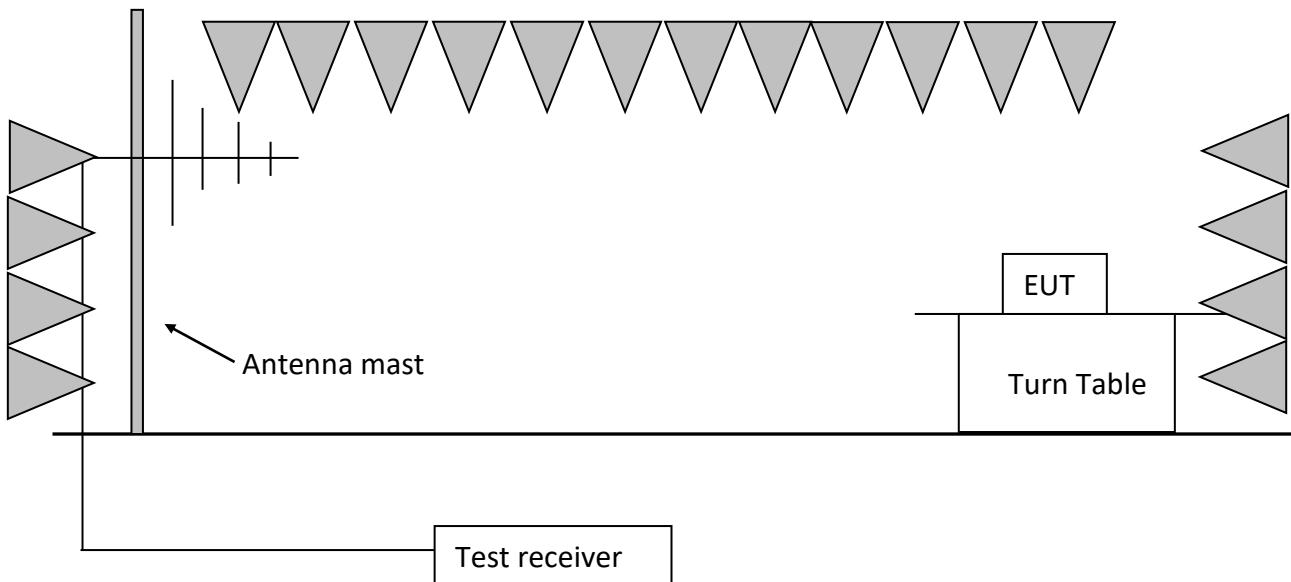
**Test result:** Pass

### 7.1 Test limit

The radiated 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) showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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

### 7.2 Test Configuration



### 7.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m.

The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The EUT was tested according to DTS test procedure of KDB558074 D01 DTS "Meas Guidance v04" for compliance to FCC 47CFR 15.247 requirements.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 300 Hz, VBW = 1 kHz (9 kHz~150 kHz);  
RBW = 10 kHz, VBW = 30 kHz (150 kHz~30MHz);  
RBW = 100 kHz, VBW = 300 kHz (30MHz~1GHz for PK)  
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);

Remark:

1. Factor= Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Measured level= Original Receiver Reading + Factor
3. Margin = Limit – Measured level
4. If the PK measured level is lower than AV limit, the AV test can be elided.

Example:

Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,

Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV.

Then Factor =  $30.20 + 2.00 - 32.00 = 0.20\text{dB}/\text{m}$ ;

Measured level =  $10\text{dBuV} + 0.20\text{dB}/\text{m} = 10.20\text{dBuV}/\text{m}$

Assuming limit = 54dBuV/m,

Measured level =  $10.20\text{dBuV}/\text{m}$ , then Margin =  $54 - 10.20 = 43.80\text{dBuV}/\text{m}$ .

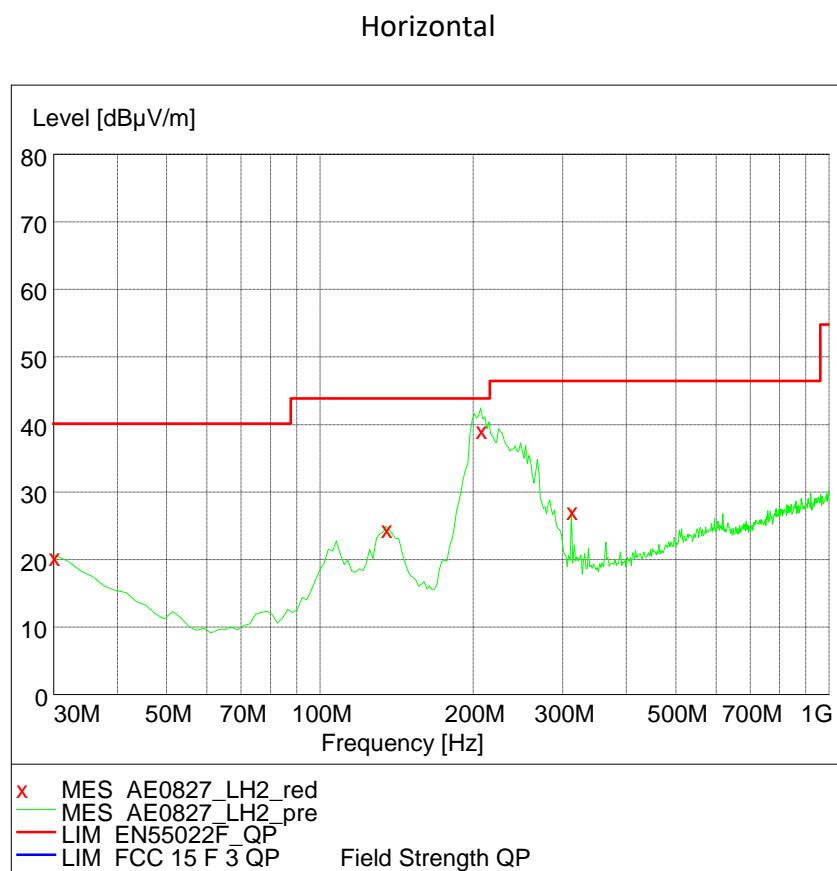
## 7.4 Test Protocol

Temperature: 25 °C

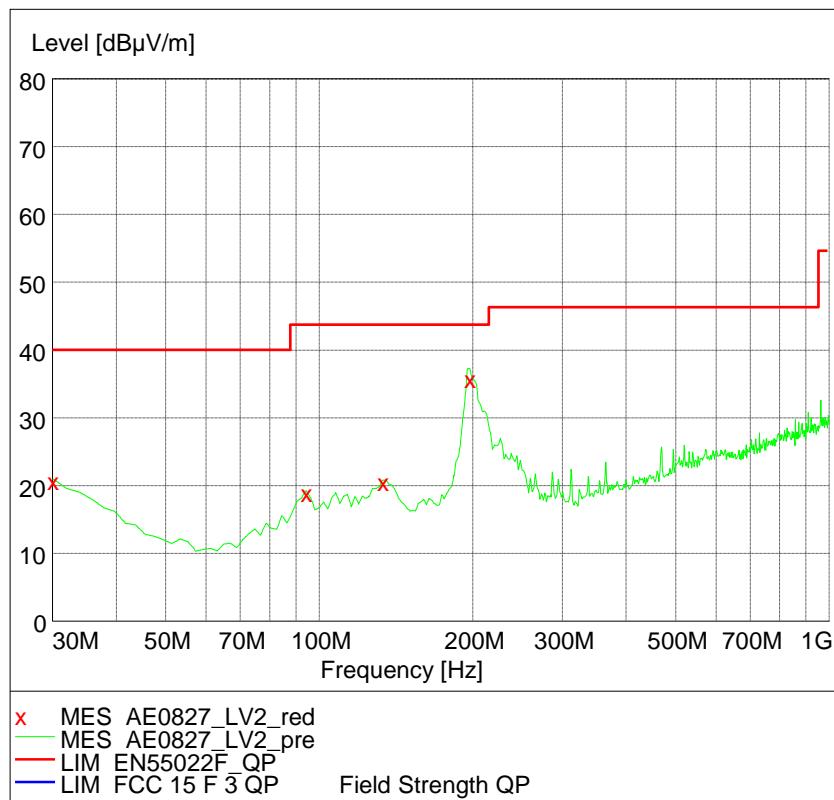
Relative Humidity: 55 %

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The worst waveform from 30MHz to 1000MHz is listed as below:



## Vertical


**Test result below 1GHz:**

Antenna	Frequency (MHz)	Corrected Reading (dB $\mu$ V/m)	Correct Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
H	30.00	20.70	19.20	40.00	19.30	PK
H	134.97	24.90	12.60	43.50	18.60	PK
H	206.89	39.50	10.70	43.50	4.00	QP
H	311.86	27.50	15.00	46.00	18.50	PK
V	30.00	21.00	19.20	40.00	19.00	PK
V	94.15	19.20	10.70	43.50	24.30	PK
V	133.03	20.80	12.70	43.50	22.70	PK
V	197.17	36.10	10.70	43.50	7.40	QP

**Test result above 1GHz:**

The emission was conducted from 1GHz to 25GHz

**802.11b**

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2412.40	104.80	34.10	Fundamental	/	PK
	V	2389.96	46.08	34.20	74.00	27.92	PK
	V	4824.61	48.90	-3.60	74.00	25.10	PK
M	V	2437.56	104.60	34.20	Fundamental	/	PK
	V	4874.35	45.20	-3.50	74.00	28.80	PK
H	V	2462.60	104.30	34.40	Fundamental	/	PK
	V	2483.63	49.19	34.80	74.00	24.81	PK
	V	4921.84	42.90	-3.30	74.00	31.10	PK

**802.11g**

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2412.40	103.60	34.10	Fundamental	/	PK
	V	2388.44	52.22	34.20	74.00	21.78	PK
	V	4823.65	41.10	-3.60	74.00	32.90	PK
M	V	2437.58	103.80	34.20	Fundamental	/	PK
H	V	2462.90	104.10	34.40	Fundamental	/	PK
	V	2483.50	57.56	34.80	74.00	16.44	PK
	V	2483.50	43.56	34.80	54.00	10.44	AV
	V	4921.84	40.04	-3.30	74.00	33.96	PK

## 802.11n(HT20)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2412.80	104.40	34.10	Fundamental	/	PK
	V	2389.96	53.67	34.20	74.00	20.33	PK
	V	4823.60	40.10	-3.60	74.00	33.90	PK
M	V	2437.30	104.30	34.20	Fundamental	/	PK
H	V	2463.07	104.20	34.40	Fundamental	/	PK
	V	2483.50	60.03	34.80	74.00	13.97	PK
	V	2483.50	45.87	34.80	54.00	8.13	AV
	V	4921.84	40.01	-3.30	74.00	33.99	PK

## 802.11n(HT40)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2422.20	103.50	34.10	Fundamental	/	PK
	V	2388.44	65.24	34.20	74.00	8.76	PK
	V	2388.44	50.06	34.20	54.00	3.94	AV
	V	4837.68	41.15	-3.60	74.00	32.85	PK
M	V	2437.89	102.20	34.20	Fundamental	/	PK
H	V	2452.69	101.10	34.30	Fundamental	/	PK
	V	2483.63	64.63	34.80	74.00	9.37	PK
	V	2483.63	52.00	34.80	54.00	2.00	AV
	V	4903.25	41.05	-3.30	74.00	32.95	PK

## 8 Power line conducted emission

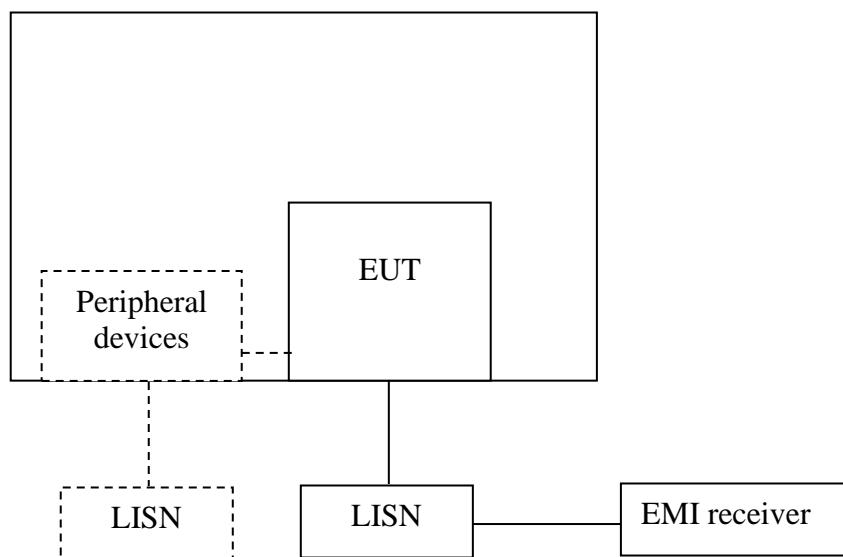
**Test result:** Pass

### 8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
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.

### 8.2 Test configuration



For table top equipment, wooden support is 0.8m height table

For floor standing equipment, wooden support is 0.1m height rack.

### 8.3 Test procedure and test set up

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

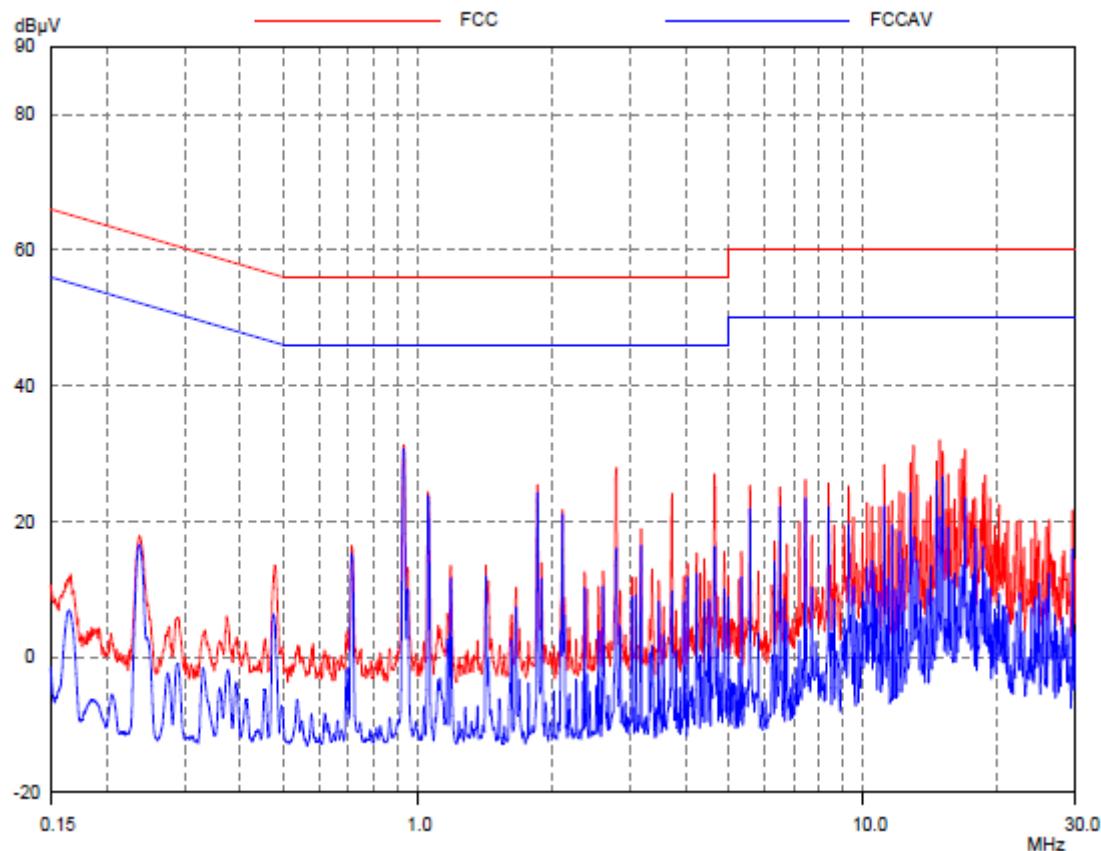
The bandwidth of the test receiver is set at 9 kHz.

## 8.4 Test protocol

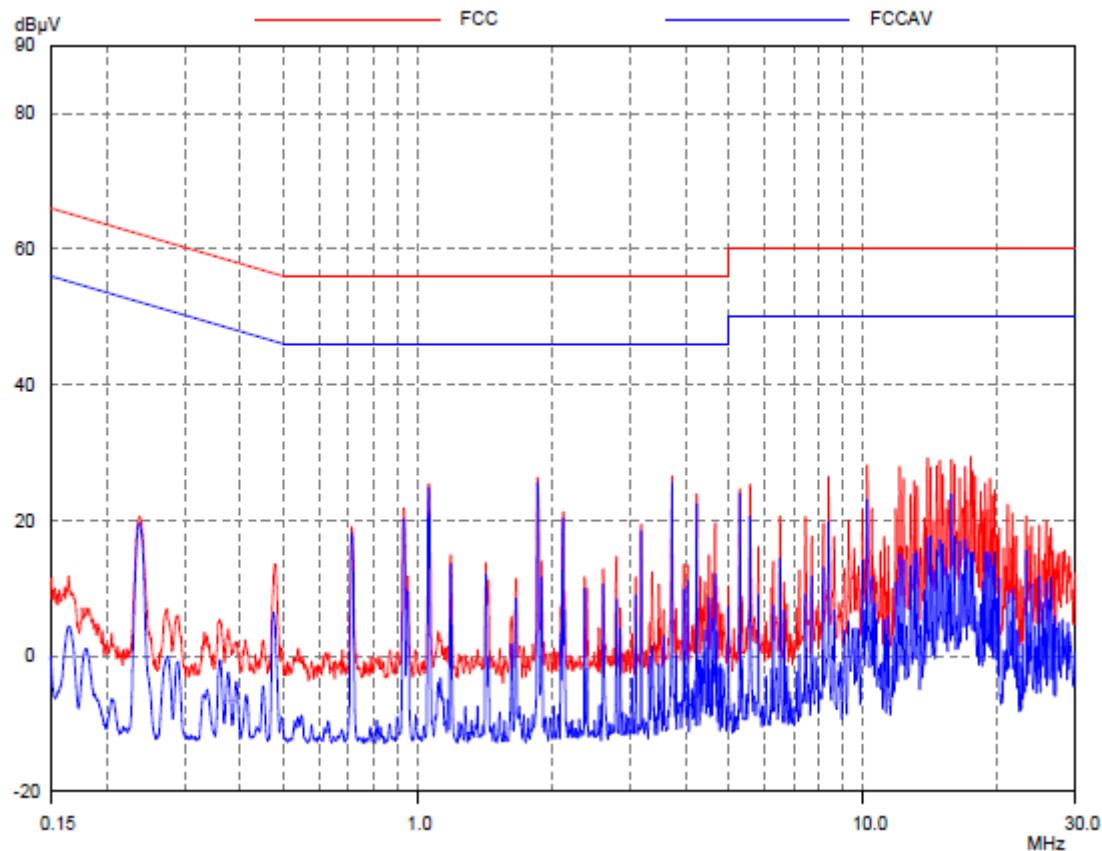
Temperature: 25 °C

Relative Humidity: 55 %

L Line



N Line



## 9 Antenna requirement

### **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 shall be considered sufficient to comply with the provisions of this section.

### **Result:**

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

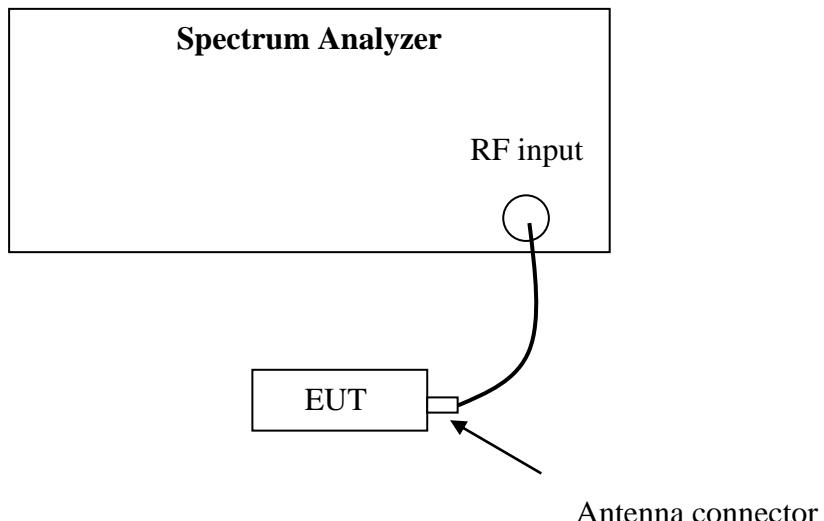
## 10 Occupied Bandwidth

**Test Status:** Tested

### 10.1 Test limit

None

### 10.2 Test Configuration



### 10.3 Test procedure and test setup

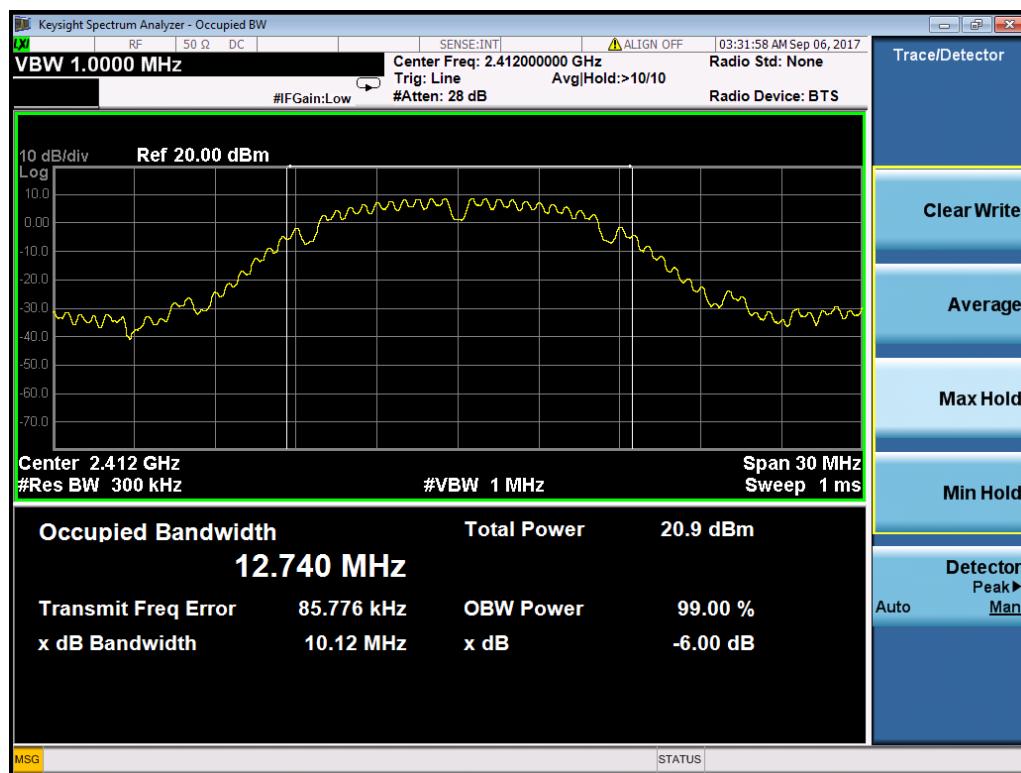
The occupied bandwidth per RSS-Gen Issue 4 Clause 6.6 was measured using the Spectrum Analyzer.

#### 10.4 Test protocol

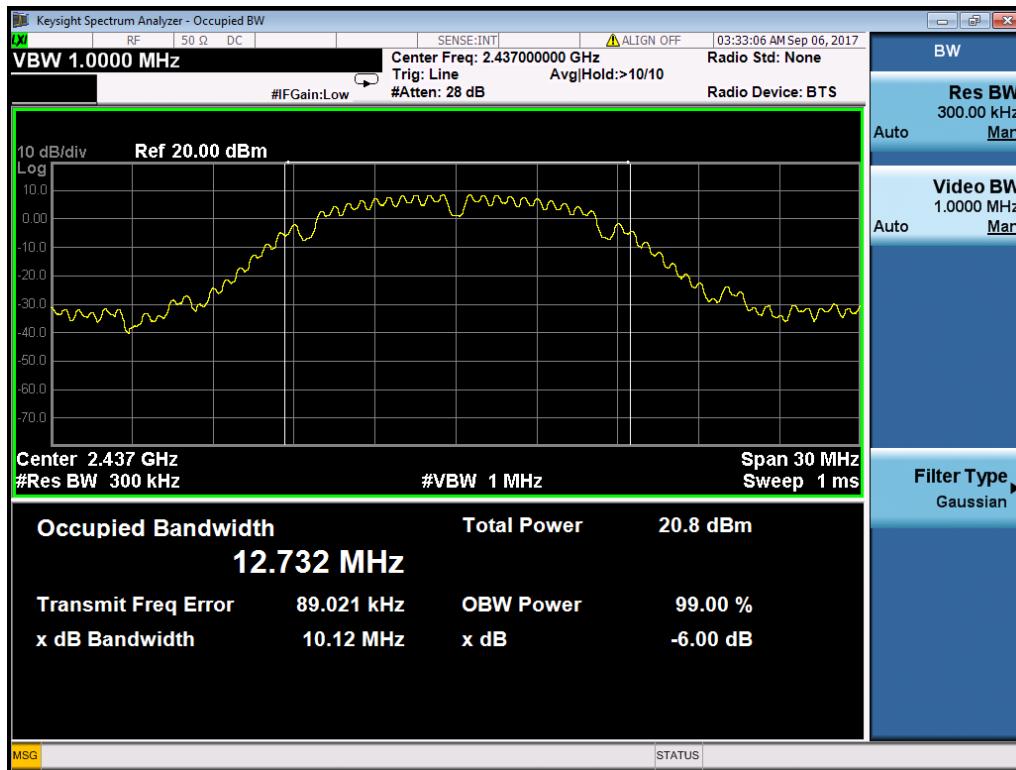
Temperature : 25 °C  
Relative Humidity : 55 %

Mode	Mode	99% Bandwidth (MHz)		
		Port0	-	-
802.11b	L	12.740	-	-
	M	12.732	-	-
	H	12.784	-	-

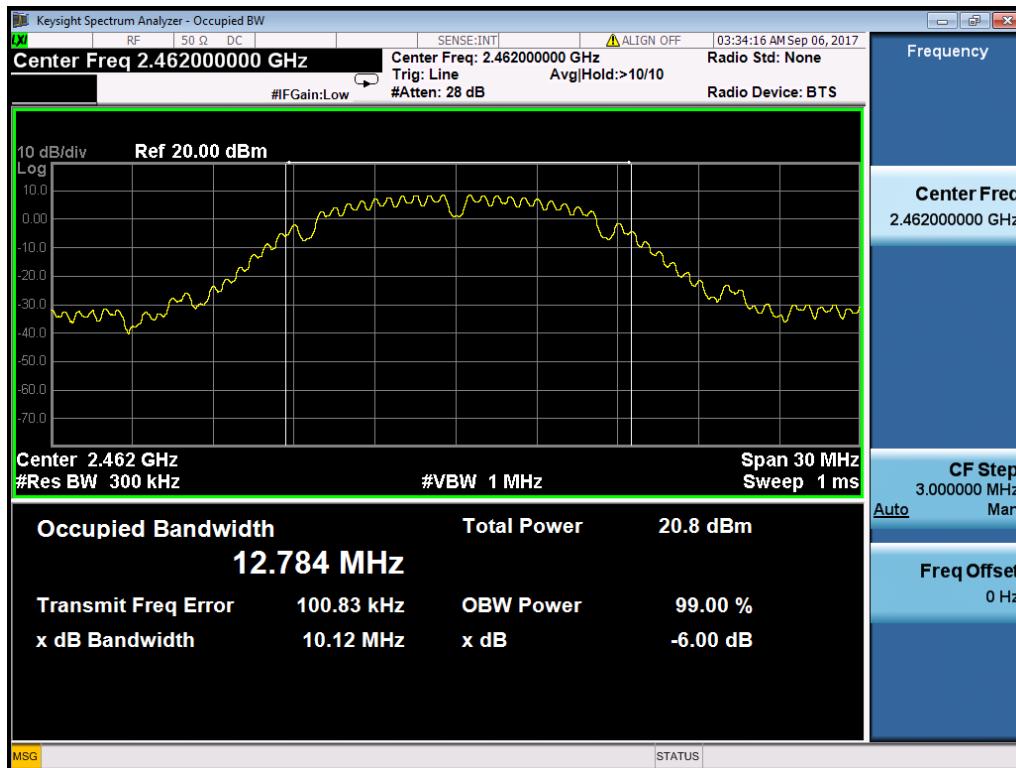
Channel L



## Channel M

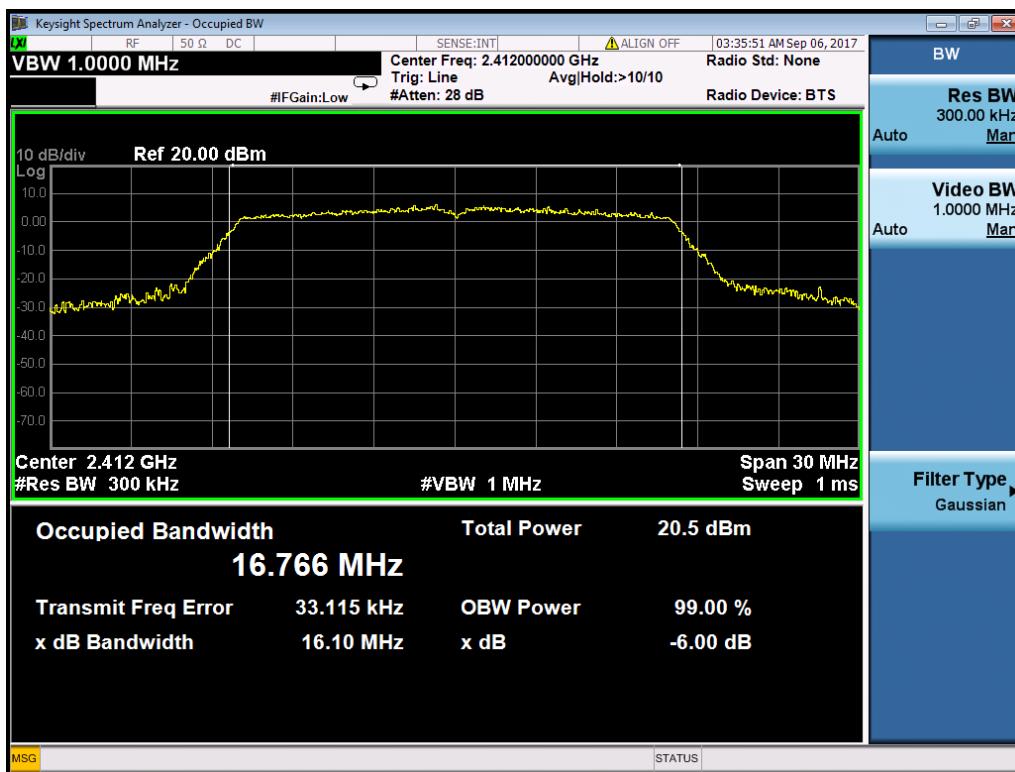


## Channel H

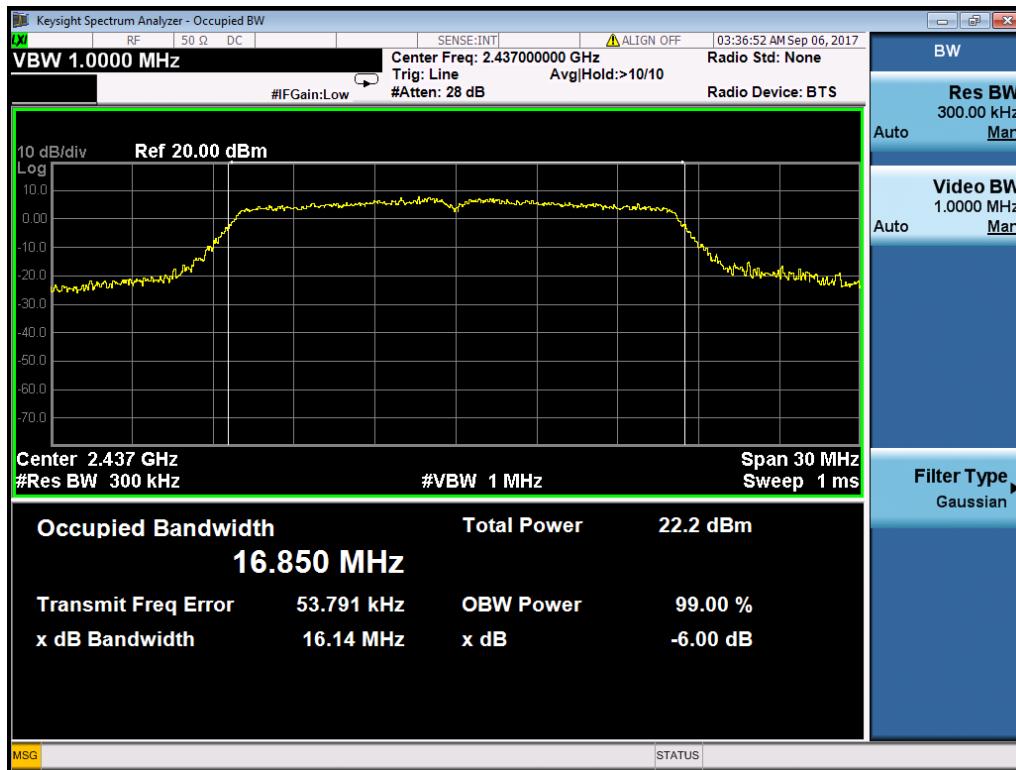


Mode	Mode	99% Bandwidth (MHz)		
		Port0	Port 1	Port 2
802.11g	L	16.766	-	-
	M	16.850	-	-
	H	16.866	-	-

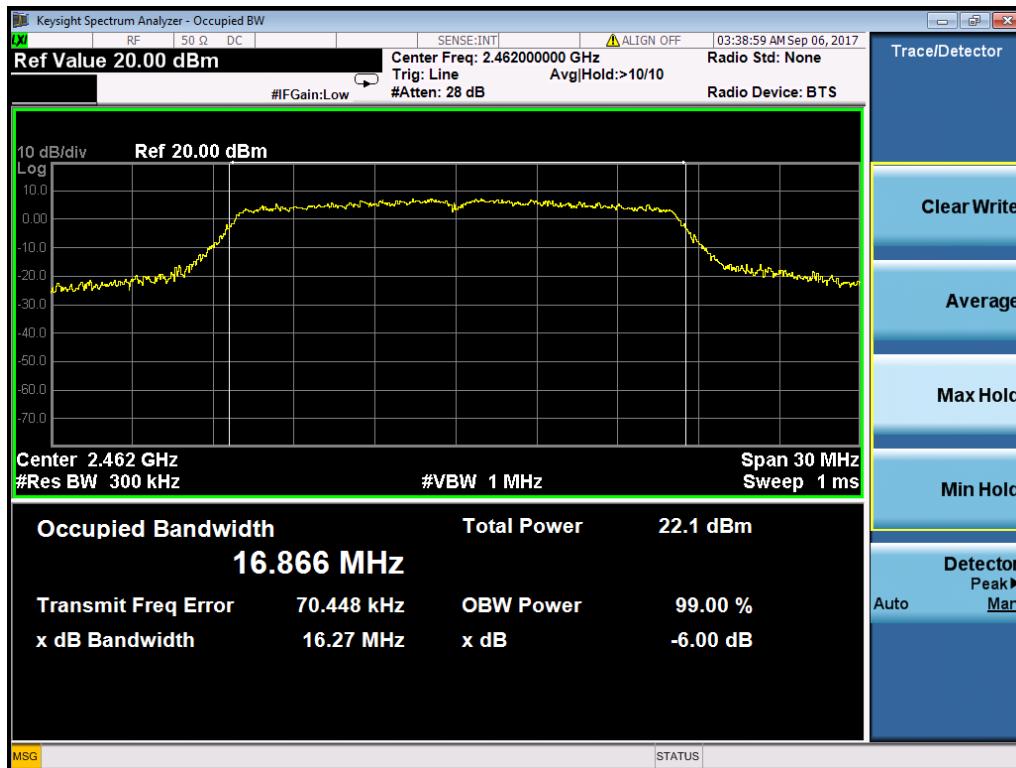
## Channel L



## Channel M

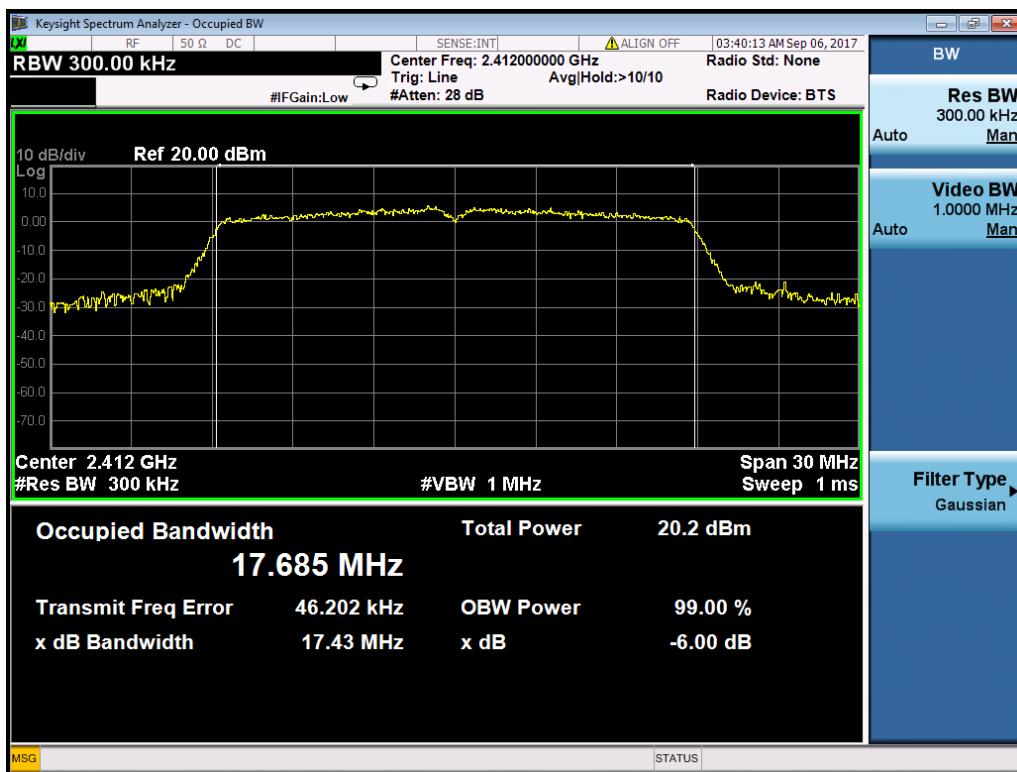


## Channel H

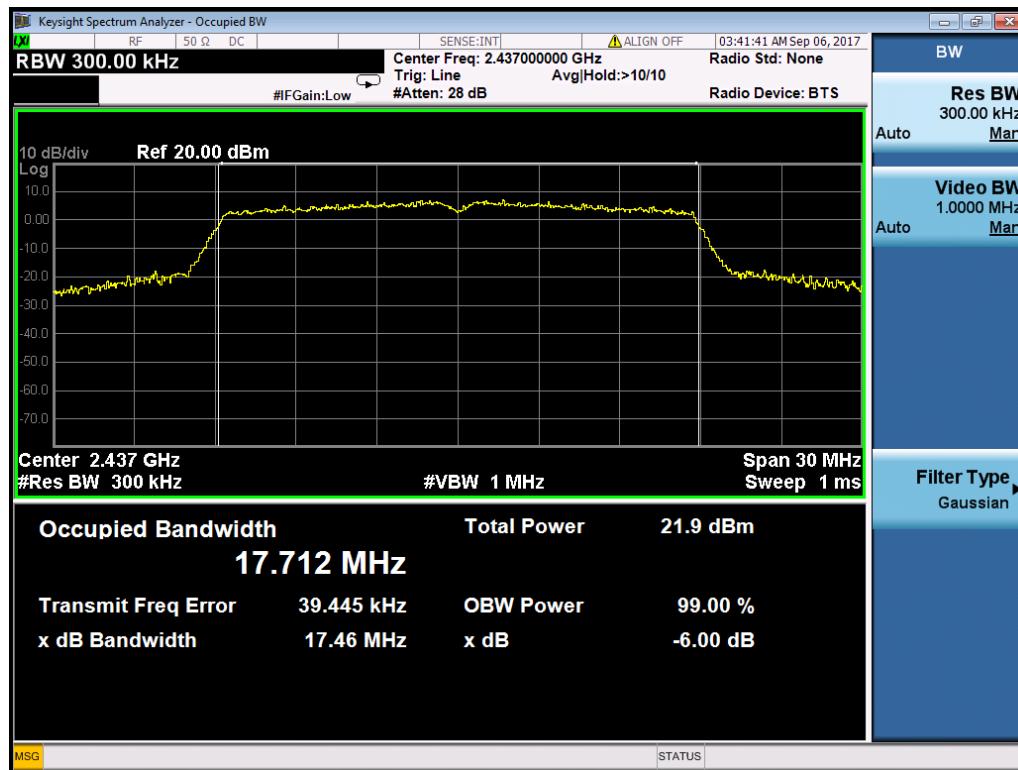


Mode	Mode	99% Bandwidth (MHz)		
		Port0	Port 1	Port 2
802.11n (HT20)	L	17.685	-	-
	M	17.712	-	-
	H	17.778	-	-

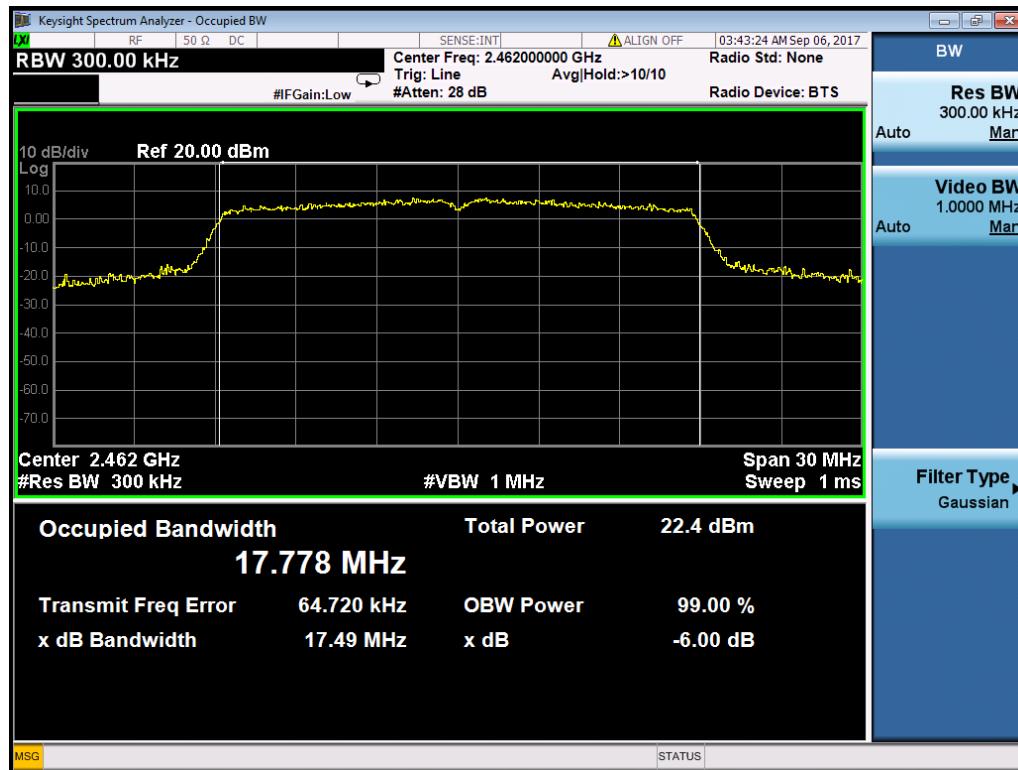
## Channel L



## Channel M

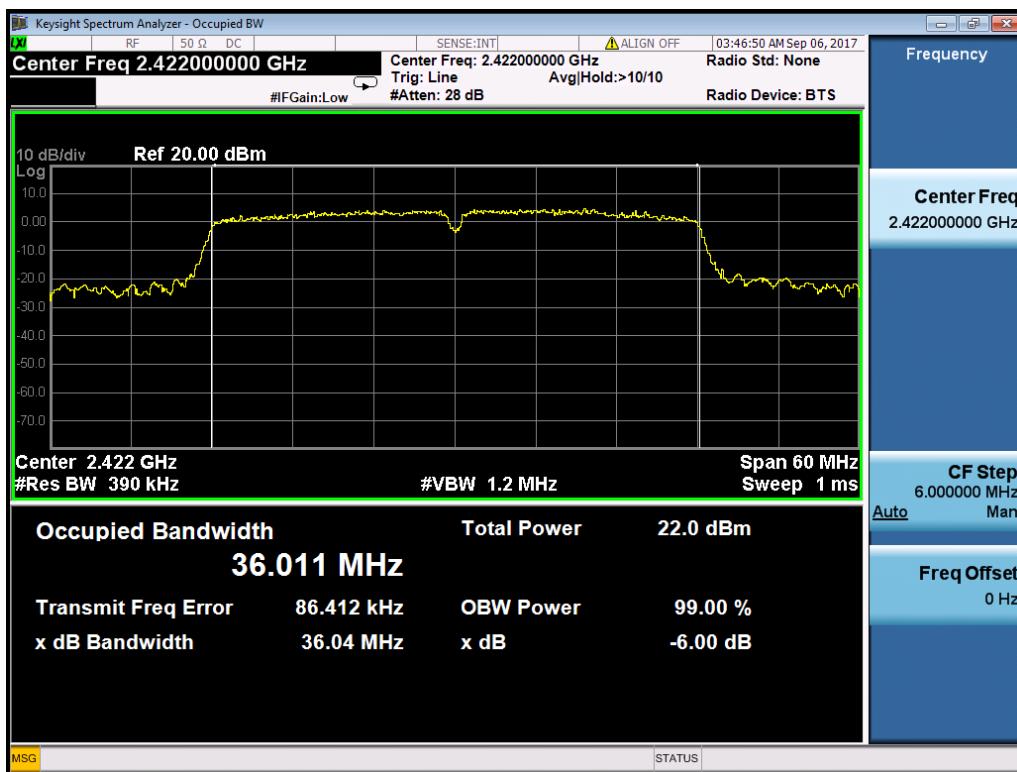


## Channel H

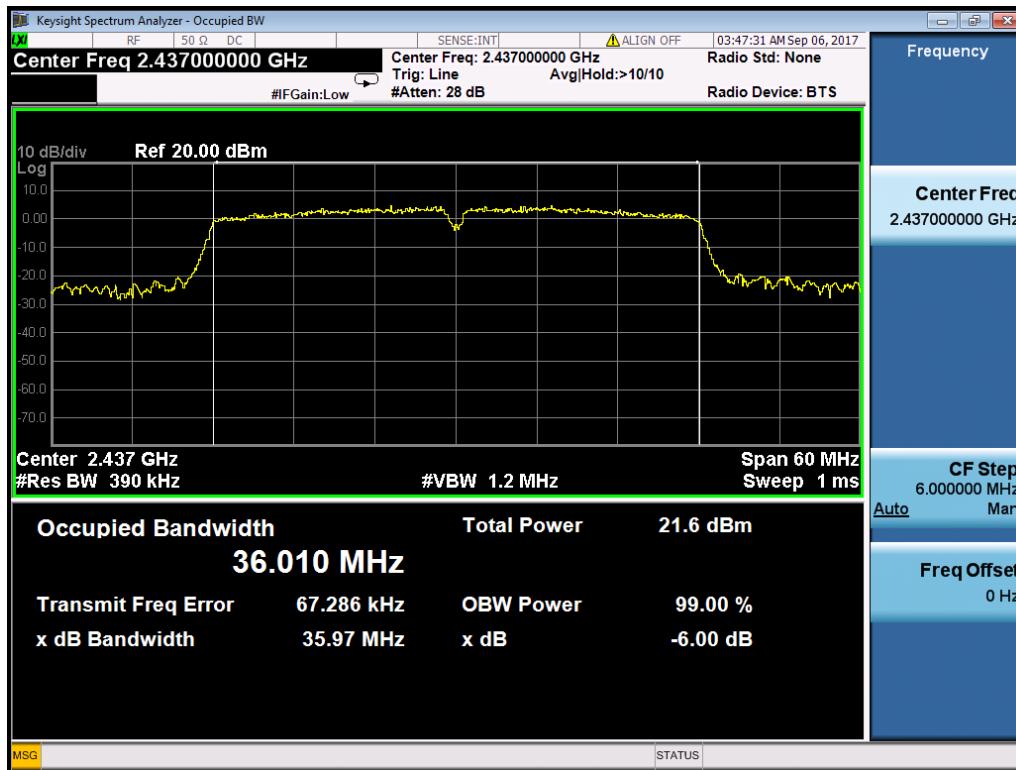


Mode	Mode	99% Bandwidth (MHz)		
		Port0	Port 1	Port 2
802.11n (HT40)	L	36.011	-	-
	M	36.010	-	-
	H	36.048	-	-

## Channel L



## Channel M



## Channel H

