

FCC TEST REPORT

**Test report
On Behalf of
Shenzhen Teslong Technology Limited
For
ScopeAround
Model No.: Focus, Fit, Flexible**

FCC ID: 2AHTO-FOCUS

Prepared for : Shenzhen Teslong Technology Limited
Room 201,Block D, BaiFuHui Industrial Park, Jianshe Road, Longhua, Shenzhen

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Date of Test: September. 13, 2016 ~ September. 20, 2016
Date of Report: September. 21, 2016
Report Number: WST1600911029-E

TEST RESULT CERTIFICATION**Applicant's name** : Shenzhen Teslong Technology LimitedAddress : Room 201,Block D, BaiFuHui Industrial Park, Jianshe Road,
Longhua, Shenzhen**Manufacture's Name** : Shenzhen Teslong Technology LimitedAddress : Room 201,Block D, BaiFuHui Industrial Park, Jianshe Road,
Longhua, Shenzhen**Product description**

Trade Mark: N/A

Product name : ScopeAround

Model and/or type reference : Focus, Fit, Flexible

Standards : FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10: 2013

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Date of TestDate (s) of performance of tests : **September. 13, 2016 ~ September. 20, 2016**Date of Issue : **September. 21, 2016**Test Result : **Pass**

Testing Engineer :



 (Eric Xie)

Technical Manager :



 (Dora Qin)

Authorized Signatory :



 (Kait Chen)

Table of Contents	Page
1 . TEST SUMMARY	5
2 . GENERAL INFORMATION	6
2.1 GENERAL DESCRIPTION OF EUT	6
Operation of EUT during testing	7
2.2 DESCRIPTION OF TEST SETUP	7
2.3 MEASUREMENT INSTRUMENTS LIST	8
3 . CONDUCTED EMISSIONS TEST	9
3.1 Conducted Power Line Emission Limit	9
3.2 Test Setup	9
3.3 Test Procedure	9
3.4 Test Result	9
4 RADIATED EMISSION TEST	12
4.1 Radiation Limit	12
4.2 Test Setup	12
4.3 Test Procedure	13
4.4 Test Result	13
5 BAND EDGE	28
5.1 Limits	28
5.2 Test Procedure	28
5.3 Test Result	28
6 OCCUPIED BANDWIDTH MEASUREMENT	36
6.1 Test Limit	36
6.2 Test Procedure	36
6.3 Measurement Equipment Used	36
6.4 Test Result	36
7 POWER SPECTRAL DENSITY TEST	53
7.1 Test Limit	53
7.2 Test Procedure	53
7.3 Measurement Equipment Used	53
7.4 Test Result	53
8 PEAK OUTPUT POWER TEST	71
8.1 Test Limit	71
8.2 Test Procedure	71
8.3 Measurement Equipment Used	71

Table of Contents	Page
8.4 Test Result	71
9 ANTENNA REQUIREMENT	72
10 PHOTOGRAPH OF TEST	73
10.1 Radiated Emission	73
10.2 Conducted Emission	74

1. TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	COMPLIANT
RADIATED EMISSION TEST	COMPLIANT
BAND EDGE	COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT
POWER SPECTRAL DENSITY	COMPLIANT
PEAK OUTPUT POWER _{Peak}	COMPLIANT
ANTENNA REQUIREMENT	COMPLIANT

1.2 TEST FACILITY

Test Firm : Dongguan Dongdian Testing Service Co., Ltd
Certificated by FCC, Registration No.: 270092
Address No.17 Zongbu road 2, Songshan Lake Sci&Tech Park, DongGuan
City, Guangdong province,523808 China

1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty	
Conducted Emission Expanded Uncertainty	= 2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	= 3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	= 4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	= 4.06dB, k=2

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	ScopeAround
Model Name	Focus
Serial No	Fit, Flexible
Model Difference	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: Focus.
FCC ID	2AHTO-FOCUS
Antenna Type	Antenna port 1: Integral Antenna Antenna port 2: Integral Antenna
Antenna Gain	Antenna port 1: 0 dBi Antenna port 2: 2 dBi
BT Operation frequency	802.11b/g/n 20: 2412~2462 MHz 802.11n 40: 2422~2452MHz
Number of Channels	802.11b/g/n20: 11CH 802.11n 40: 7CH
Modulation Type	CCK/OFDM/DBPSK/DAPSK
Power Source	AC Adapter mode: DFC050A1000
Power Rating	DC 5V for adapter with AC 120V/60Hz or DC 3.7V from battery

2.1.1 Carrier Frequency of Channels

Channel List for 802.11b/g/n(20MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		

Channel List for 802.11n(40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
03	2422	06	2437	09	2452		
04	2427	07	2442				
05	2432	08	2447				

Operation of EUT during testing

Operating Mode

The mode is used: **Transmitting mode for 802.11b/g/n(20MHz)**

Low Channel: 2412MHz

Middle Channel: 2437MHz

High Channel: 2462MHz

Transmitting mode for 802.11n(40MHz)

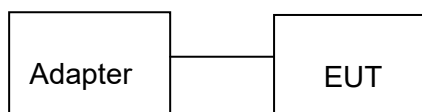
Low Channel: 2422MHz

Middle Channel: 2437MHz

High Channel: 2452MHz

2.2 DESCRIPTION OF TEST SETUP

Operation of EUT during conducted and Radiation testing:



2.3 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2016	1 Year
2.	LISN	SchwarzBeck	NSLK 8126	8126377	Feb. 19, 2016	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Feb. 19, 2016	1 Year
4.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
5.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2016	1 Year
6.	Trilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Feb. 19, 2016	1 Year
7.	Pre-amplifier	Compliance Direction	PAP-0203	22008	Feb. 19, 2016	1 Year
8.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
9.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2016	1 Year
10.	LISN	SchwarzBeck	NSLK 8126	8126377	Feb. 19, 2016	1 Year
11.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Feb. 19, 2016	1 Year
12.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
13.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2016	1 Year
14.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2016	1 Year
15.	LISN	SchwarzBeck	NSLK 8126	8126377	Feb. 19, 2016	1 Year
16.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Feb. 19, 2016	1 Year
17.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
18.	Power Meter	R&S	NRVD	SEL0069	Feb. 19, 2016	1 Year
19.	Power Sensor	R&S	URV5-Z2	SEL0071	Feb. 19, 2016	1 Year
20.	Power Sensor	R&S	URV5-Z2	SEL0072	Feb. 19, 2016	1 Year
21.	Software EMC32	R&S	EMC32-S	SEL0082	N/A	N/A
22.	Log-periodic Antenna	Amplifier Reasearch	AFocus80	SEL0073	N/A	N/A
23.	Antenna Tripod	Amplifier Reasearch	TP1000A	SEL0074	N/A	N/A
24.	High Gain Horn Antenna(0.8-5GHz)	Amplifier Reasearch	AT4002A	SEL0075	N/A	N/A
25.	Spectrum analyzer	Agilent	N9020A	MY499110 048	Feb. 19, 2016	1 Year
26.	Spectrum analyzer	Agilent	E4407B	MY461843 26	Feb. 19, 2016	1 Year

3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

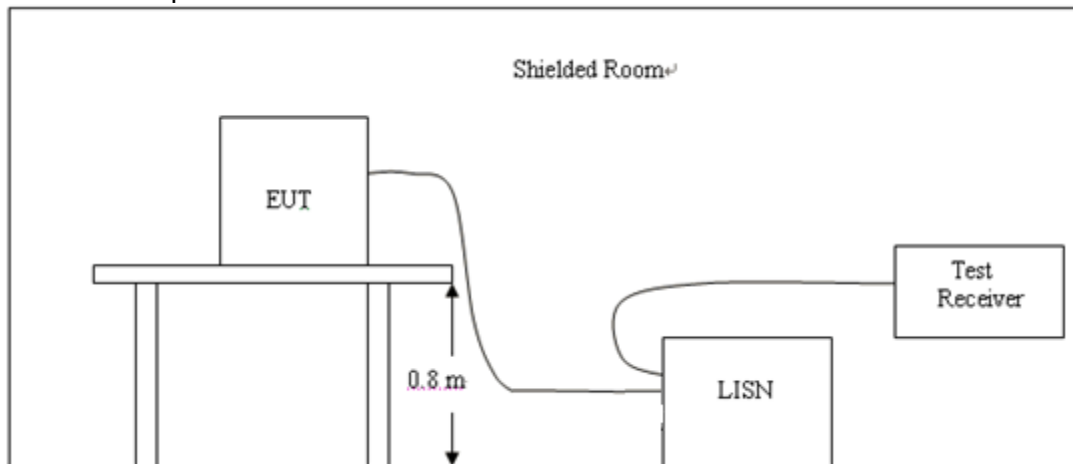
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage (dB μ V)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

3.2 Test Setup



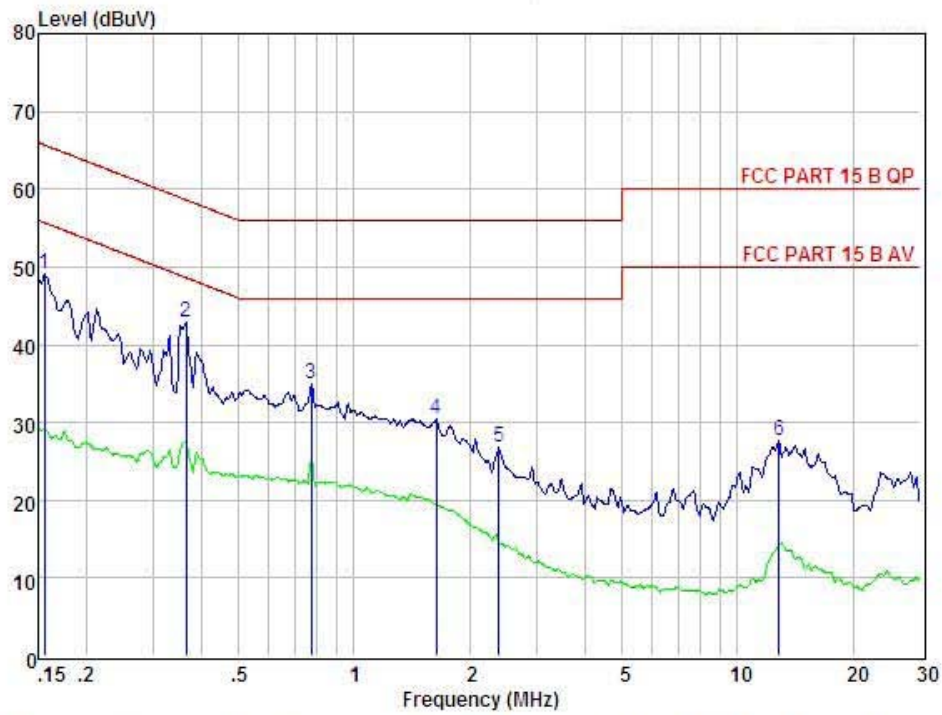
3.3 Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

3.4 Test Result

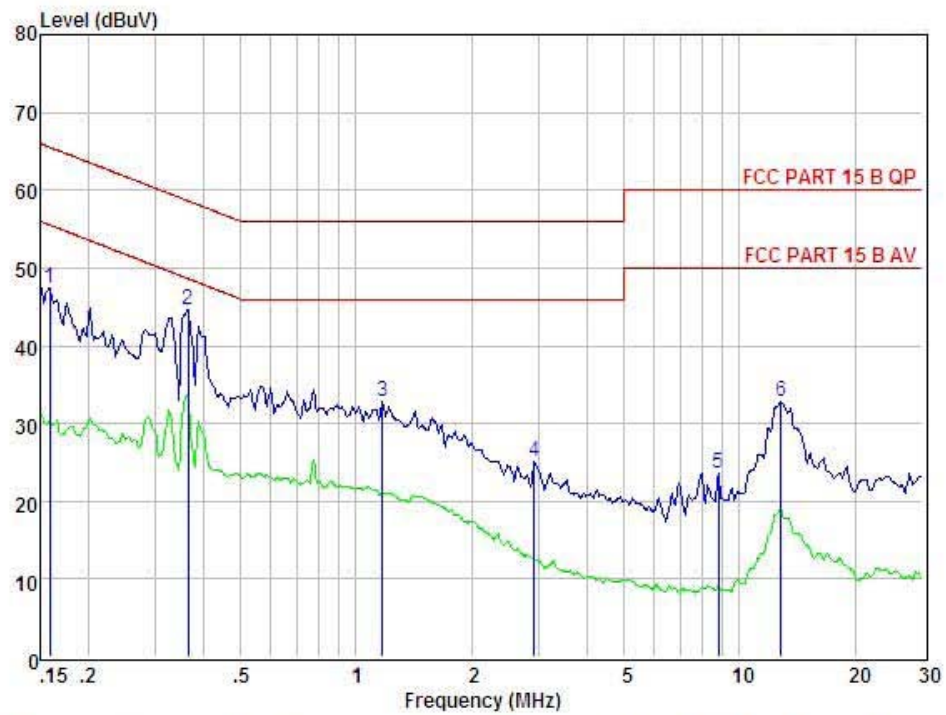
PASS

All the test modes completed for test.



Condition		: FCC PART 15 B QP			POL: LINE		Temp: 23.1°C		Hum: 48 %	
Item	Freq MHz	Read Level dBuV	LISN Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark	
1	0.156	39.43	0.03	-9.52	0.10	49.08	65.69	-16.61	Peak	
2	0.365	33.28	0.03	-9.57	0.10	42.98	58.61	-15.63	Peak	
3	0.775	25.30	0.00	-9.60	0.10	35.00	56.00	-21.00	Peak	
4	1.636	20.63	0.05	-9.69	0.10	30.47	56.00	-25.53	Peak	
5	2.384	16.81	0.06	-9.75	0.11	26.73	56.00	-29.27	Peak	
6	12.852	17.37	0.23	-9.89	0.22	27.71	60.00	-32.29	Peak	

Remark: Level = Read Level + LISN Factor - Preamp Factor + Cable Loss



Condition		: FCC PART 15 B QP			POL: NEUTRAL		Temp: 23.1°C	Hum: 48 %	
Item	Freq MHz	Read Level dBuV	LISN Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	0.159	37.80	0.03	-9.52	0.10	47.45	65.52	-18.07	Peak
2	0.365	35.01	0.03	-9.57	0.10	44.71	58.61	-13.90	Peak
3	1.172	23.08	0.04	-9.65	0.10	32.87	56.00	-23.13	Peak
4	2.915	15.18	0.07	-9.79	0.12	25.16	56.00	-30.84	Peak
5	8.822	13.36	0.16	-9.95	0.18	23.65	60.00	-36.35	Peak
6	12.852	22.42	0.23	-9.89	0.22	32.76	60.00	-27.24	Peak

Remark: Level = Read Level + LISN Factor - Preamp Factor + Cable Loss

4 RADIATED EMISSION TEST

4.1 Radiation Limit

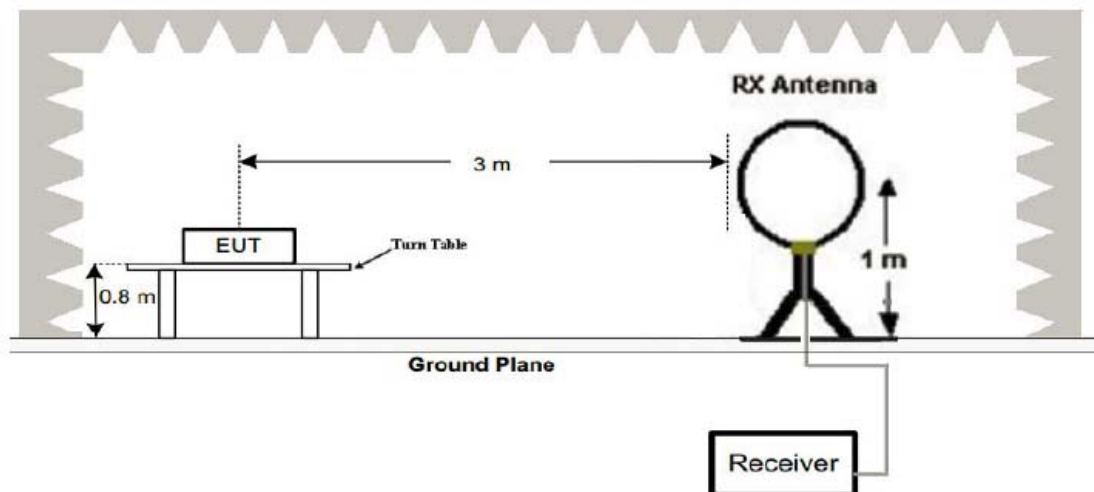
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

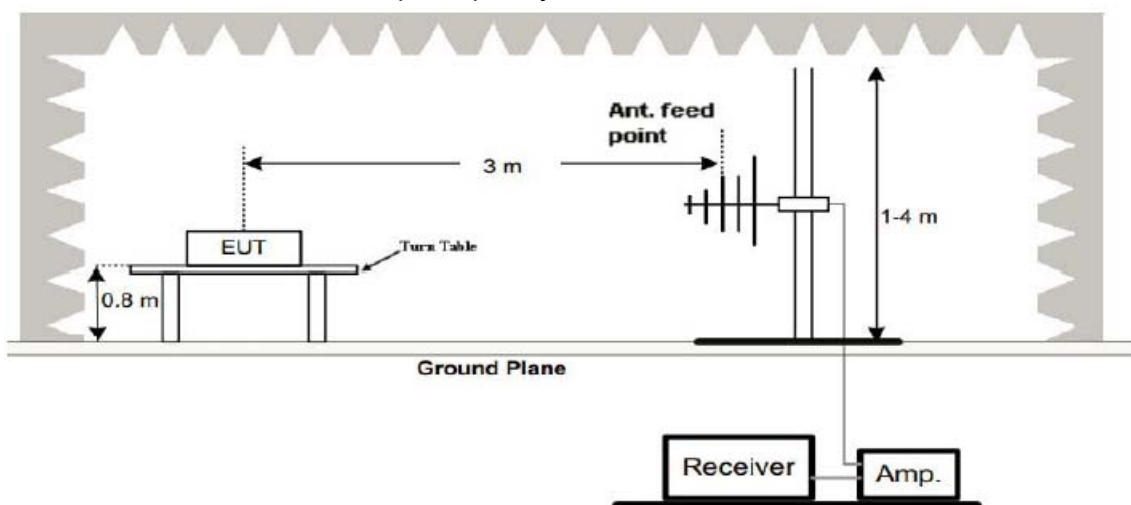
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

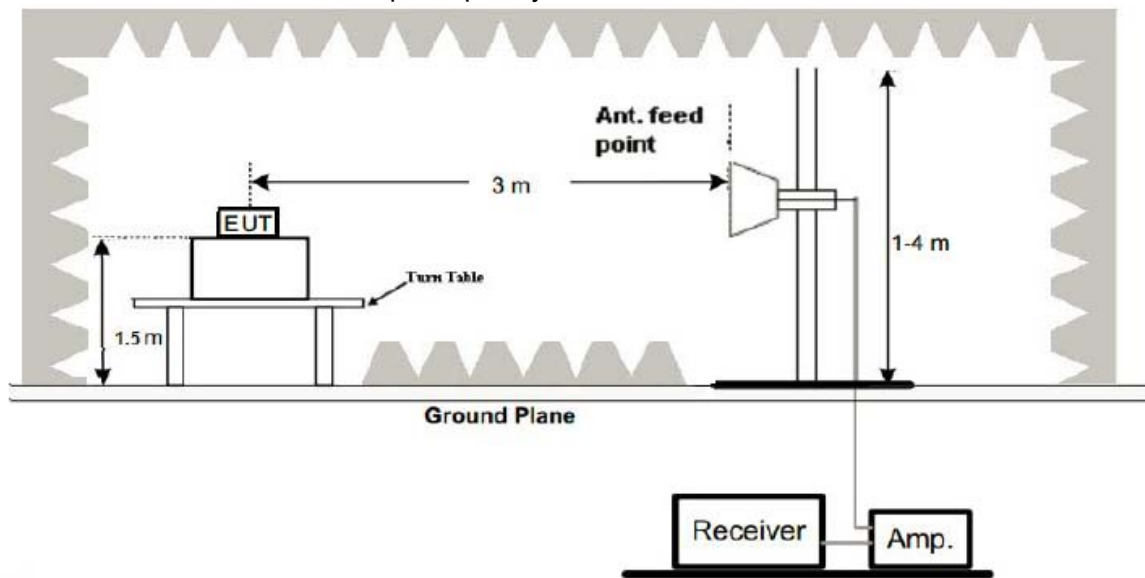
(1) Radiated Emission Test-Up Frequency Below 30MHz



(2) Radiated Emission Test-Up Frequency 30MHz~1GHz



(3) Radiated Emission Test-Up Frequency Above 1GHz



4.3 Test Procedure

1. Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

Note:

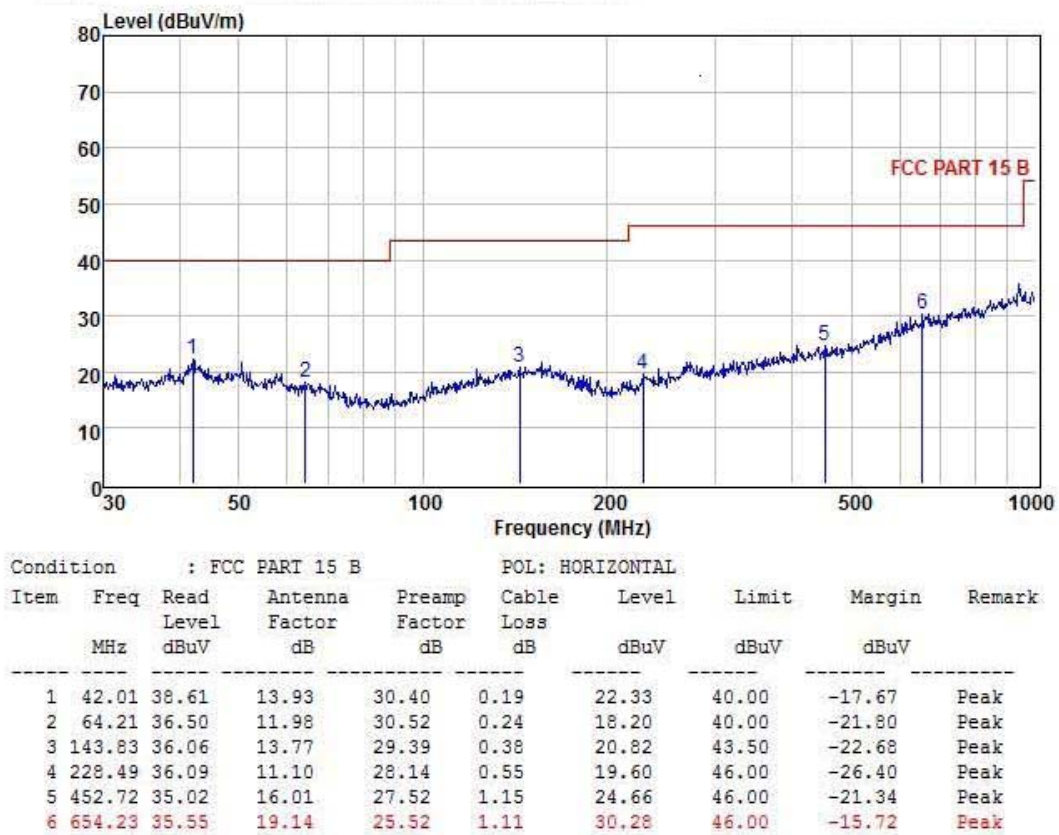
For battery operated equipment, the equipment tests shall be performed using a new battery.

4.4 Test Result

PASS

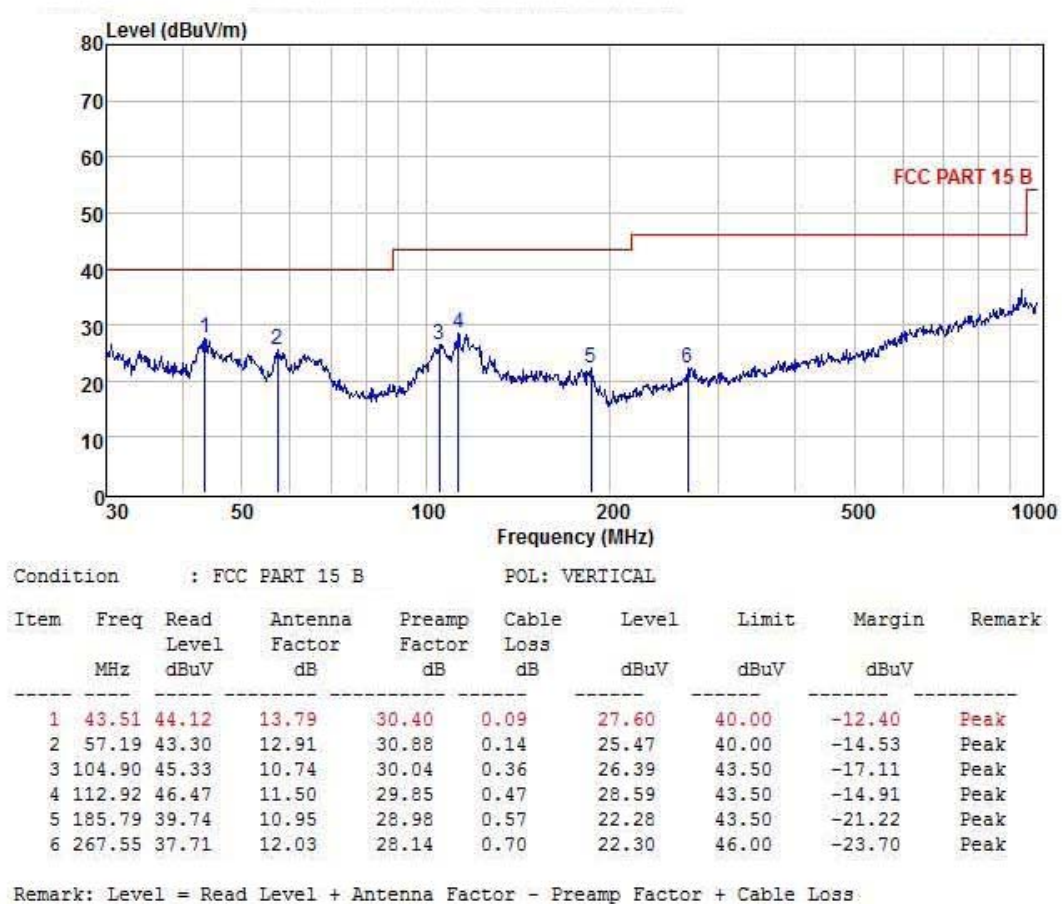
All the test modes completed for test. The worst case of Radiated Emission; the test data of this mode was reported.

Below 1GHz Test Results:
Antenna polarity: H



Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Antenna polarity: V



Remark:

- (1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

All the test modes completed for test. The worst case MIMO mode of Radiated Emission; the test data of this mode was reported.

For MIMO antenna port 1 and part 2 above 1 GHz Test Results:

LOW CH1 (802.11b Mode)/2412

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	61.85	-3.64	58.21	74	-15.79	peak
4824	46.16	-3.64	42.52	54	-11.48	AVG
7236	55.48	-0.95	54.53	74	-19.47	peak
7236	40.16	-0.95	39.21	54	-14.79	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	61.21	-3.64	57.57	74	-16.43	peak
4824	44.89	-3.64	41.25	54	-12.75	AVG
7236	55.77	-0.95	54.82	74	-19.18	peak
7236	40.24	-0.95	39.29	54	-14.71	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

HIGH CH11 (802.11b Mode)/2462
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	61.35	-3.43	57.92	74	-16.08	peak
4924	46.00	-3.43	42.57	54	-11.43	AVG
7386	55.90	-0.75	55.15	74	-18.85	peak
7386	40.96	-0.75	40.21	54	-13.79	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	62.16	-3.43	58.73	74	-15.27	peak
4924	46.27	-3.43	42.84	54	-11.16	AVG
7386	55.67	-0.75	54.92	74	-19.08	peak
7386	40.54	-0.75	39.79	54	-14.21	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

LOW CH1 (802.11g Mode)/2412
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	61.25	-3.64	57.61	74	-16.39	peak
4824	45.47	-3.64	41.83	54	-12.17	AVG
7236	55.00	-0.95	54.05	74	-19.95	peak
7236	40.67	-0.95	39.72	54	-14.28	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	60.36	-3.64	56.72	74	-17.28	peak
4824	44.95	-3.64	41.31	54	-12.69	AVG
7236	55.60	-0.95	54.65	74	-19.35	peak
7236	40.67	-0.95	39.72	54	-14.28	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

MID CH6 (802.11g Mode)/2437
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	60.07	-3.51	56.56	74	-17.44	peak
4874	44.93	-3.51	41.42	54	-12.58	AVG
7311	55.38	-0.82	54.56	74	-19.44	peak
7311	40.09	-0.82	39.27	54	-14.73	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	61.17	-3.51	57.66	74	-16.34	peak
4874	45.36	-3.51	41.85	54	-12.15	AVG
7311	56.19	-0.82	55.37	74	-18.63	peak
7311	41.23	-0.82	40.41	54	-13.59	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

HIGH CH11 (802.11g Mode)/2462
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	60.99	-3.43	57.56	74	-16.44	peak
4924	45.24	-3.43	41.81	54	-12.19	AVG
7386	56.22	-0.75	55.47	74	-18.53	peak
7386	41.07	-0.75	40.32	54	-13.68	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	62.02	-3.43	58.59	74	-15.41	peak
4924	45.67	-3.43	42.24	54	-11.76	AVG
7386	54.79	-0.75	54.04	74	-19.96	peak
7386	40.53	-0.75	39.78	54	-14.22	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

LOW CH1 (802.11n/H20 Mode)/2412
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	61.80	-3.64	58.16	74	-15.84	peak
4824	45.92	-3.64	42.28	54	-11.72	AVG
7236	55.37	-0.95	54.42	74	-19.58	peak
7236	40.70	-0.95	39.75	54	-14.25	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

[illegible]

HIGH CH11 (802.11n/H20 Mode)/2462
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	60.29	-3.43	56.86	74	-17.14	peak
4924	44.80	-3.43	41.37	54	-12.63	AVG
7386	55.93	-0.75	55.18	74	-18.82	peak
7386	40.48	-0.75	39.73	54	-14.27	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	62.11	-3.43	58.68	74	-15.32	peak
4924	45.54	-3.43	42.11	54	-11.89	AVG
7386	55.81	-0.75	55.06	74	-18.94	peak
7386	41.66	-0.75	40.91	54	-13.09	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

(1) Measuring frequencies from 1 GHz to the 25 GHz.

(2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.

(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

LOW CH3 (802.11n/H40 Mode)/2422
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	61.28	-3.63	57.65	74	-16.35	peak
4924	45.37	-3.63	41.74	54	-12.26	AVG
7386	55.79	-0.94	54.85	74	-19.15	peak
7386	40.47	-0.94	39.53	54	-14.47	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

[illegible]

MID CH6 (802.11n/H40 Mode)/2437
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	61.28	-3.51	57.77	74	-16.23	peak
4874	44.57	-3.51	41.06	54	-12.94	AVG
7311	55.79	-0.82	54.97	74	-19.03	peak
7311	40.57	-0.82	39.75	54	-14.25	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	59.73	-3.51	56.22	74	-17.78	peak
4874	44.43	-3.51	40.92	54	-13.08	AVG
7311	55.34	-0.82	54.52	74	-19.48	peak
7311	40.25	-0.82	39.43	54	-14.57	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

HIGH CH9 (802.11n/H40 Mode)/2452
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4904	61.91	-3.43	58.48	74	-15.52	peak
4904	45.60	-3.43	42.17	54	-11.83	AVG
7356	56.06	-0.75	55.31	74	-18.69	peak
7356	41.04	-0.75	40.29	54	-13.71	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4904	60.74	-3.43	57.31	74	-16.69	peak
4904	45.08	-3.43	41.65	54	-12.35	AVG
7356	55.93	-0.75	55.18	74	-18.82	peak
7356	41.38	-0.75	40.63	54	-13.37	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	51.63	-5.81	45.82	74	-28.18	peak
2390	/	-5.81	/	54	/	AVG
2400	61.15	-5.84	55.31	74	-18.69	peak
2400	46.26	-5.84	40.42	54	-13.58	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High (2462MHz)
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	53.02	-5.65	47.37	74	-26.63	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	52.80	-5.65	47.15	74	-26.85	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

Operation Mode: 802.11n/H20 Mode TX CH Low (2412MHz)
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	53.64	-5.81	47.83	74	-26.17	peak
2390	/	-5.81	/	54	/	AVG
2400	62.38	-5.84	56.54	74	-17.46	peak
2400	46.69	-5.84	40.85	54	-13.15	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	52.49	-5.81	46.68	74	-27.32	peak
2390	/	-5.81	/	54	/	AVG
2400	61.35	-5.84	55.51	74	-18.49	peak
2400	46.07	-5.84	40.23	54	-13.77	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Operation Mode: TX CH High (2462MHz)
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	52.72	-5.65	47.07	74	-26.93	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	52.23	-5.65	46.58	74	-27.42	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

6 OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

6.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on FCC Part15 C Section 15.247: RBW= 100KHz. VBW= 300 KHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

6.3 Measurement Equipment Used

Same as Radiated Emission Measurement

6.4 Test Result

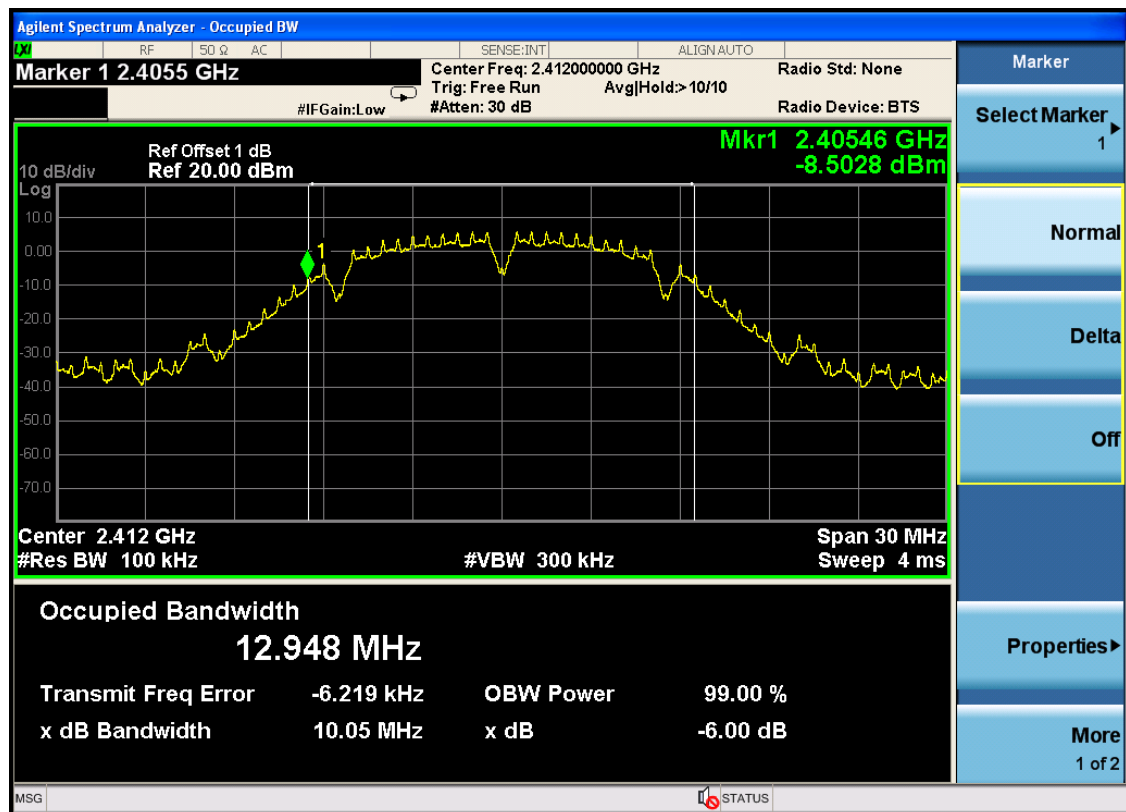
PASS

All the test modes completed for test.

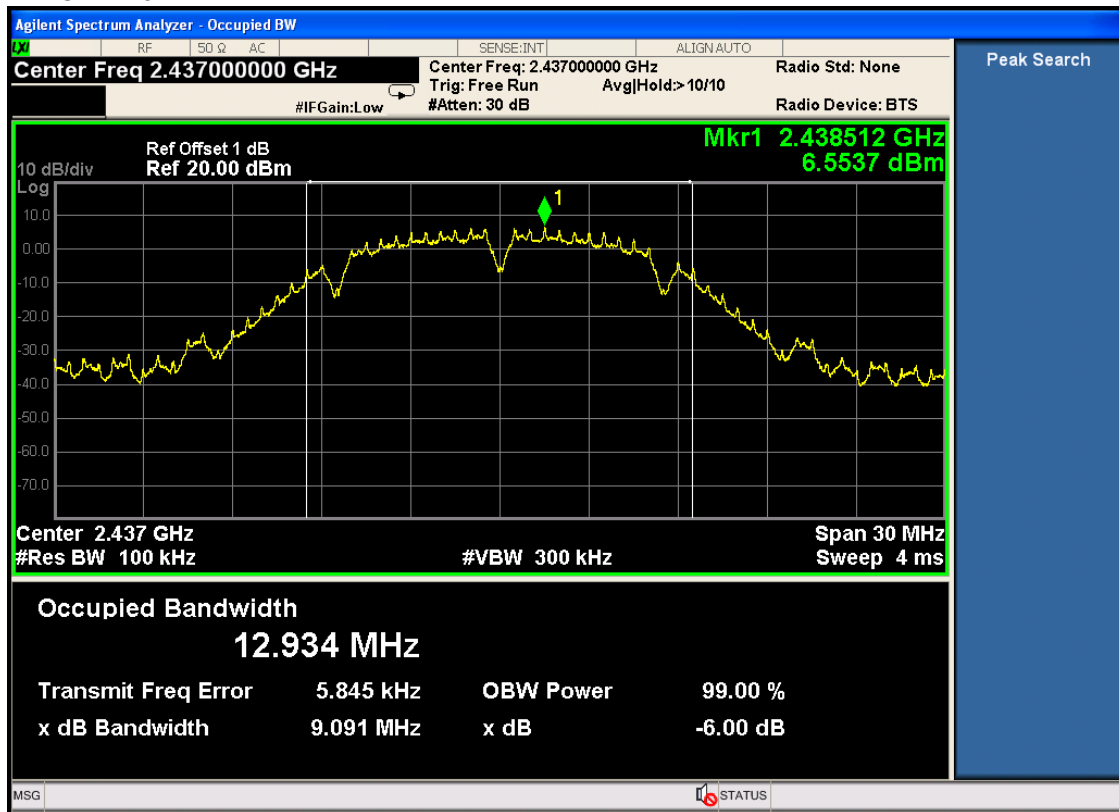
For antenna port 1:

TX 802.11b Mode			
Frequency	6dB Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	10.05	>=500KHz	PASS
2437 MHz	9.091	>=500KHz	PASS
2462 MHz	10.04	>=500KHz	PASS

CH: 2412MHz



CH: 2437MHz

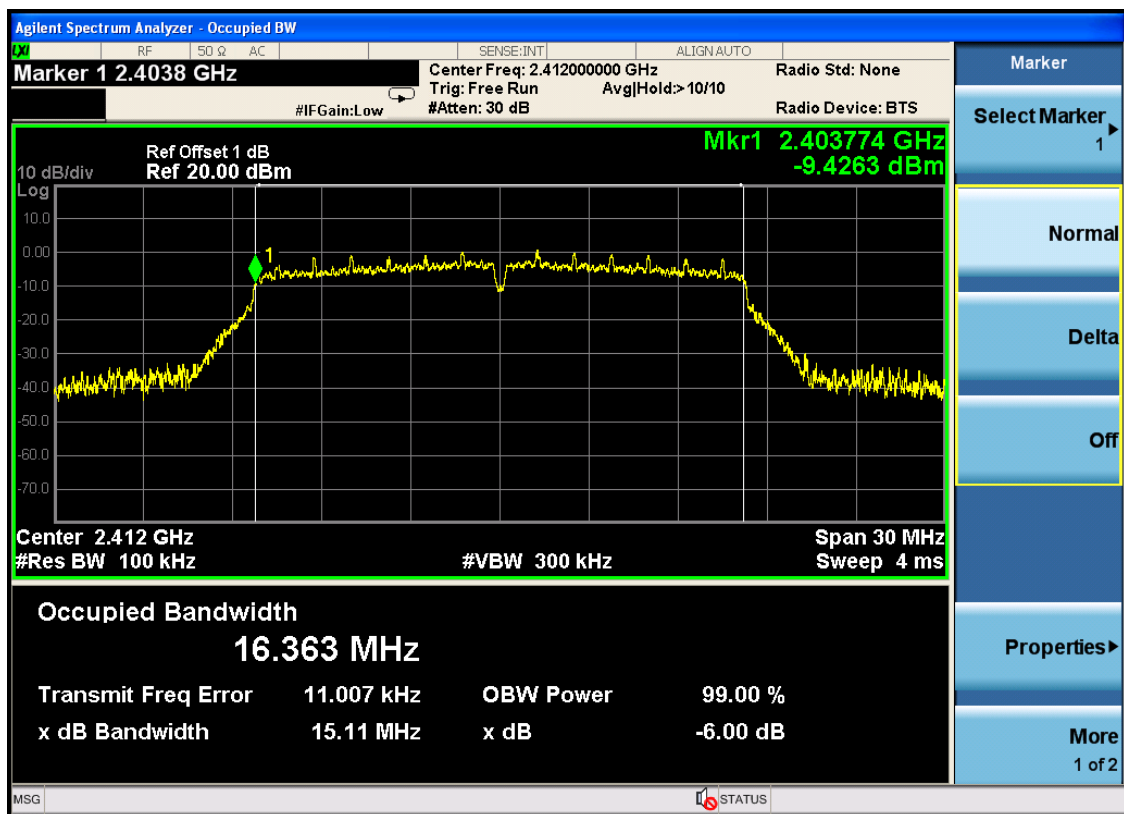


CH: 2462MHz

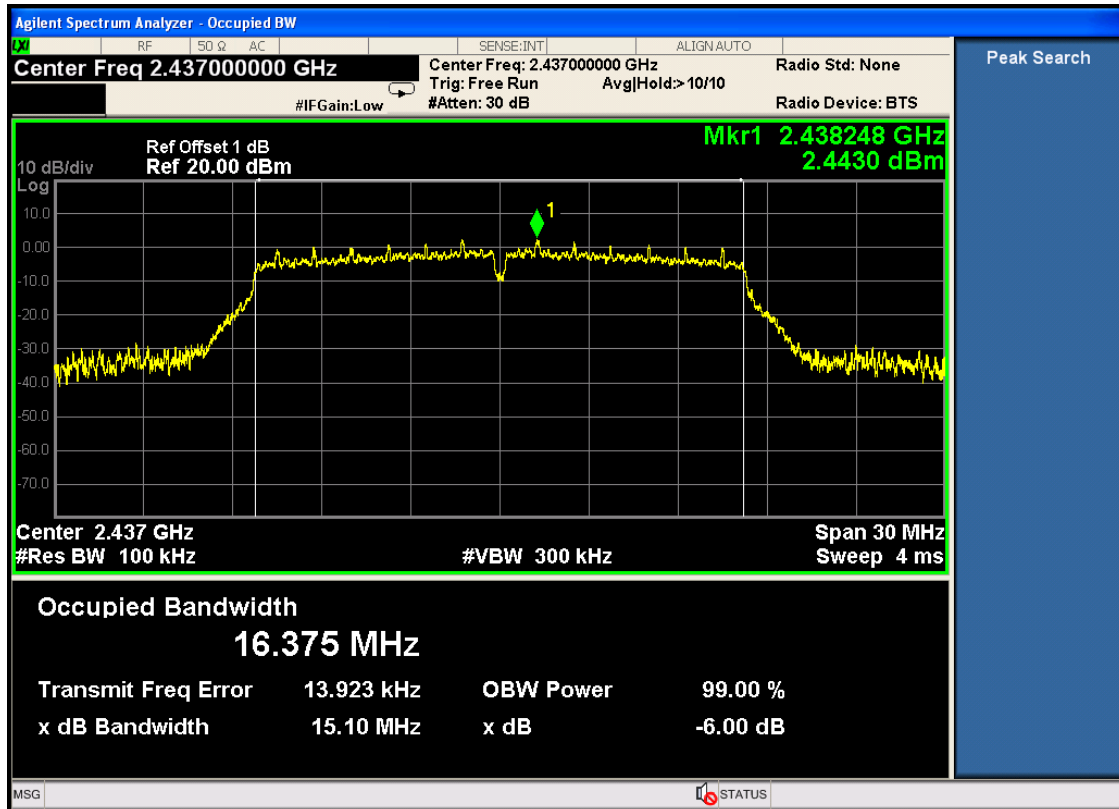


TX 802.11g Mode			
Frequency	6dB Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	15.11	$\geq 500\text{KHz}$	PASS
2437 MHz	15.10	$\geq 500\text{KHz}$	PASS
2462 MHz	15.32	$\geq 500\text{KHz}$	PASS

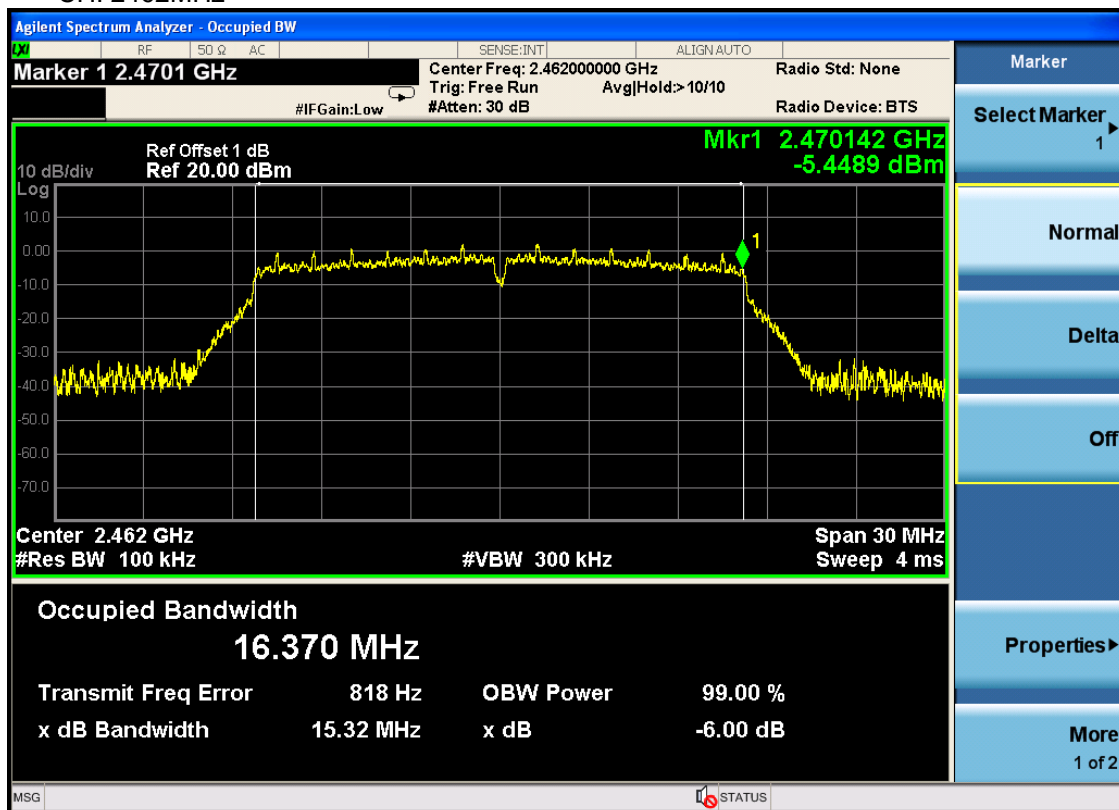
CH: 2412MHz



CH: 2437MHz

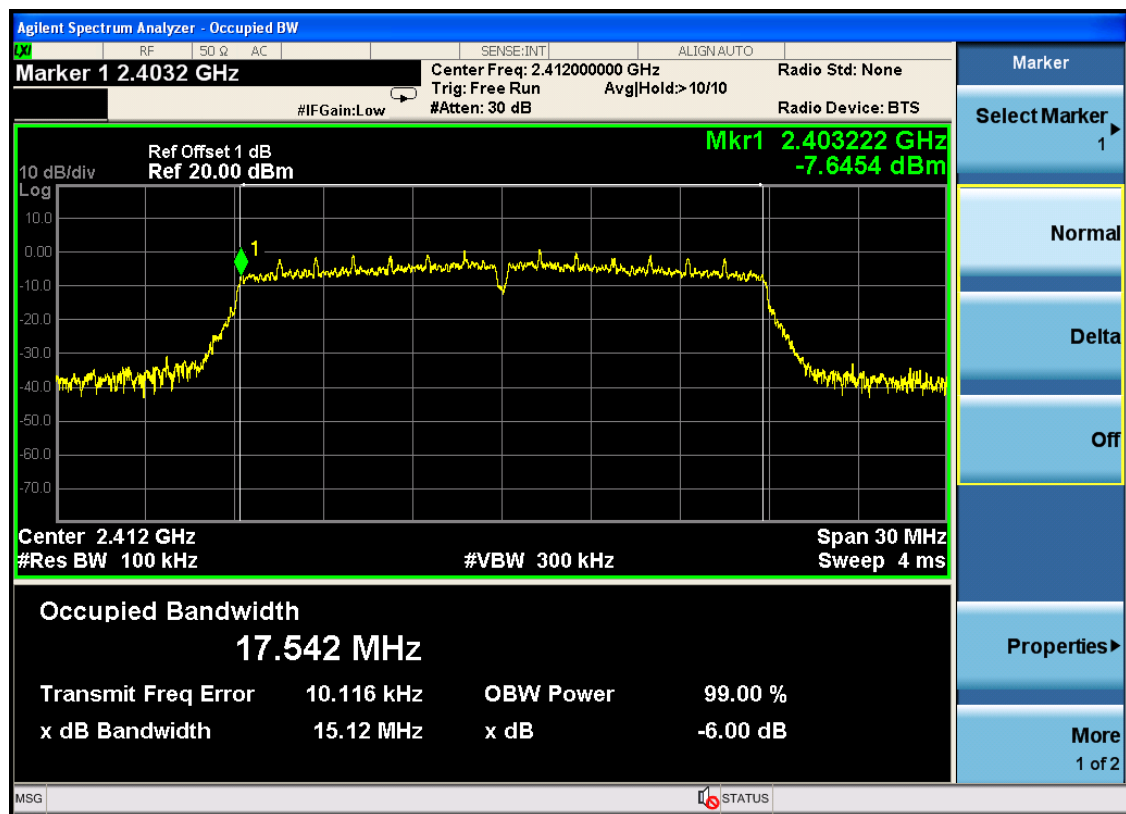


CH: 2462MHz

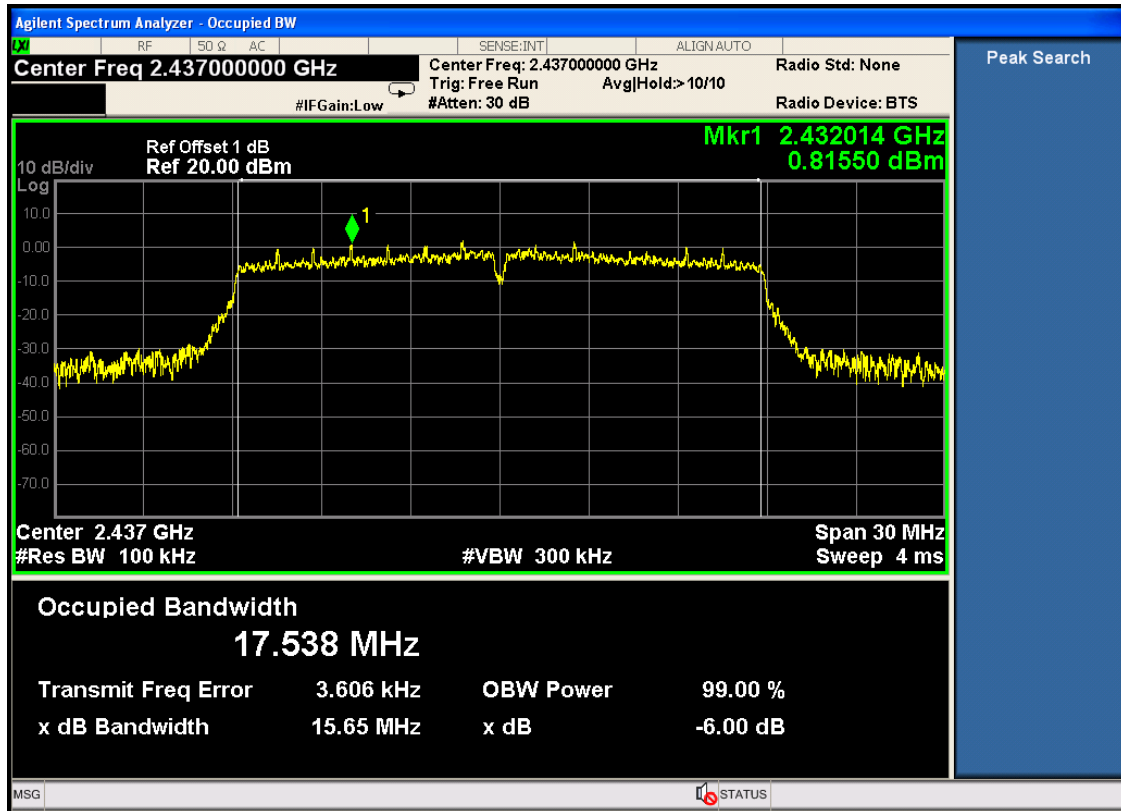


TX 802.11n/HT20 Mode			
Frequency	6dB Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	15.12	>=500KHz	PASS
2437 MHz	15.65	>=500KHz	PASS
2462 MHz	15.11	>=500KHz	PASS

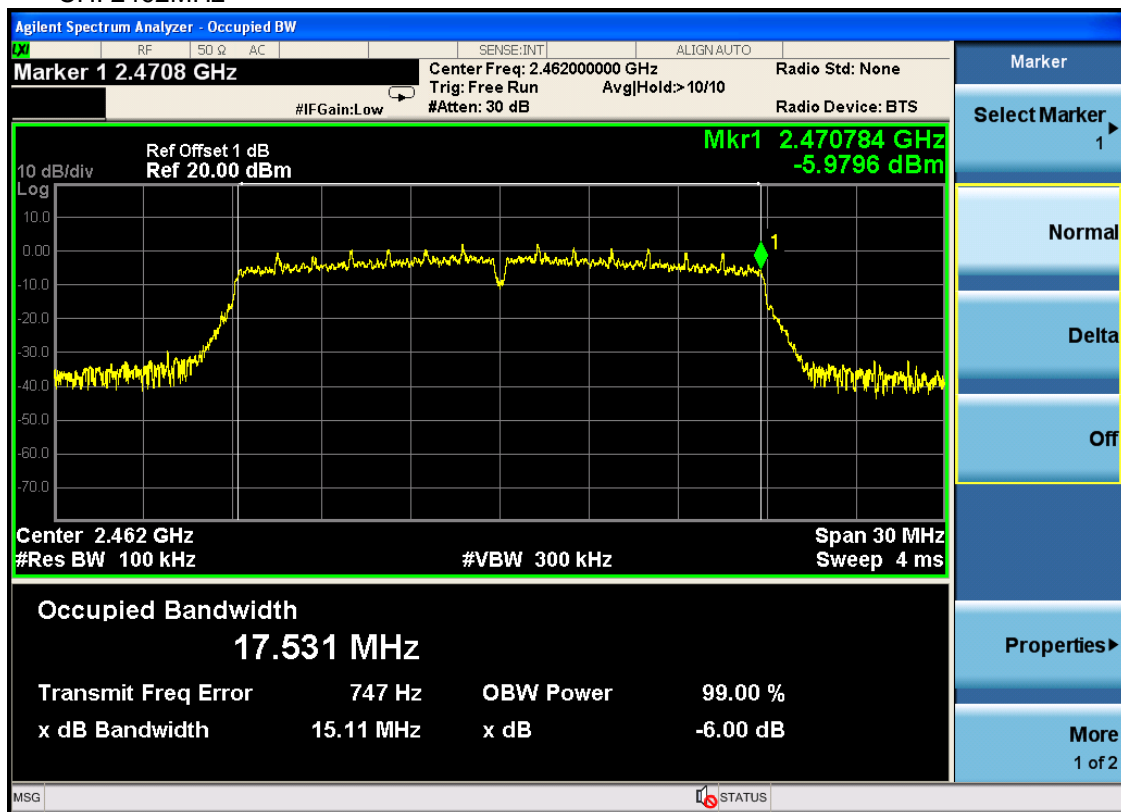
CH: 2412MHz



CH: 2437MHz

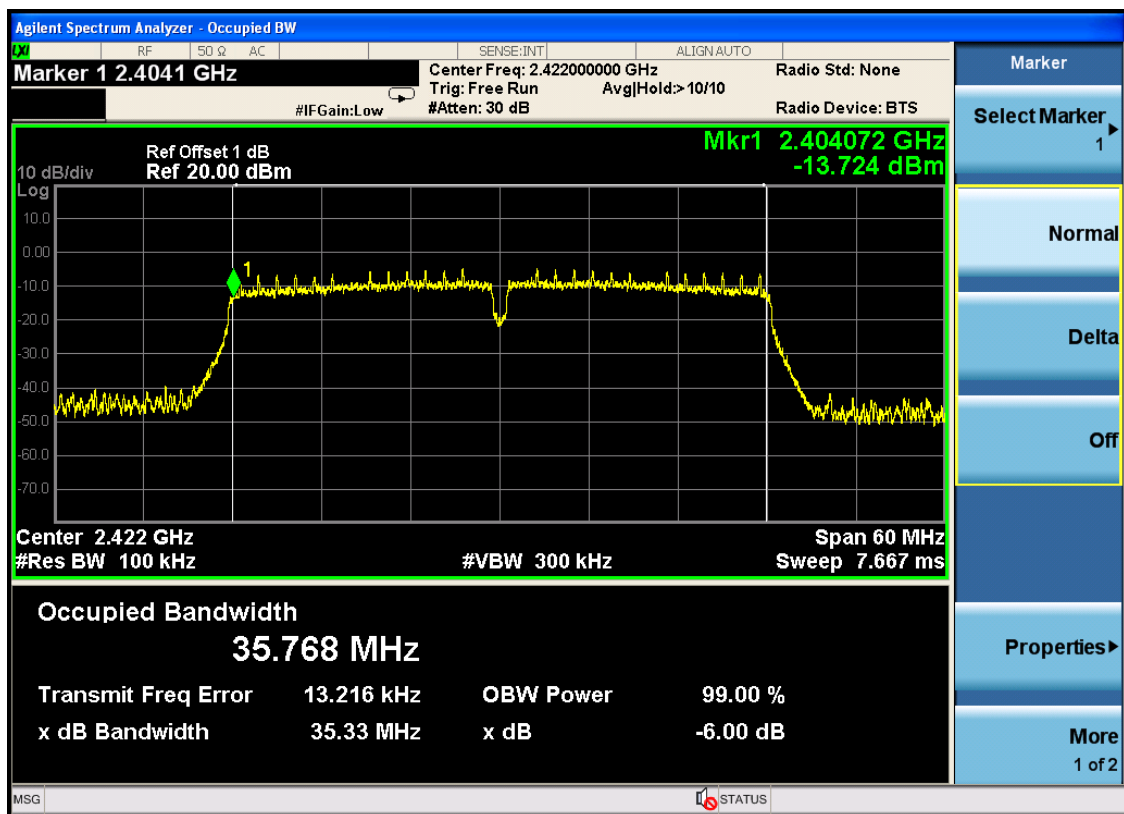


CH: 2462MHz

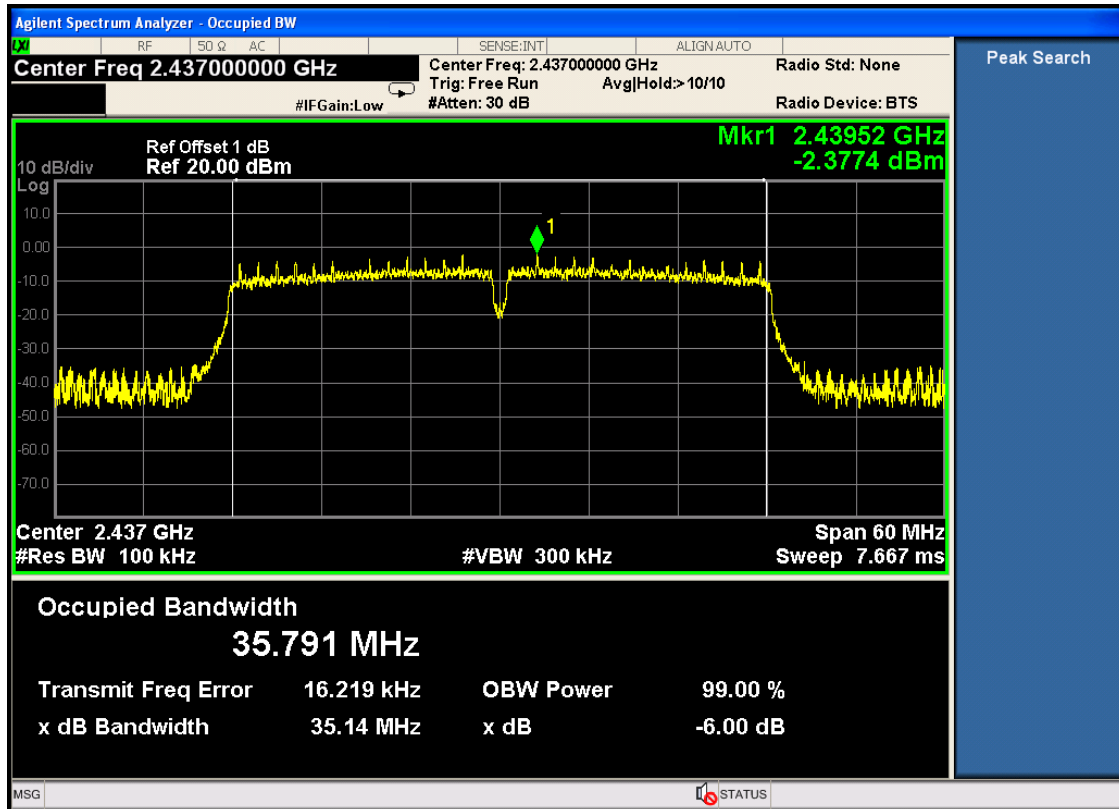


TX 802.11n/HT40 Mode			
Frequency	6dB Bandwidth (MHz)	Channel Separation (MHz)	Result
2422 MHz	35.33	>=500KHz	PASS
2437 MHz	35.14	>=500KHz	PASS
2452 MHz	35.13	>=500KHz	PASS

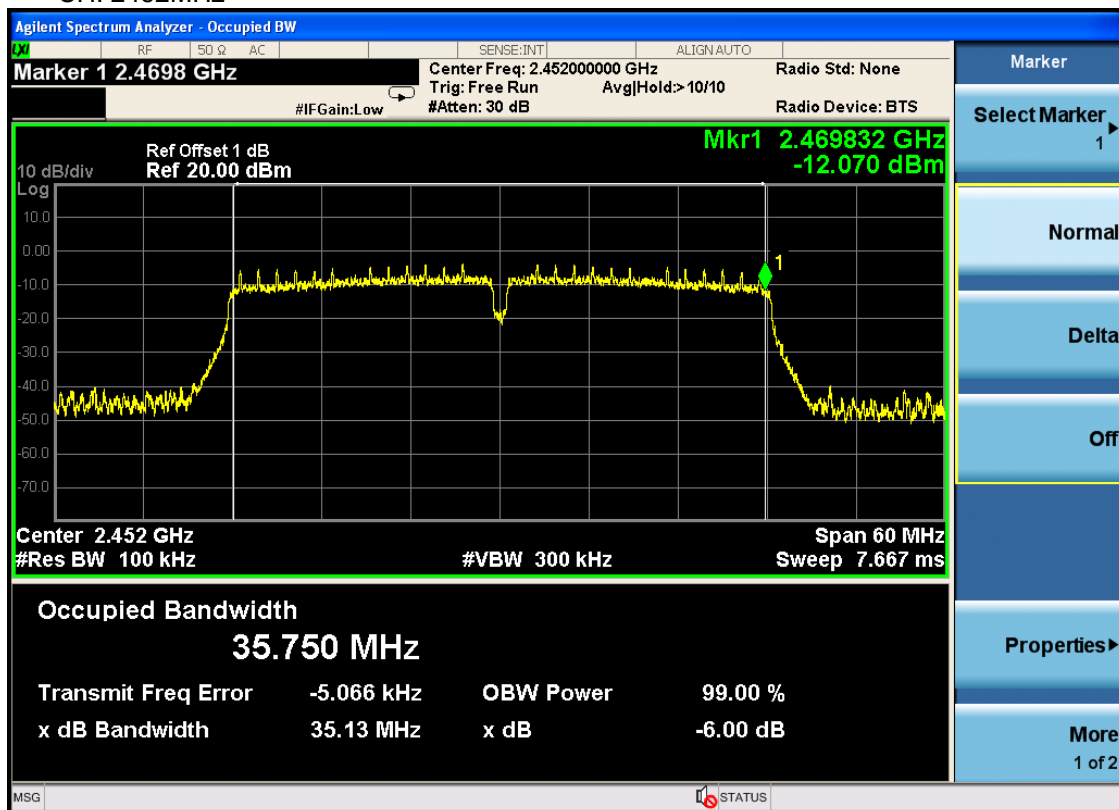
CH: 2422MHz



CH: 2437MHz



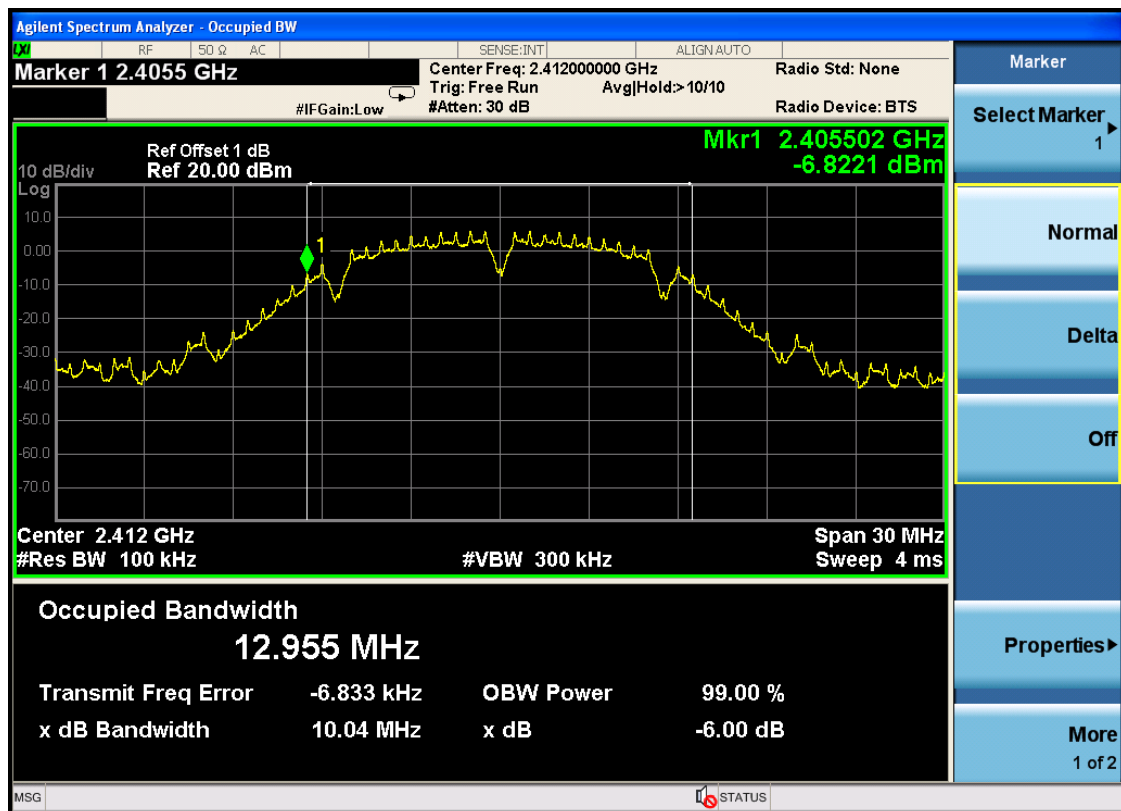
CH: 2452MHz



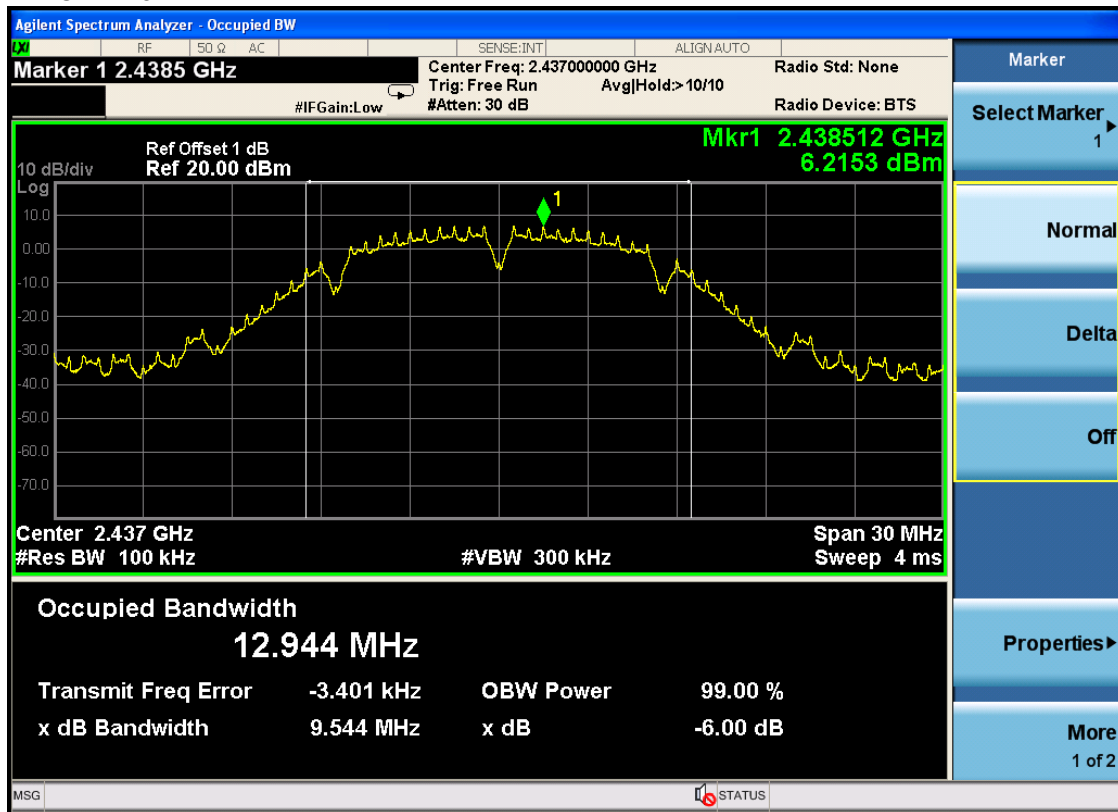
For antenna port 2:

TX 802.11b Mode			
Frequency	6dB Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	10.04	>=500KHz	PASS
2437 MHz	9.544	>=500KHz	PASS
2462 MHz	10.04	>=500KHz	PASS

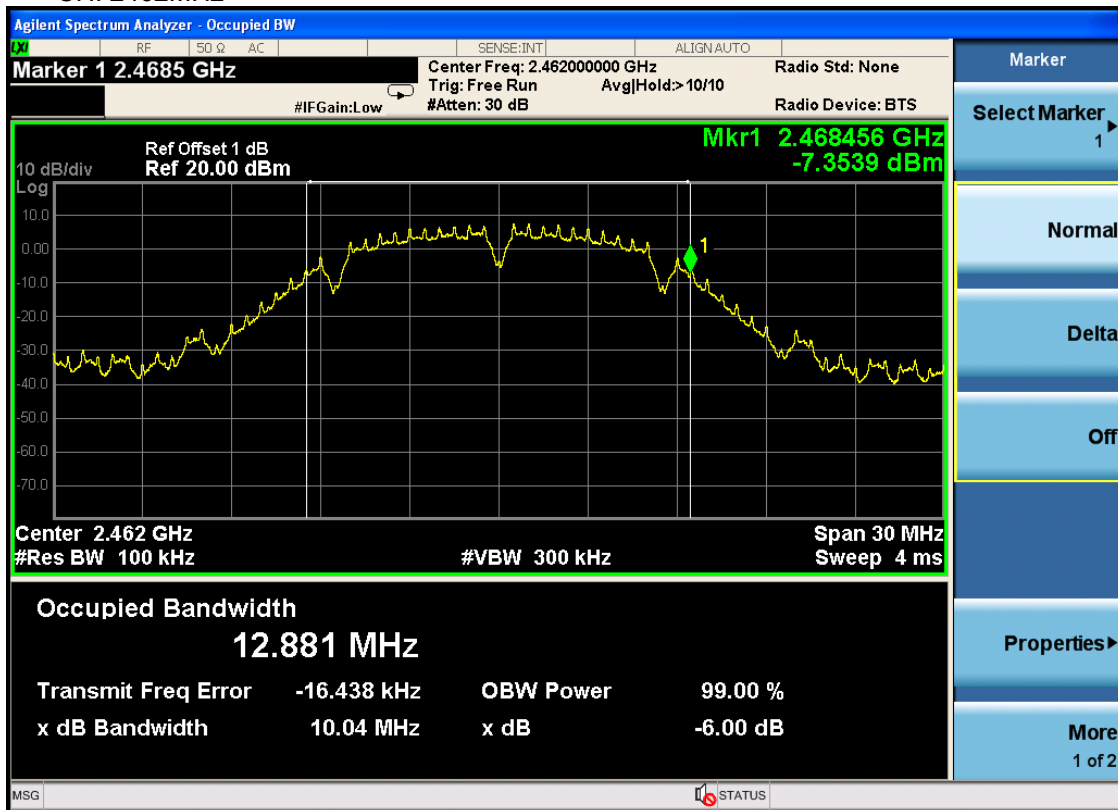
CH: 2412MHz



CH: 2437MHz

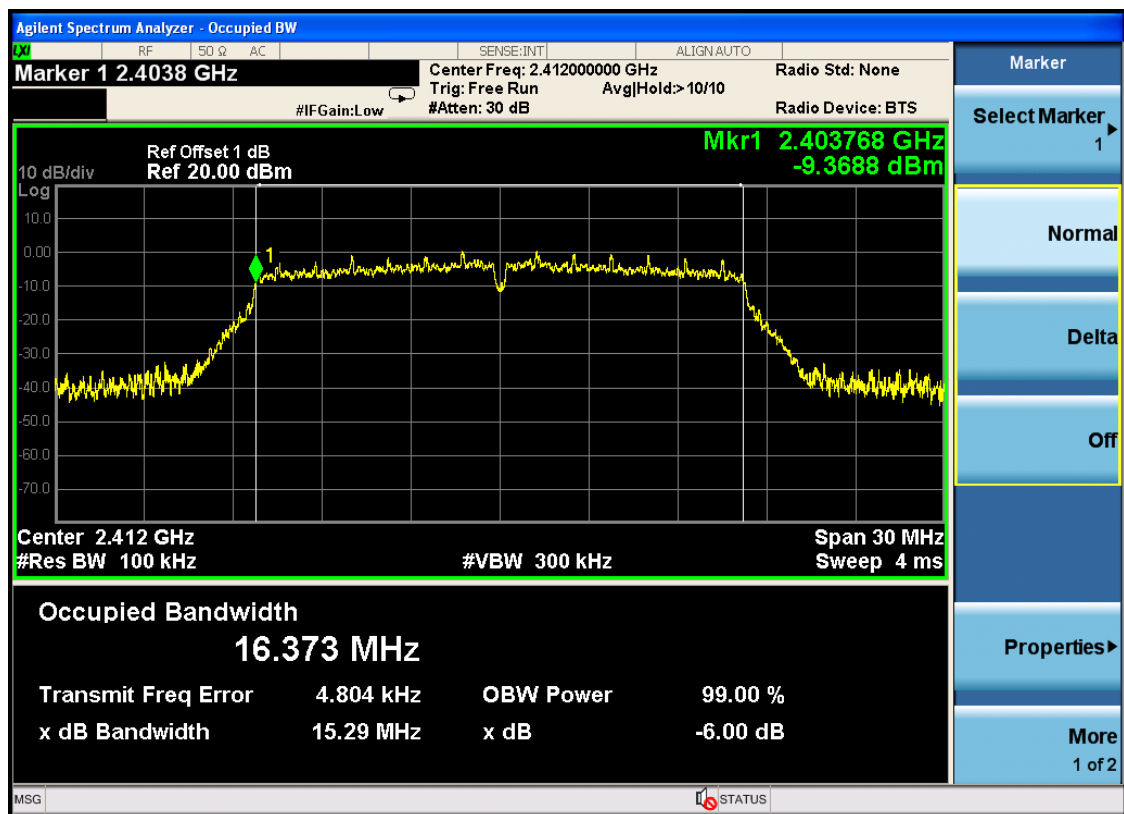


CH: 2462MHz

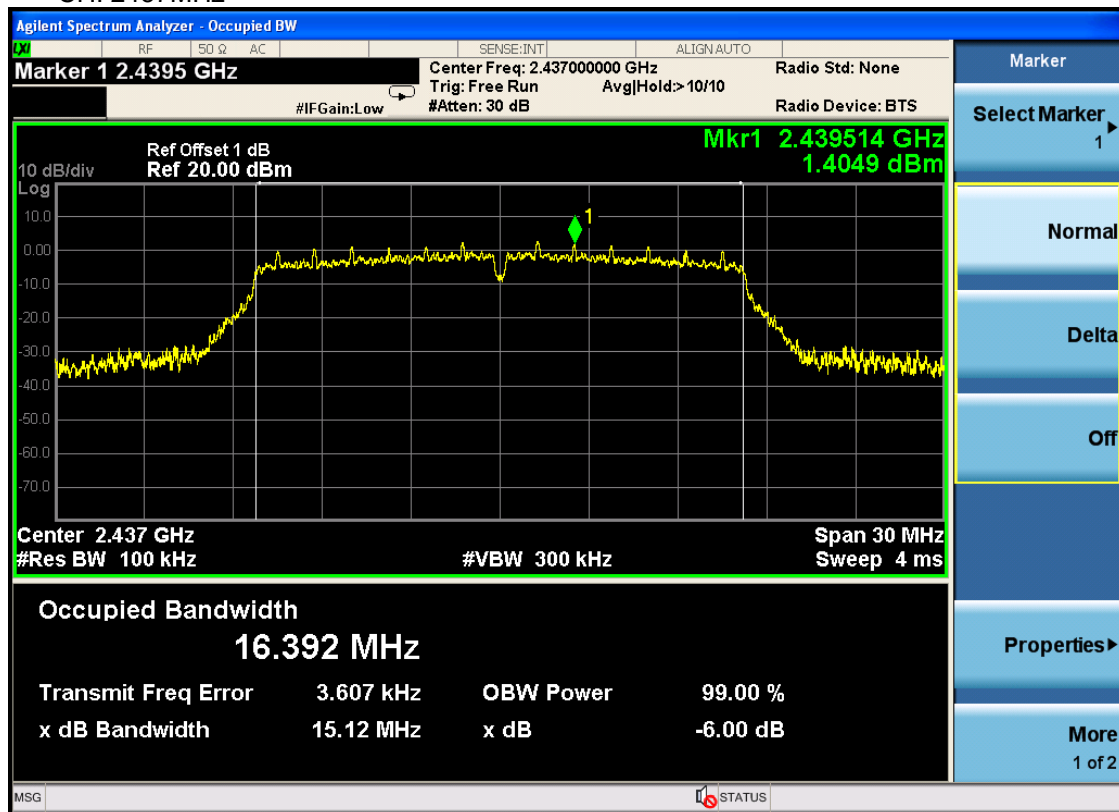


TX 802.11g Mode			
Frequency	6dB Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	15.29	$\geq 500\text{KHz}$	PASS
2437 MHz	15.12	$\geq 500\text{KHz}$	PASS
2462 MHz	15.13	$\geq 500\text{KHz}$	PASS

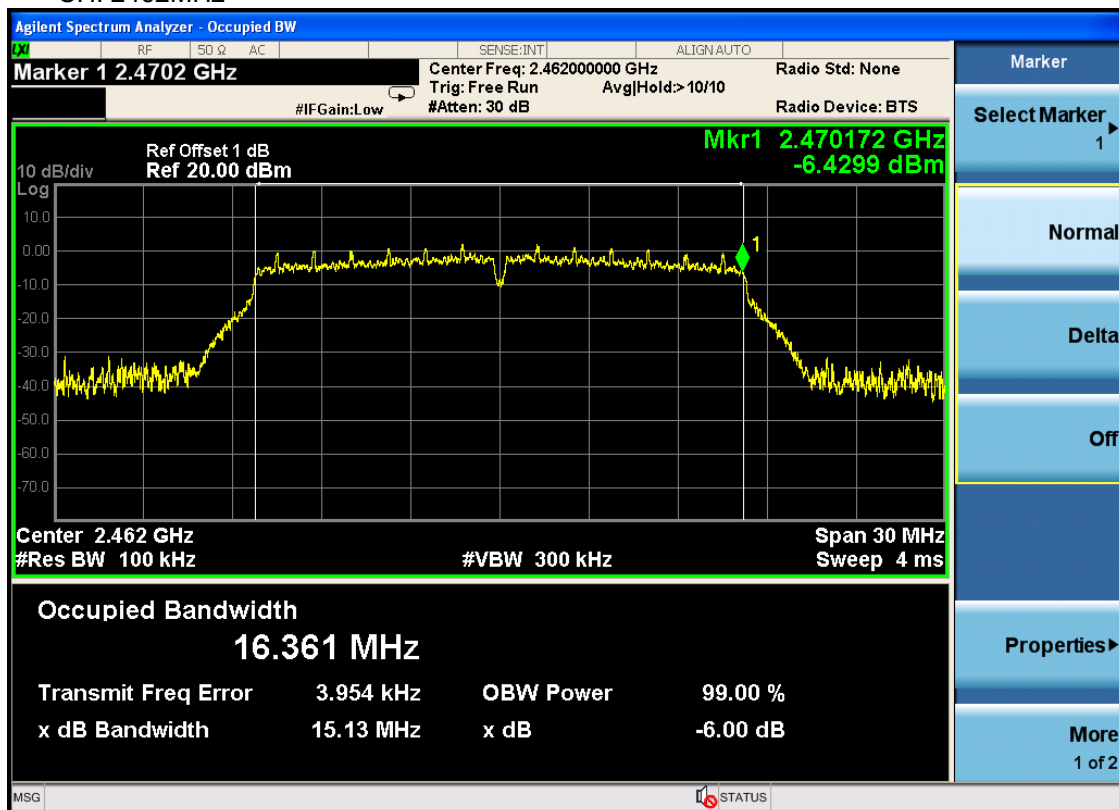
CH: 2412MHz



CH: 2437MHz

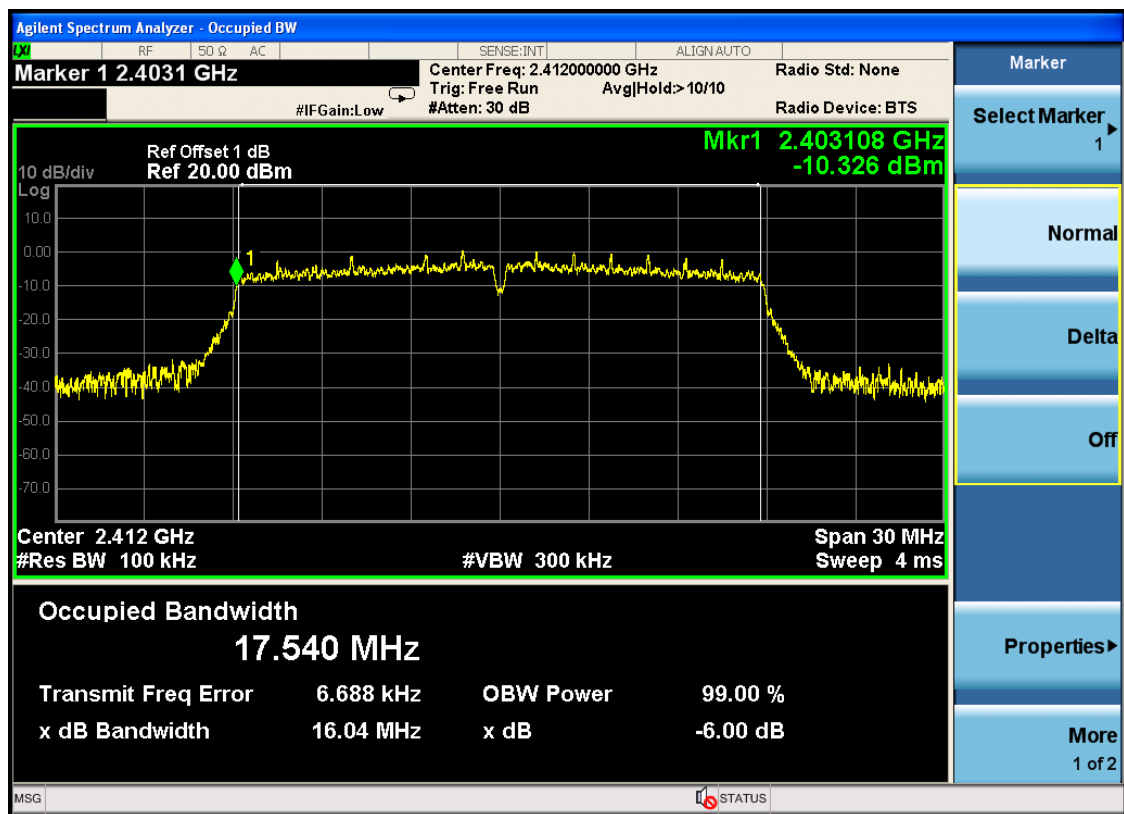


CH: 2462MHz

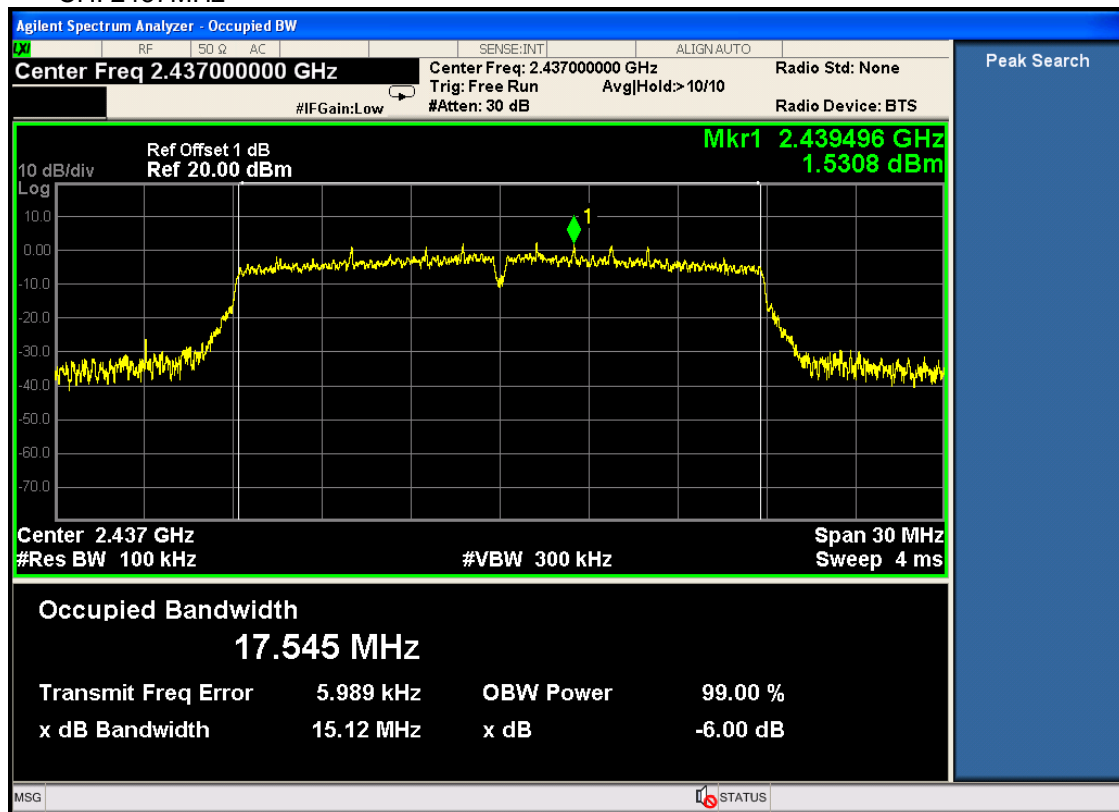


TX 802.11n/HT20 Mode			
Frequency	6dB Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	16.04	$\geq 500\text{KHz}$	PASS
2437 MHz	15.12	$\geq 500\text{KHz}$	PASS
2462 MHz	15.44	$\geq 500\text{KHz}$	PASS

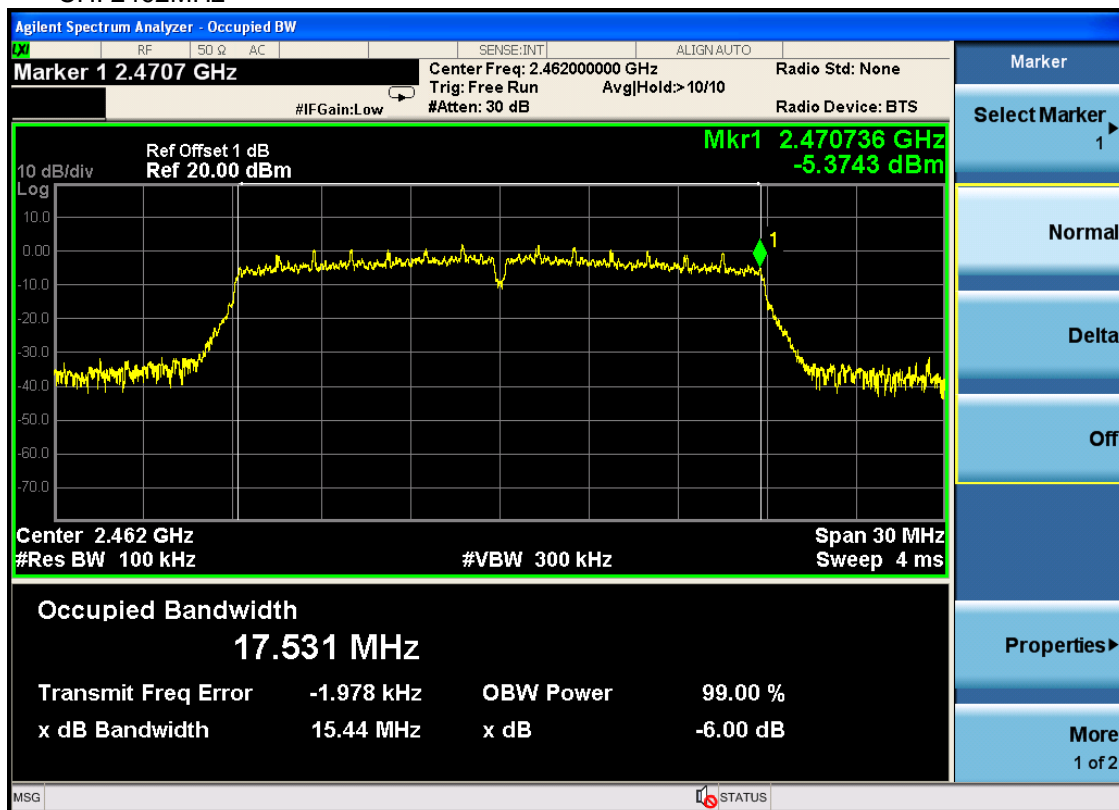
CH: 2412MHz



CH: 2437MHz

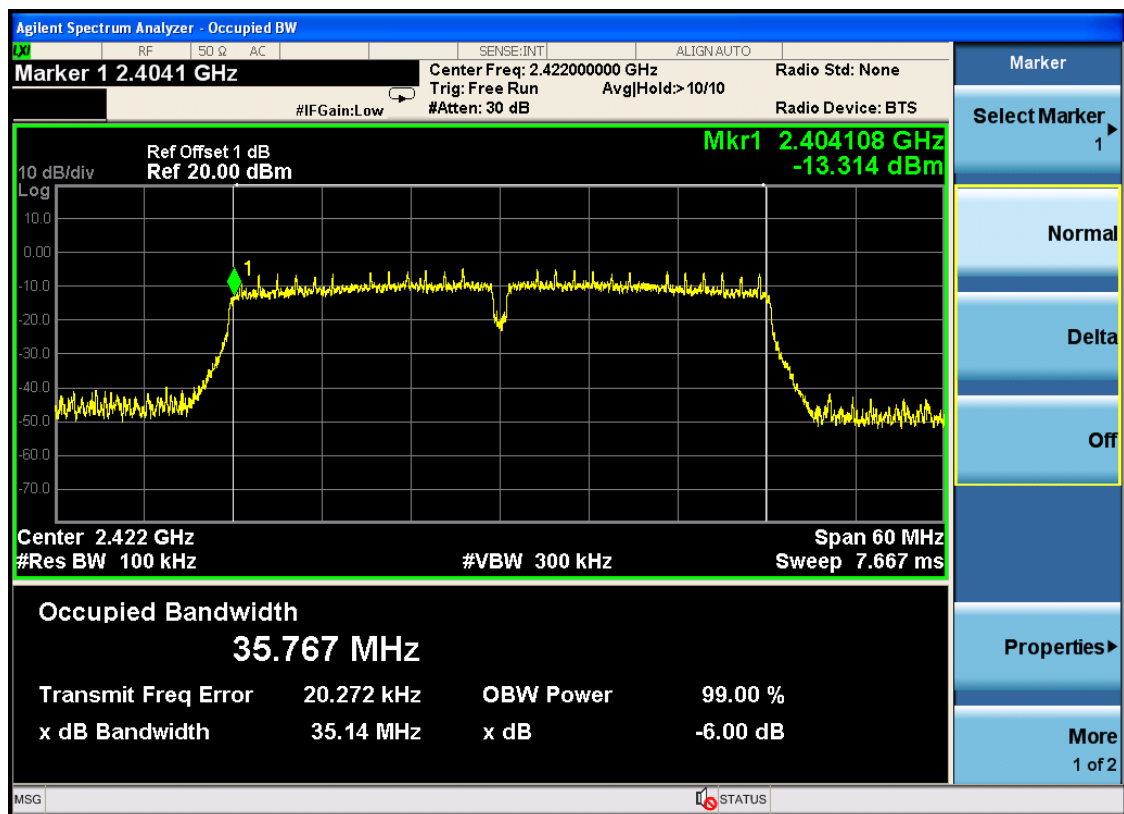


CH: 2462MHz

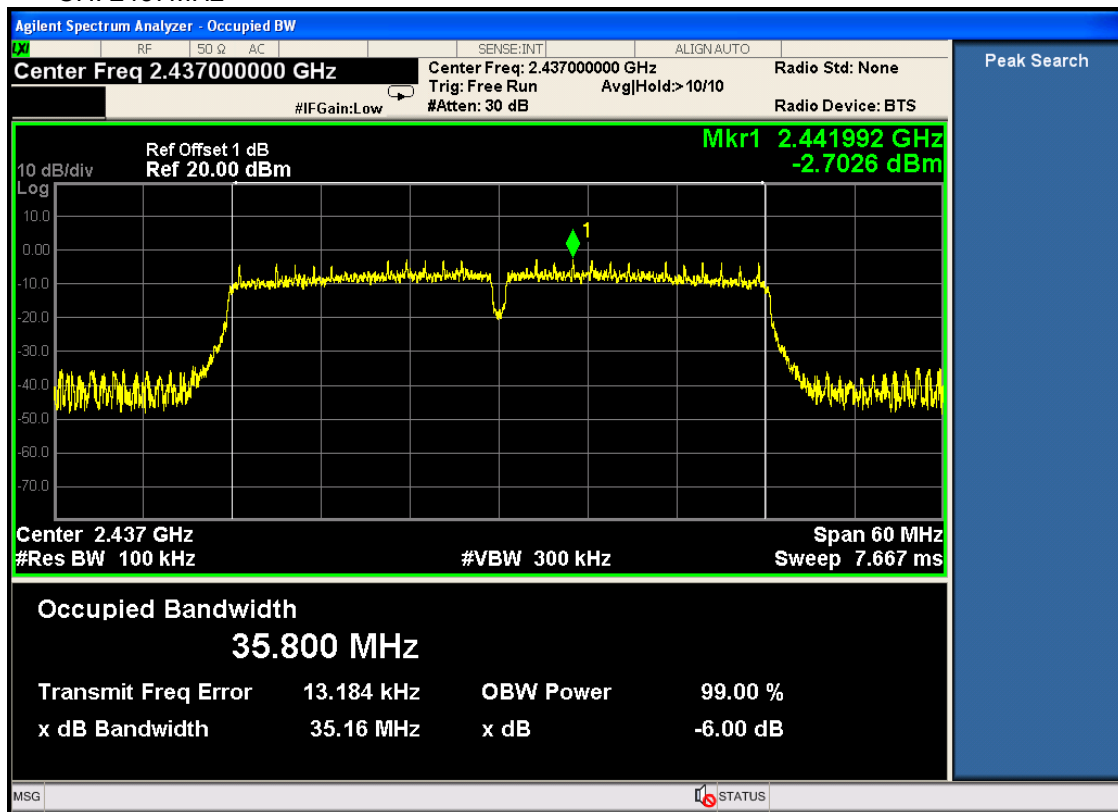


TX 802.11n/HT40 Mode			
Frequency	6dB Bandwidth (MHz)	Channel Separation (MHz)	Result
2422 MHz	35.13	$\geq 500\text{KHz}$	PASS
2437 MHz	35.16	$\geq 500\text{KHz}$	PASS
2452 MHz	35.08	$\geq 500\text{KHz}$	PASS

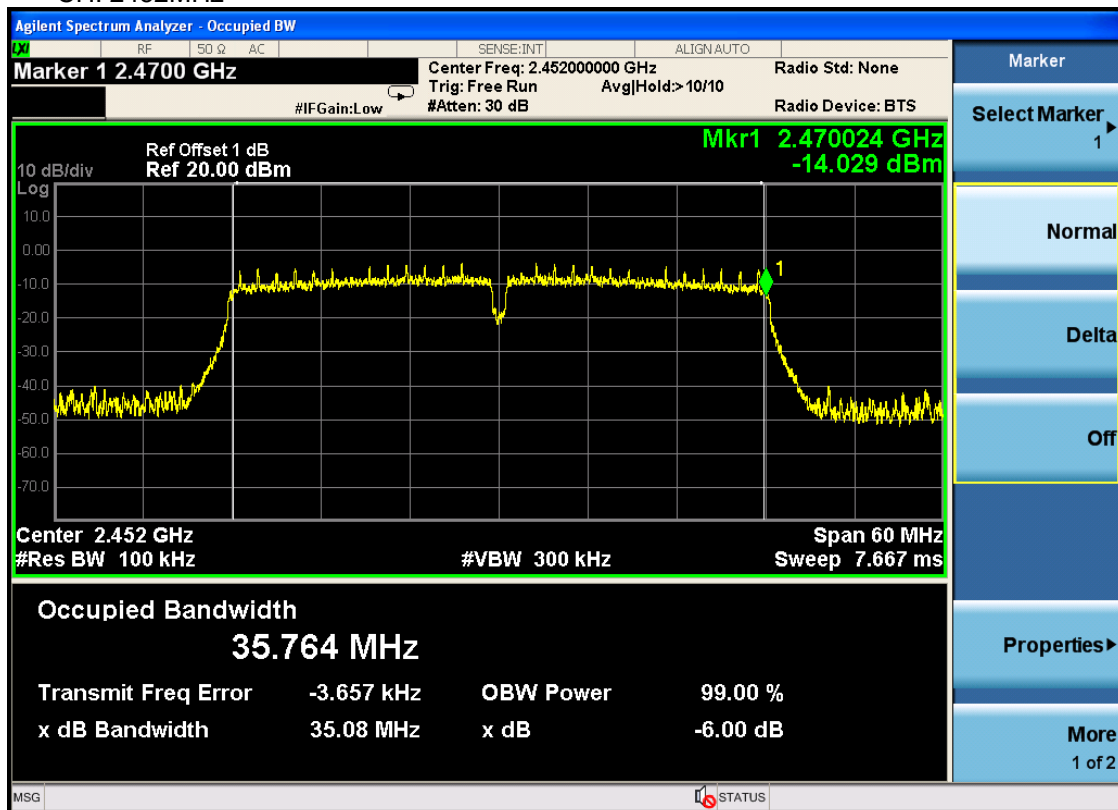
CH: 2422MHz



CH: 2437MHz



CH: 2452MHz



7 POWER SPECTRAL DENSITY TEST

7.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

7.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on FCC Part15 C Section 15.247: RBW= 3KHz. VBW= 10 KHz, Span=3MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

7.3 Measurement Equipment Used

Same as Radiated Emission Measurement

7.4 Test Result

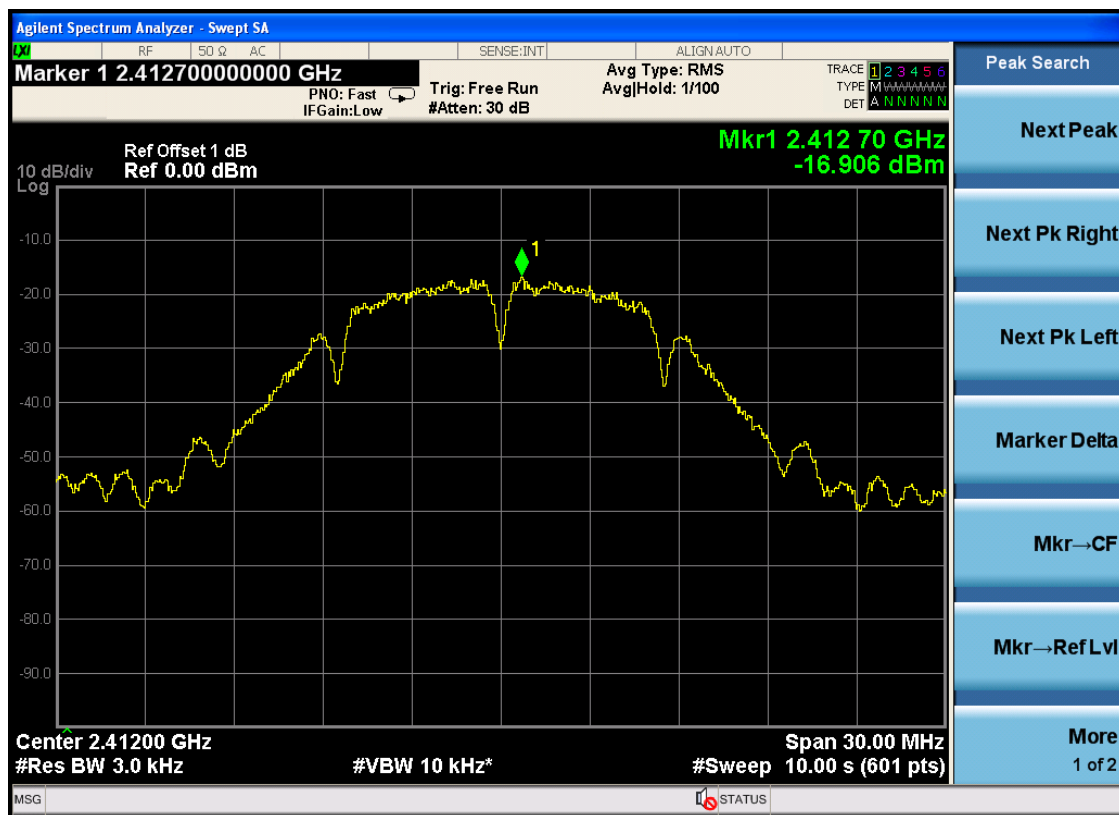
PASS

All the test modes completed for test.

For antenna port 1

TX 802.11b Mode			
Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-16.906	8	PASS
2437 MHz	-16.836	8	PASS
2462 MHz	-15.944	8	PASS

CH: 2412MHz



CH: 2437MHz

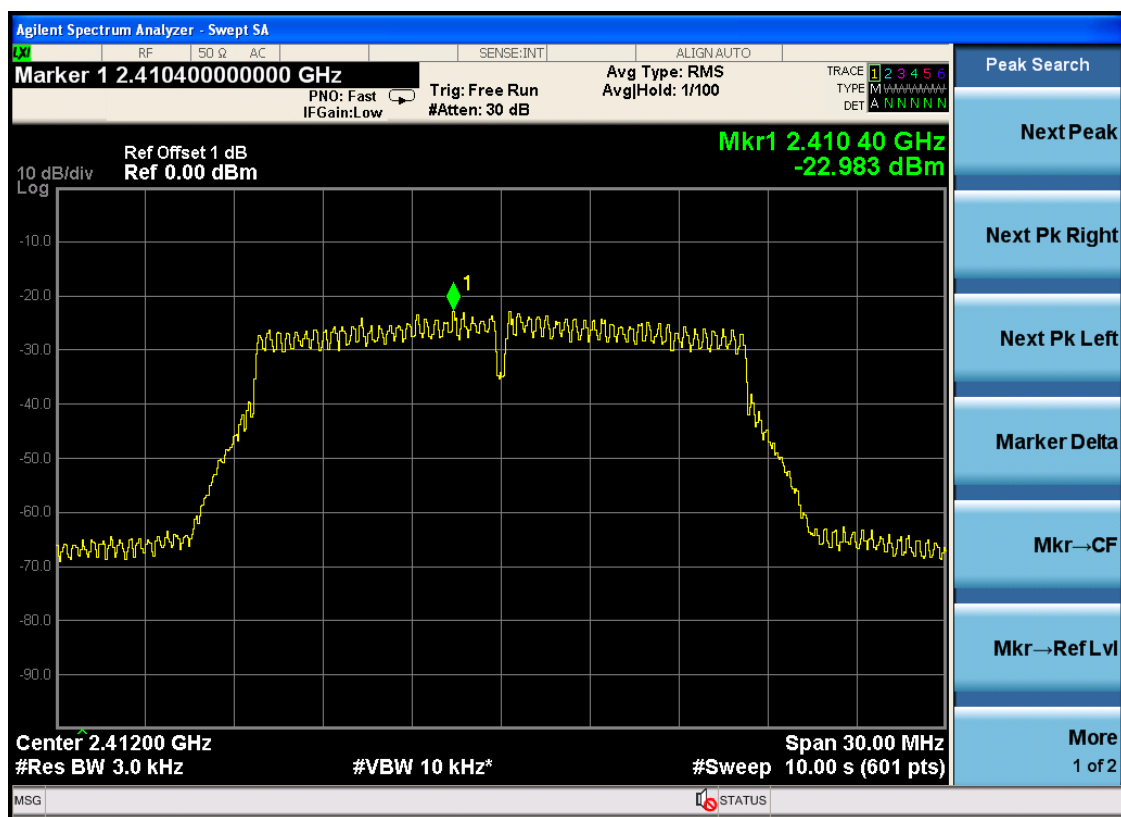


CH: 2462MHz

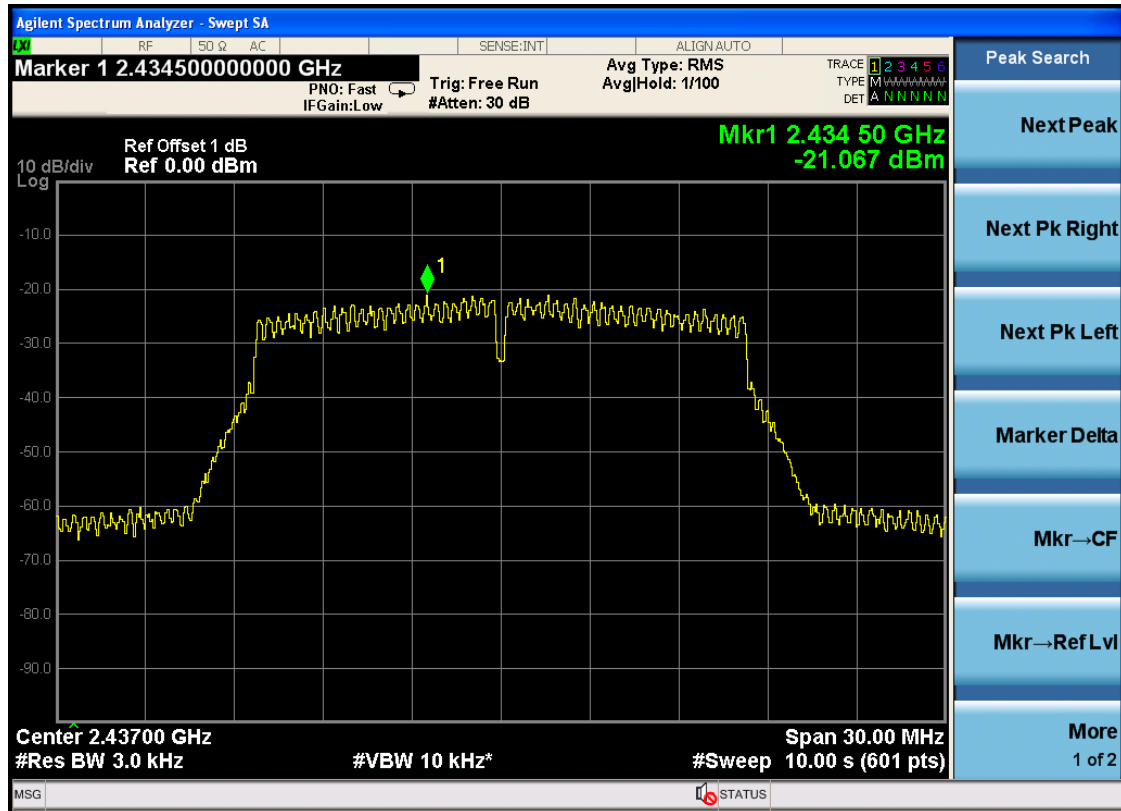


TX 802.11g Mode			
Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-22.983	8	PASS
2437 MHz	-21.067	8	PASS
2462 MHz	-20.754	8	PASS

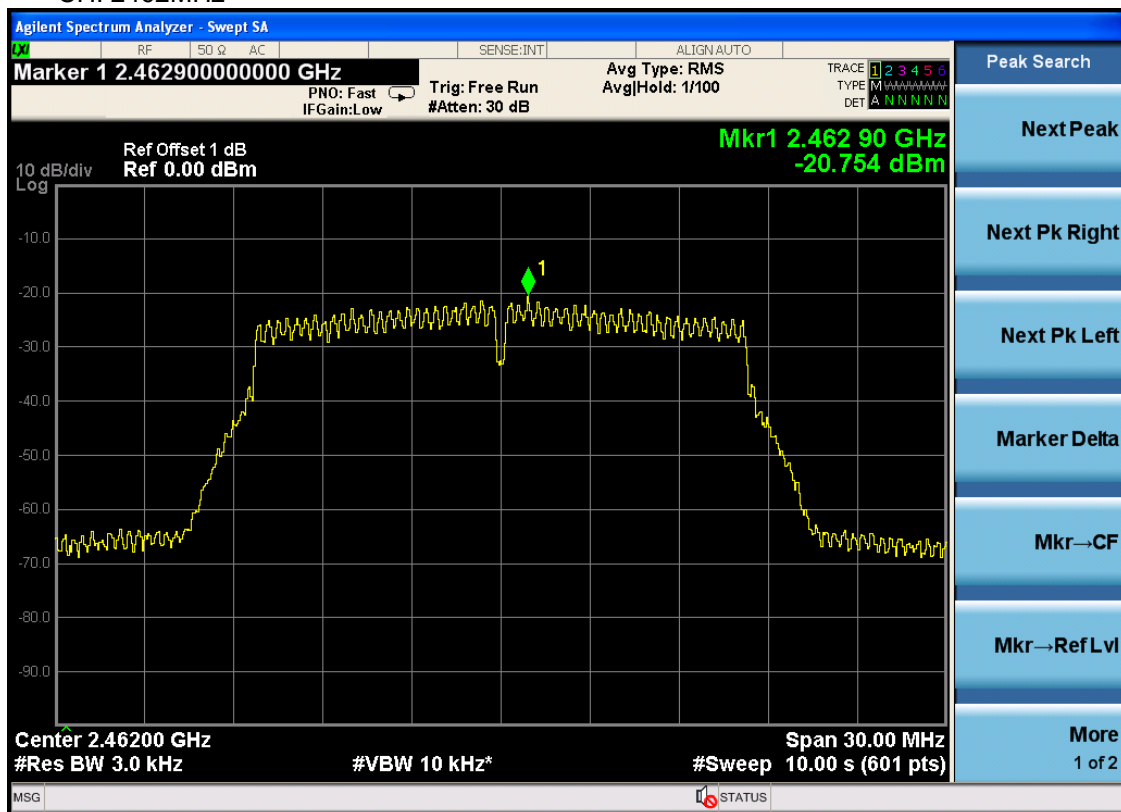
CH: 2412MHz



CH: 2437MHz

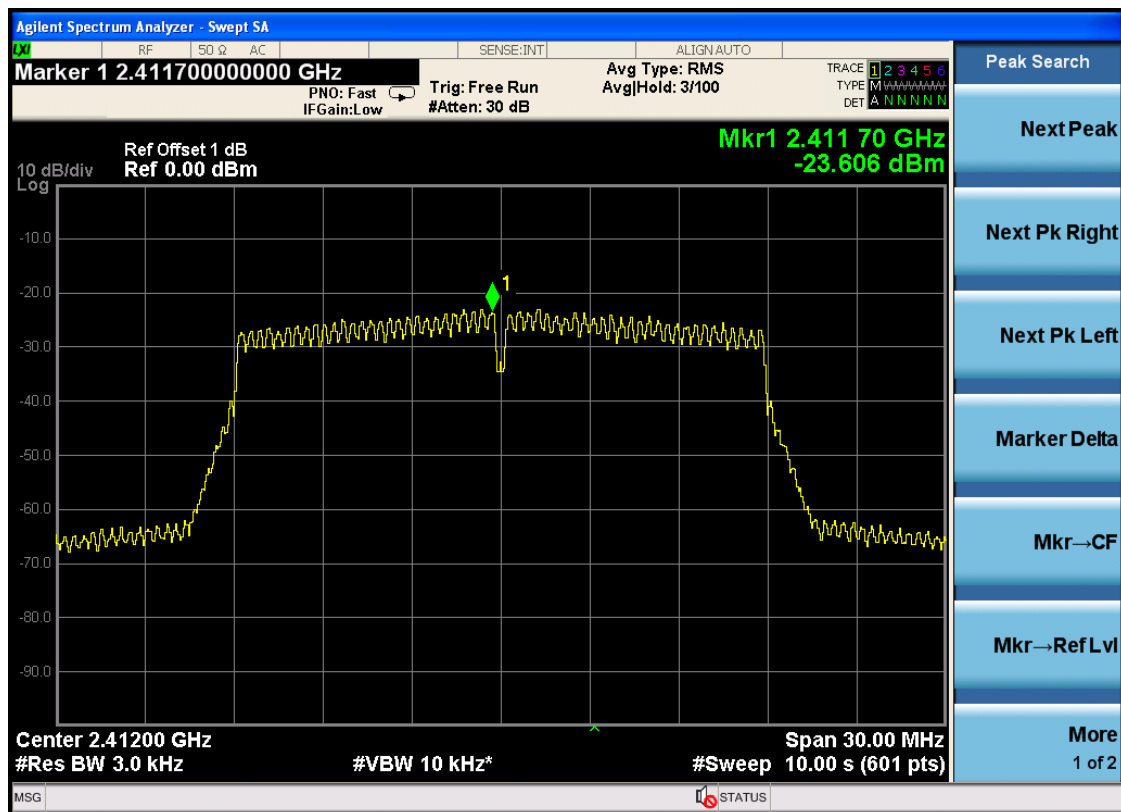


CH: 2462MHz

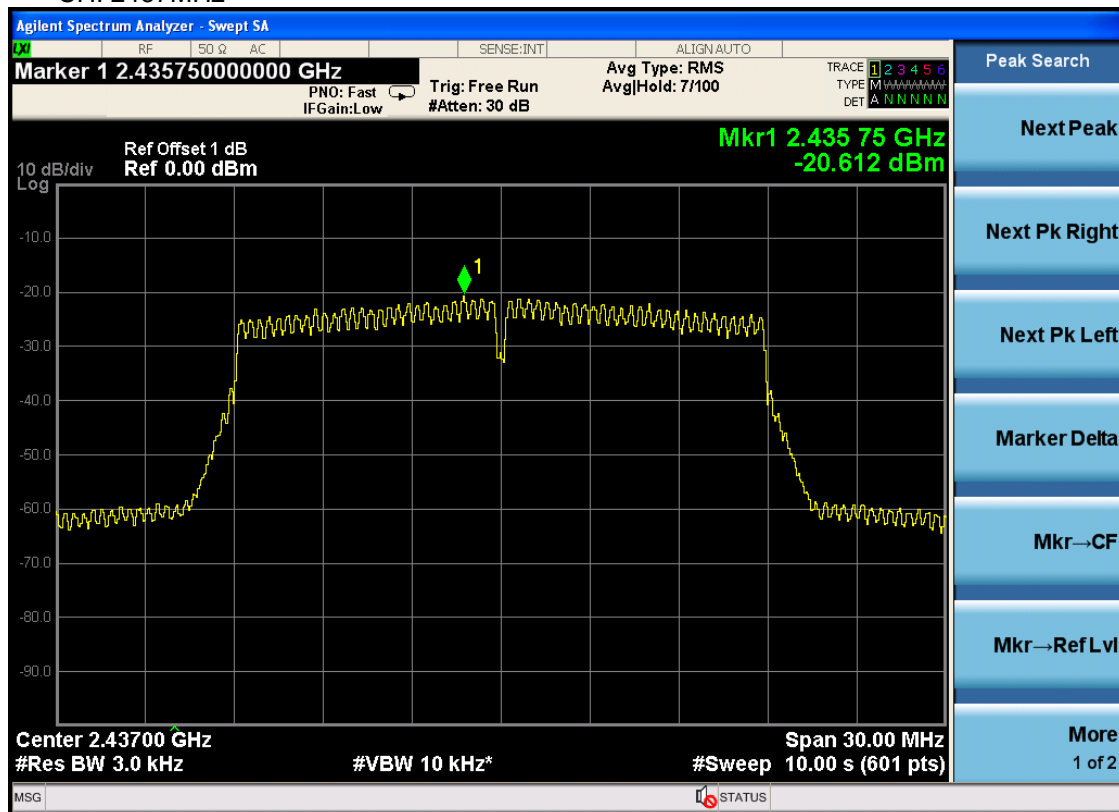


TX 802.11n/HT20 Mode			
Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-23.606	8	PASS
2437 MHz	-20.612	8	PASS
2462 MHz	-21.912	8	PASS

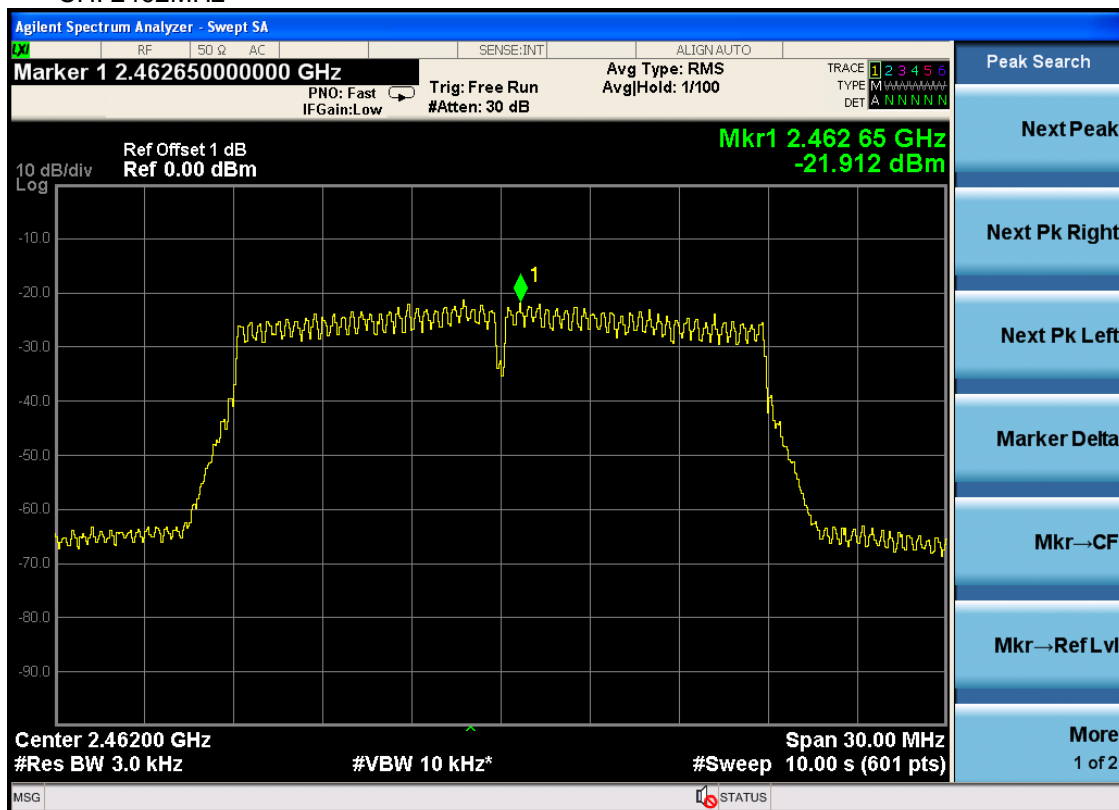
CH: 2412MHz



CH: 2437MHz

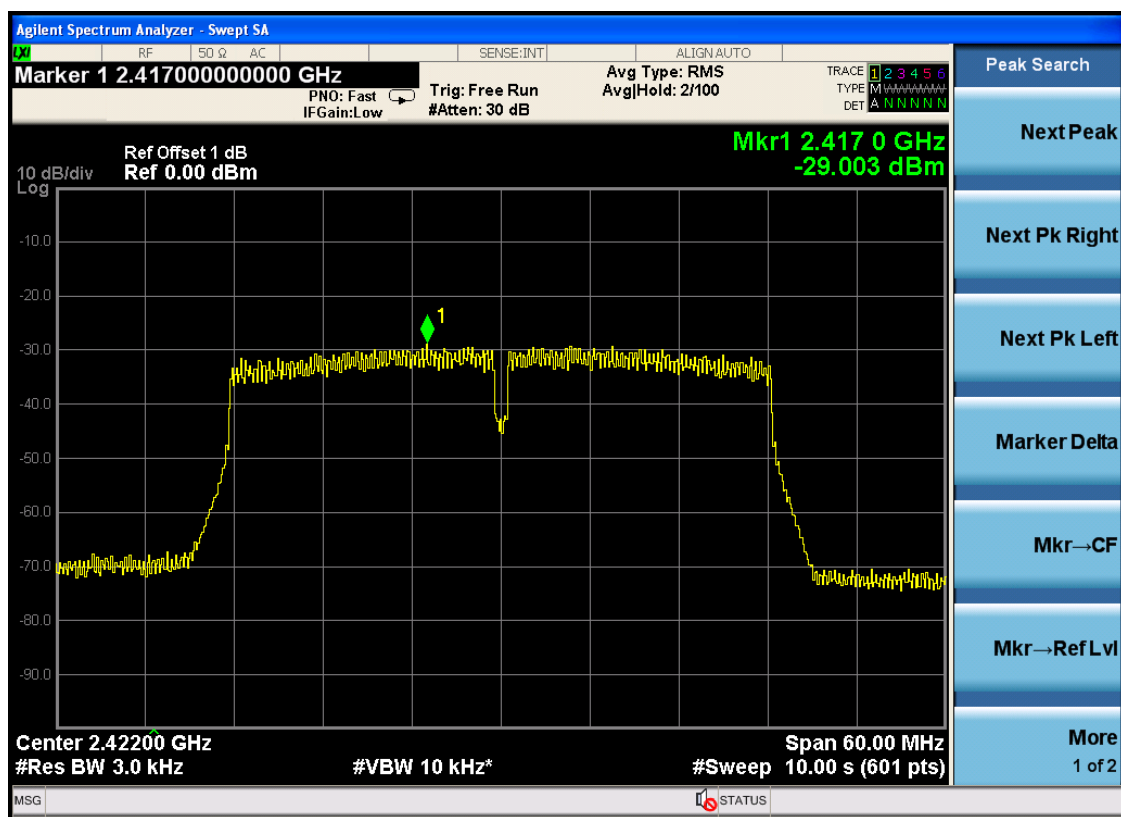


CH: 2462MHz

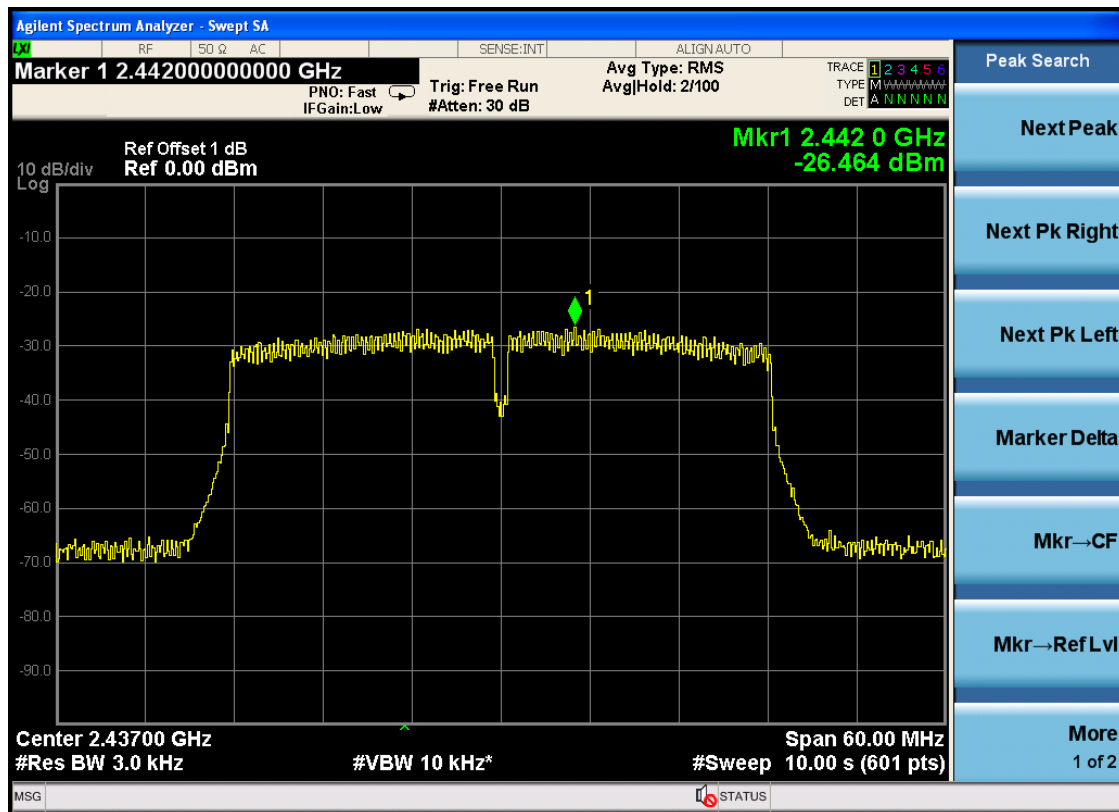


TX 802.11n/HT40 Mode			
Frequency	Power Density (dBm)	Limit (dBm)	Result
2422 MHz	-29.003	8	PASS
2437 MHz	-26.464	8	PASS
2452 MHz	-27.876	8	PASS

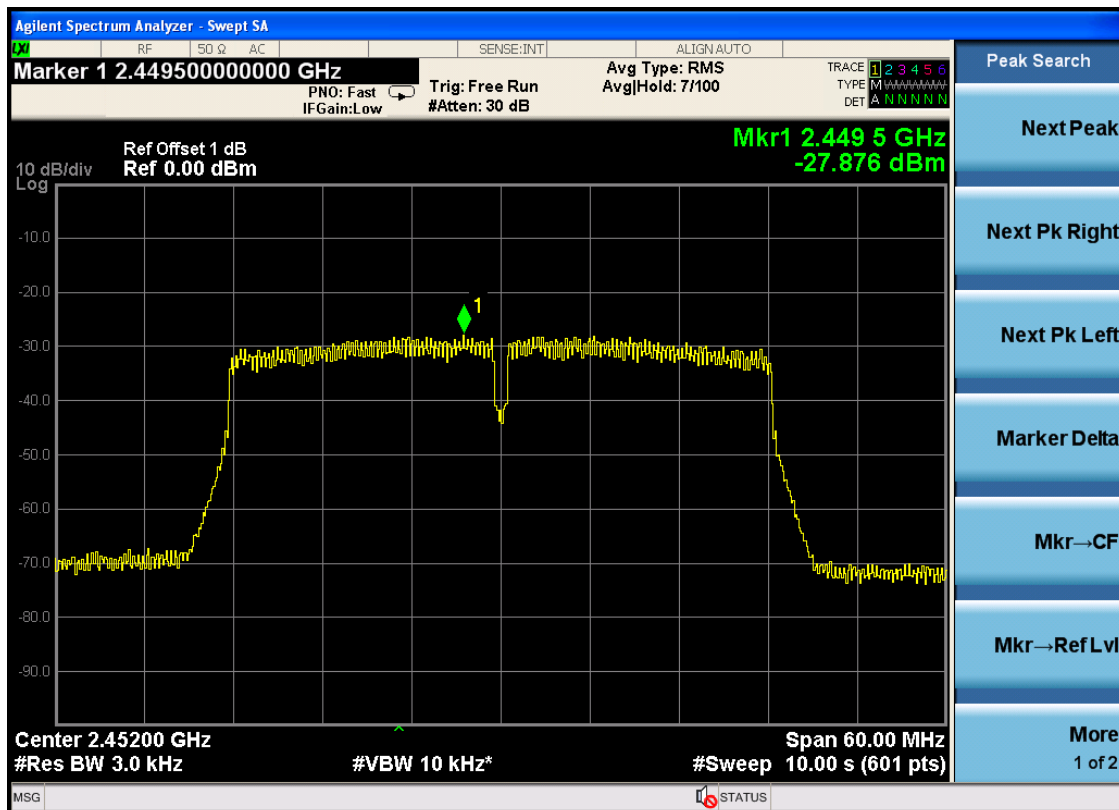
CH: 2422MHz



CH: 2437MHz



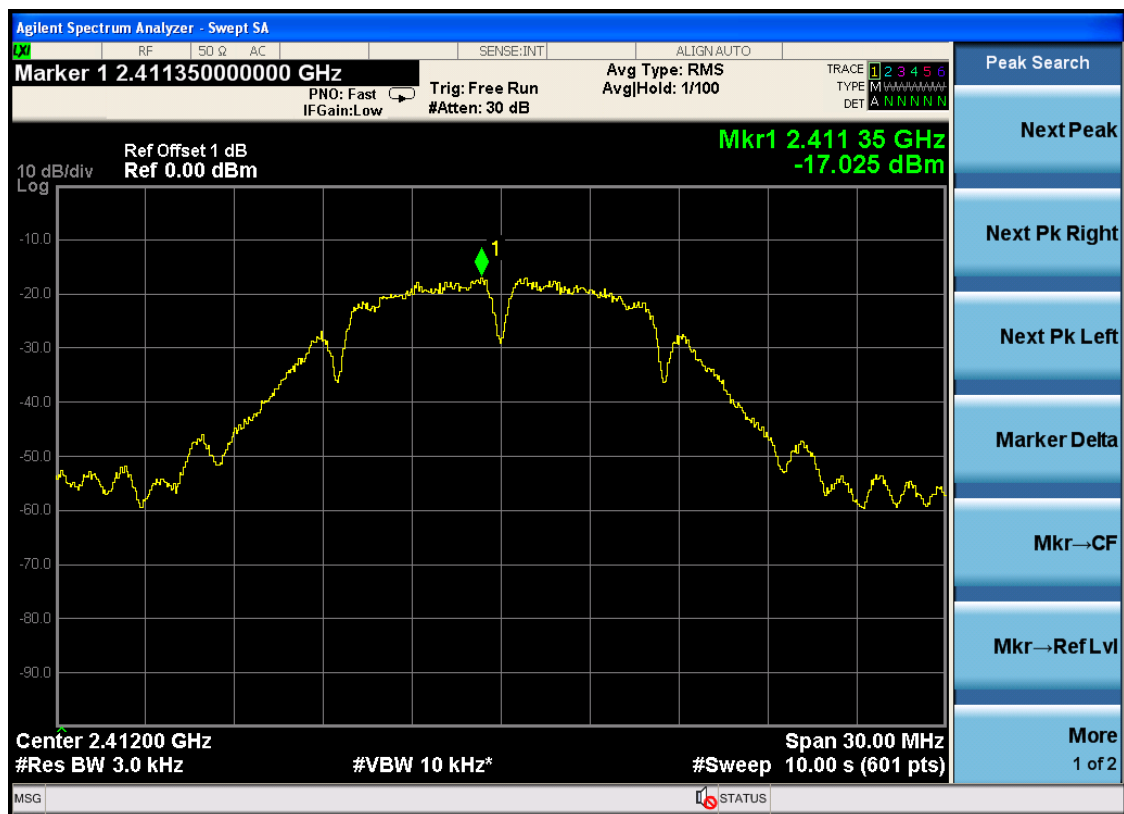
CH: 2452MHz



For antenna port 2

TX 802.11b Mode			
Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-17.025	8	PASS
2437 MHz	-16.519	8	PASS
2462 MHz	-15.669	8	PASS

CH: 2412MHz



CH: 2437MHz

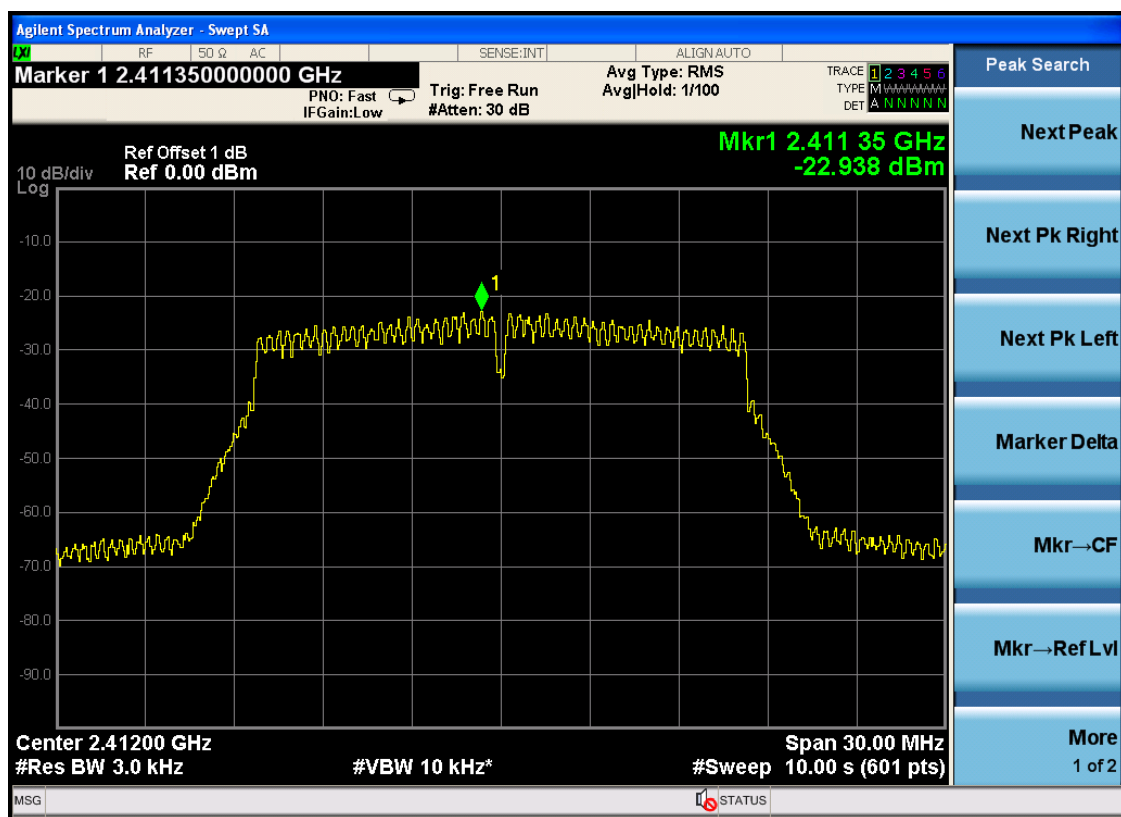


CH: 2462MHz

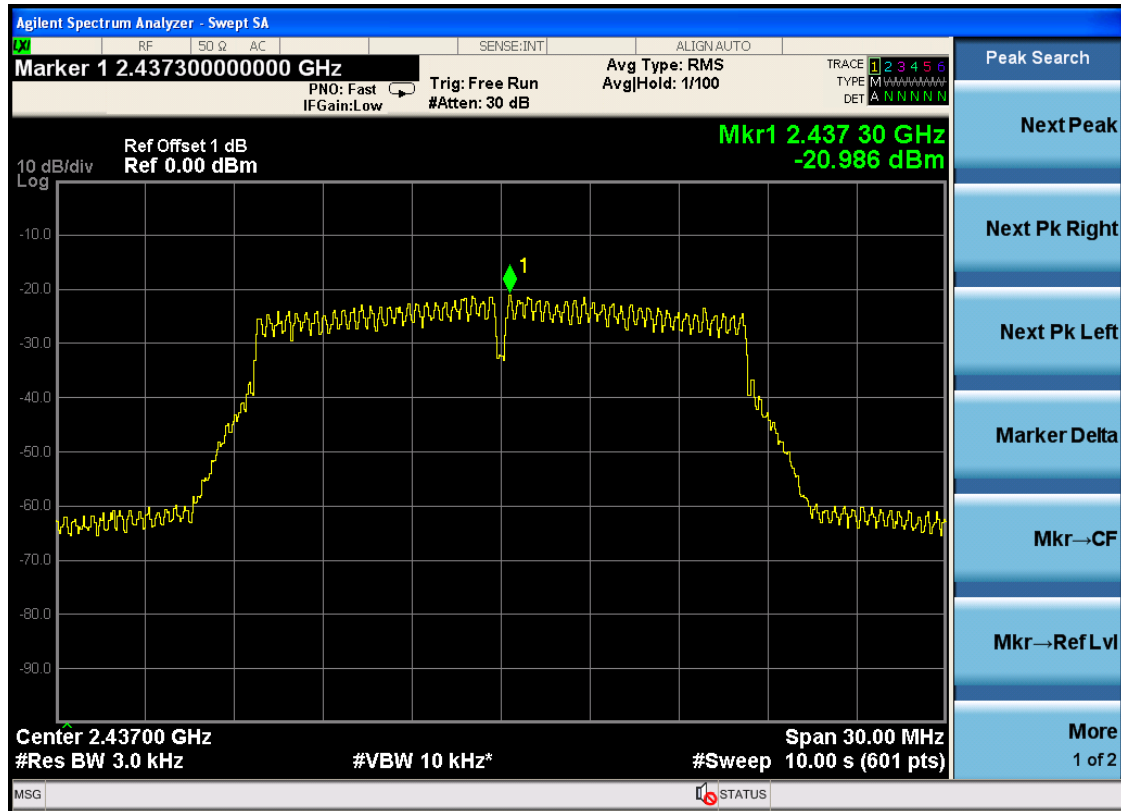


TX 802.11g Mode			
Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-22.938	8	PASS
2437 MHz	-20.986	8	PASS
2462 MHz	-21.231	8	PASS

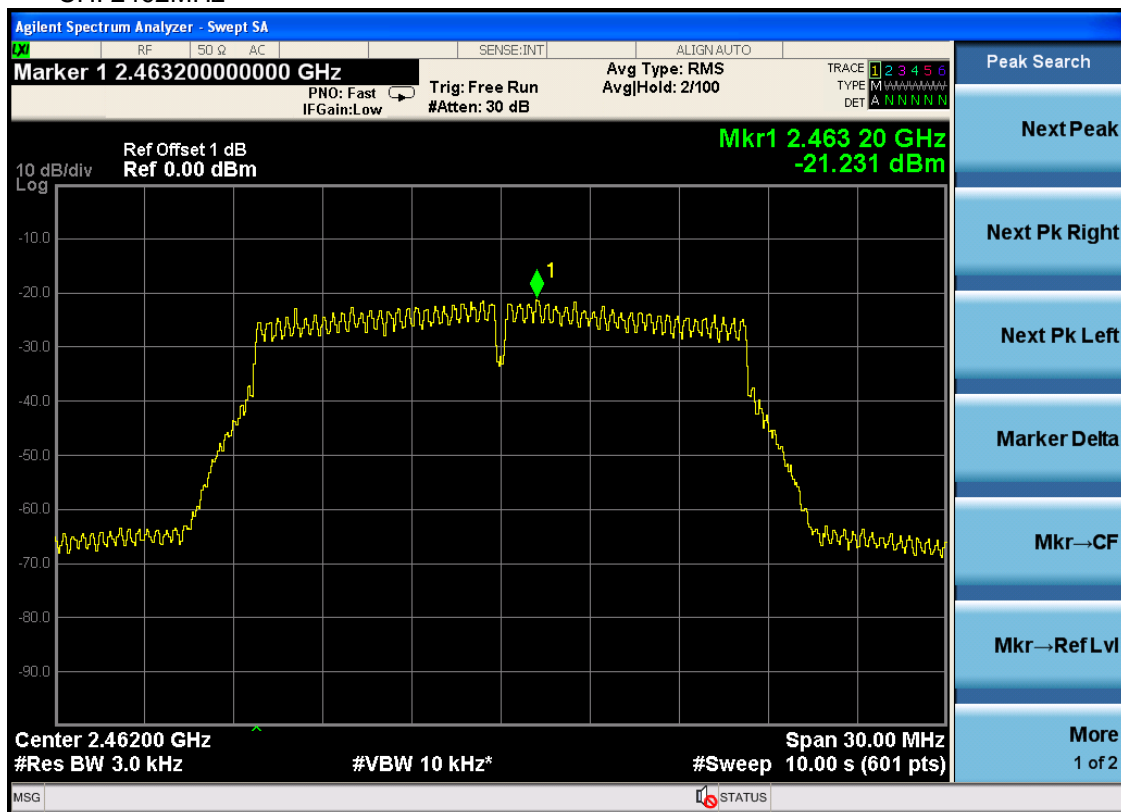
CH: 2412MHz



CH: 2437MHz

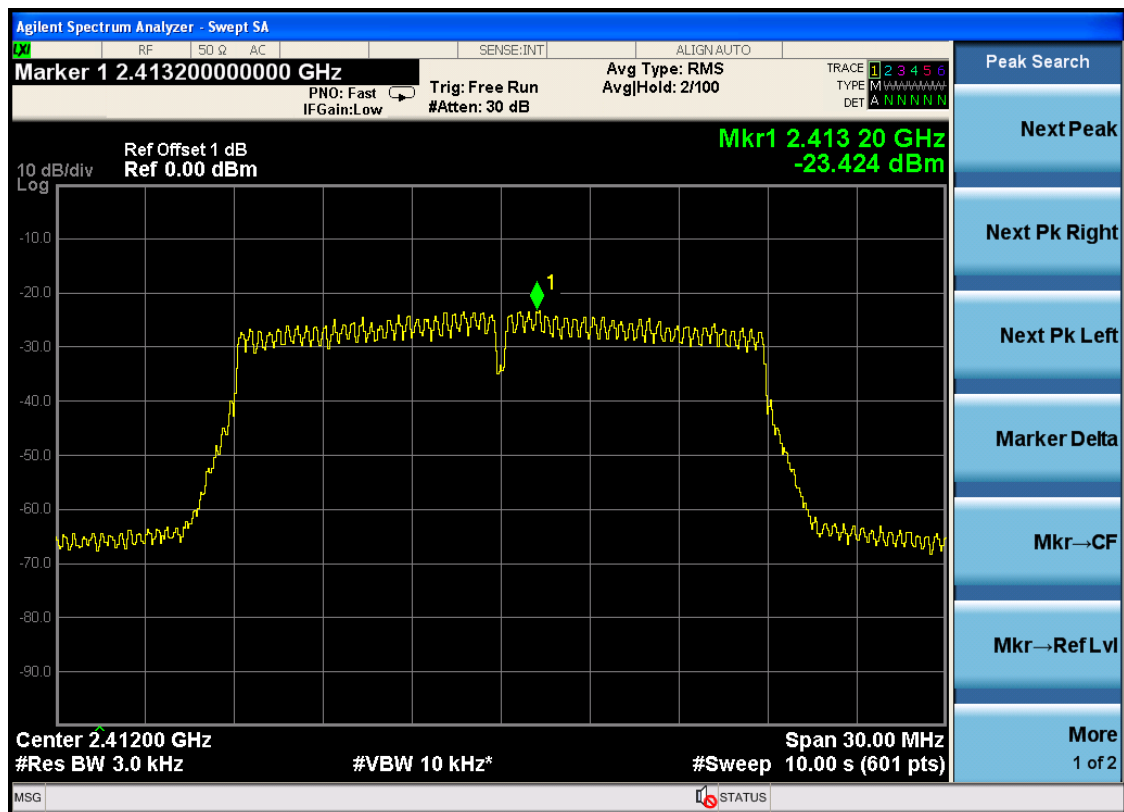


CH: 2462MHz

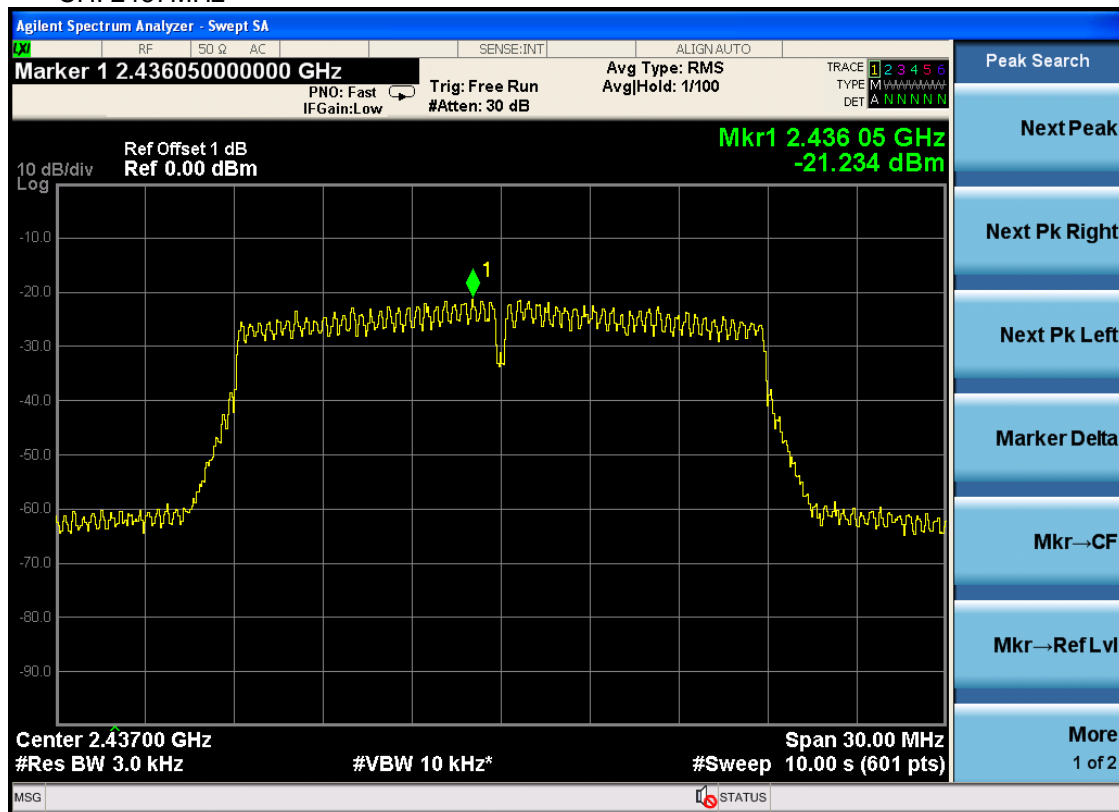


TX 802.11n/HT20 Mode			
Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-23.424	8	PASS
2437 MHz	-21.234	8	PASS
2462 MHz	-21.380	8	PASS

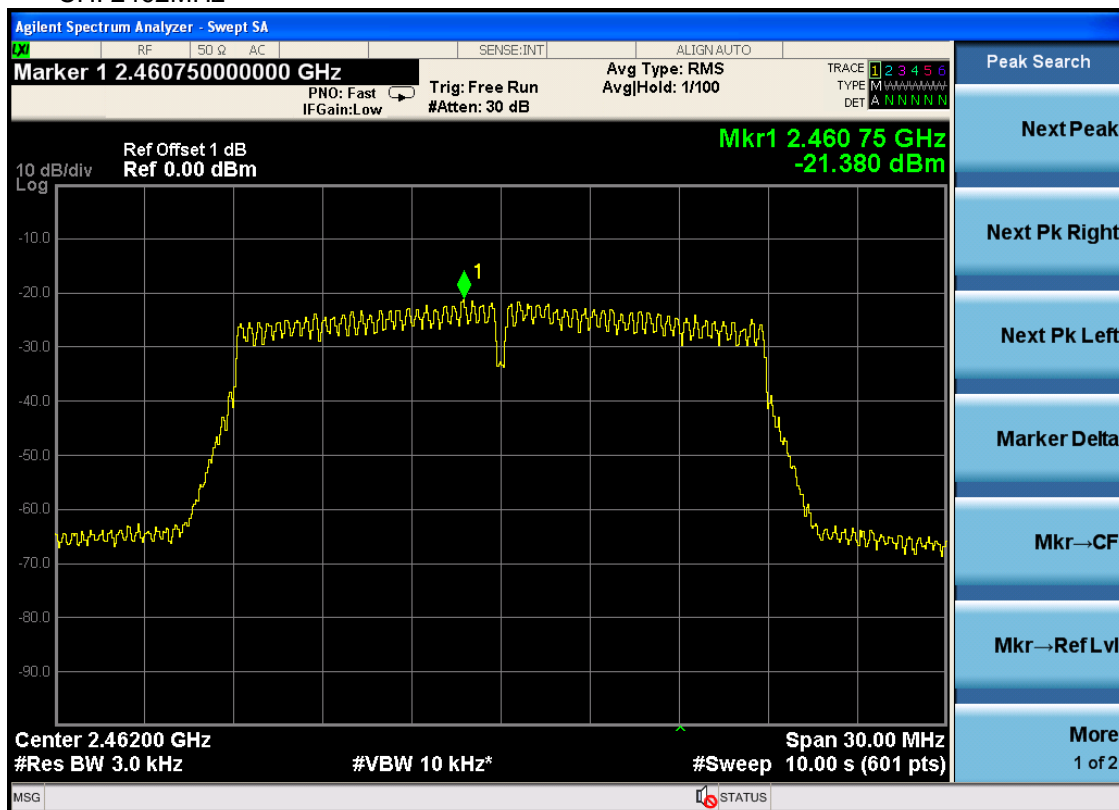
CH: 2412MHz



CH: 2437MHz

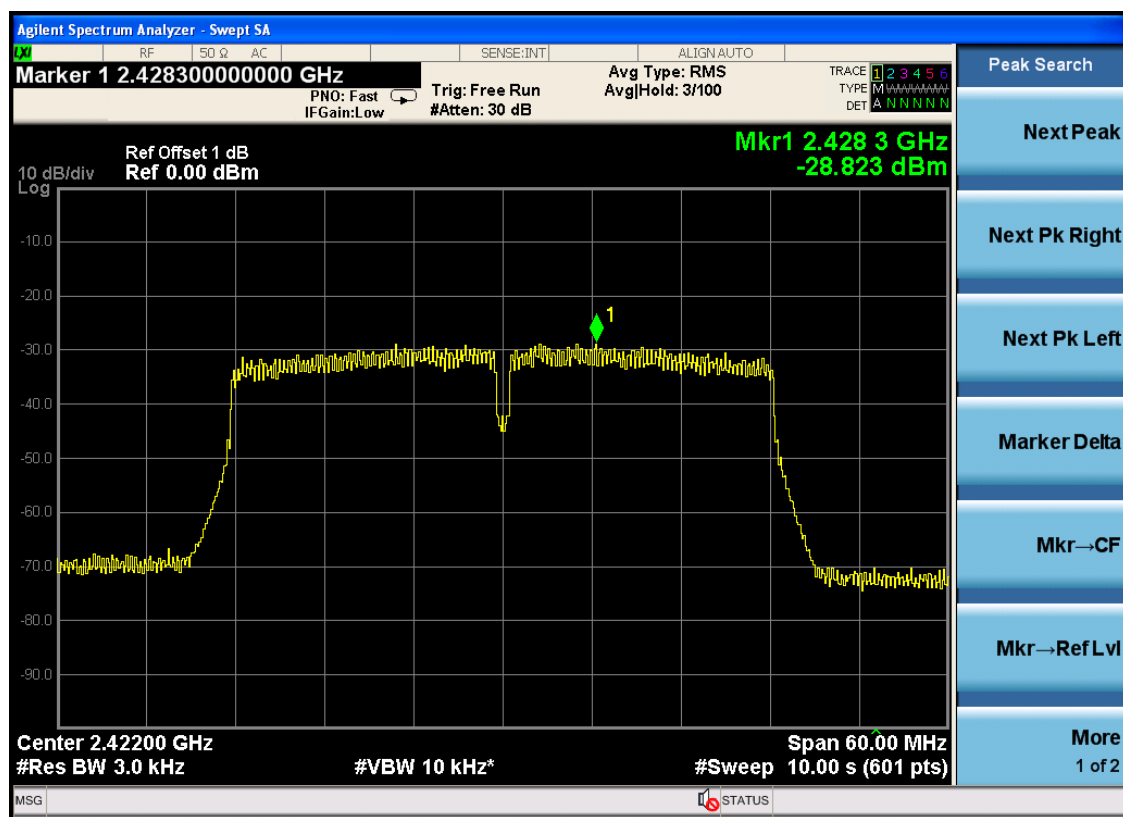


CH: 2462MHz

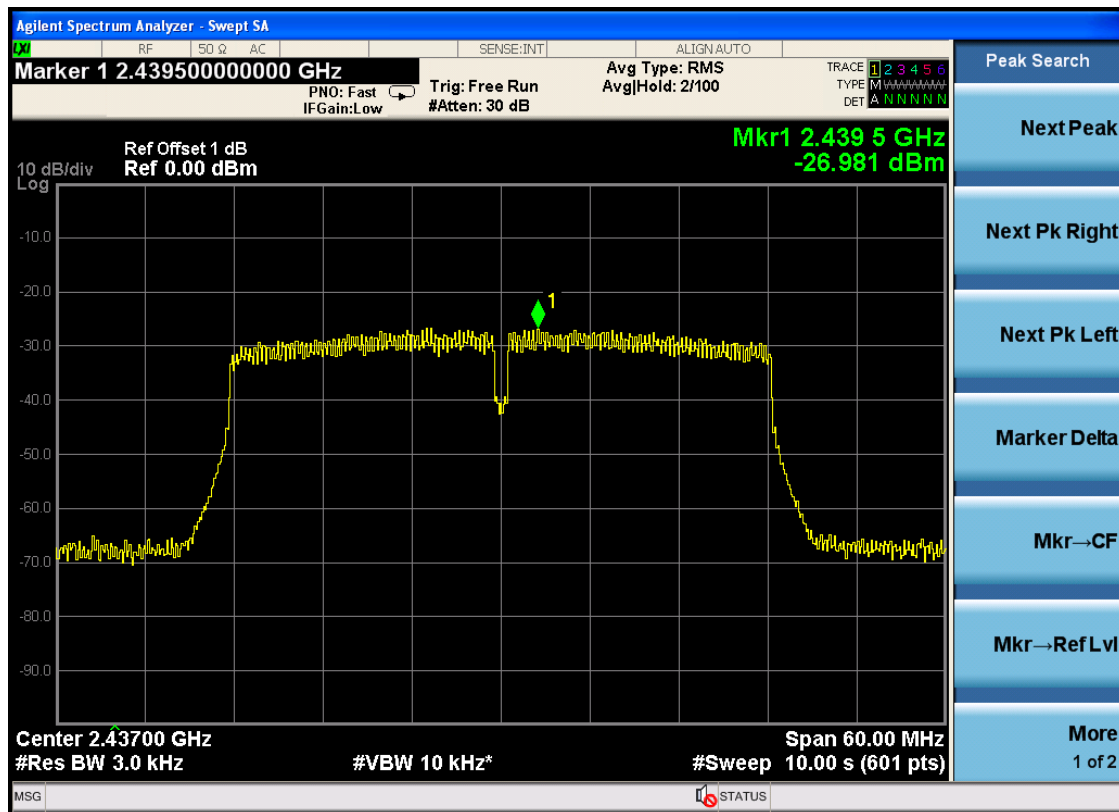


TX 802.11n/HT40 Mode			
Frequency	Power Density (dBm)	Limit (dBm)	Result
2422 MHz	-28.823	8	PASS
2437 MHz	-26.981	8	PASS
2452 MHz	-27.956	8	PASS

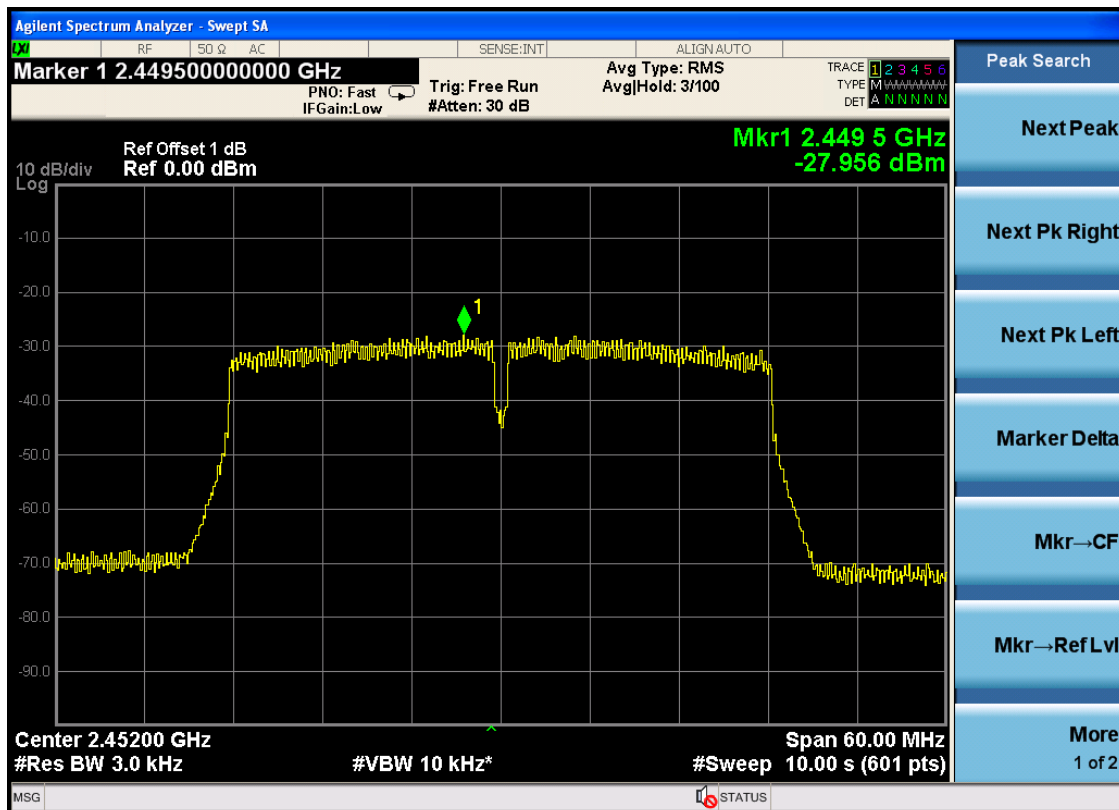
CH: 2422MHz



CH: 2437MHz



CH: 2452MHz



For MIMO antenna port 1+antenna port 2

TX 802.11b Mode			
Frequency	Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-13.95	8	PASS
2437 MHz	-13.66	8	PASS
2462 MHz	-12.79	8	PASS
TX 802.11g Mode			
2412 MHz	-19.95	8	PASS
2437 MHz	-18.02	8	PASS
2462 MHz	-17.98	8	PASS
TX 802.11n/HT20 Mode			
2412 MHz	-20.50	8	PASS
2437 MHz	-17.90	8	PASS
2462 MHz	-18.63	8	PASS
TX 802.11n/HT40 Mode			
2422 MHz	-25.90	8	PASS
2437 MHz	-23.70	8	PASS
2452 MHz	-24.91	8	PASS
Note: 1 According to KDB 662911, Result power = $10\log(10^{(\text{ant1}/10)} + 10^{(\text{ant2}/10)})$.			
2 Result unit: W, The end result is converted to units of dBm.			

8 PEAK OUTPUT POWER TEST

8.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

8.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The EUT was directly connected to the Power meter.

8.3 Measurement Equipment Used

Same as Radiated Emission Measurement

8.4 Test Result

PASS

All the test modes completed for test.

Test Channel	Frequency	Maximum Peak Conducted Output Power (dBm)			LIMIT
	(MHz)	Antenna port 1	Antenna port 2	MIMO	dBm
TX 802.11b Mode					
CH01	2412	16.85	17.32	20.10	30
CH06	2437	16.91	17.45	20.20	30
CH11	2462	16.87	17.38	20.14	30
TX 802.11g Mode					
CH01	2412	16.12	17.06	19.63	30
CH06	2437	16.23	16.93	19.60	30
CH11	2462	16.18	16.87	19.55	30
TX 802.11n20 Mode					
CH01	2412	15.44	16.11	18.80	30
CH06	2437	15.41	16.04	18.75	30
CH11	2462	15.36	16.08	18.75	30
TX 802.11n40 Mode					
CH03	2422	13.75	14.26	17.02	30
CH06	2437	13.82	14.22	17.03	30
CH09	2452	13.69	14.15	16.94	30

Note: 1 MIMO is Antenna port 1 and Antenna port 2.

2 According to KDB 662911, Result power = $10\log(10^{(ant1/10)} + 10^{(ant2/10)})$.

3 Result unit: W, The end result is converted to units of dBm.

9 ANTENNA REQUIREMENT

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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. And according to FCC 47 CFR Section 15.249, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance.

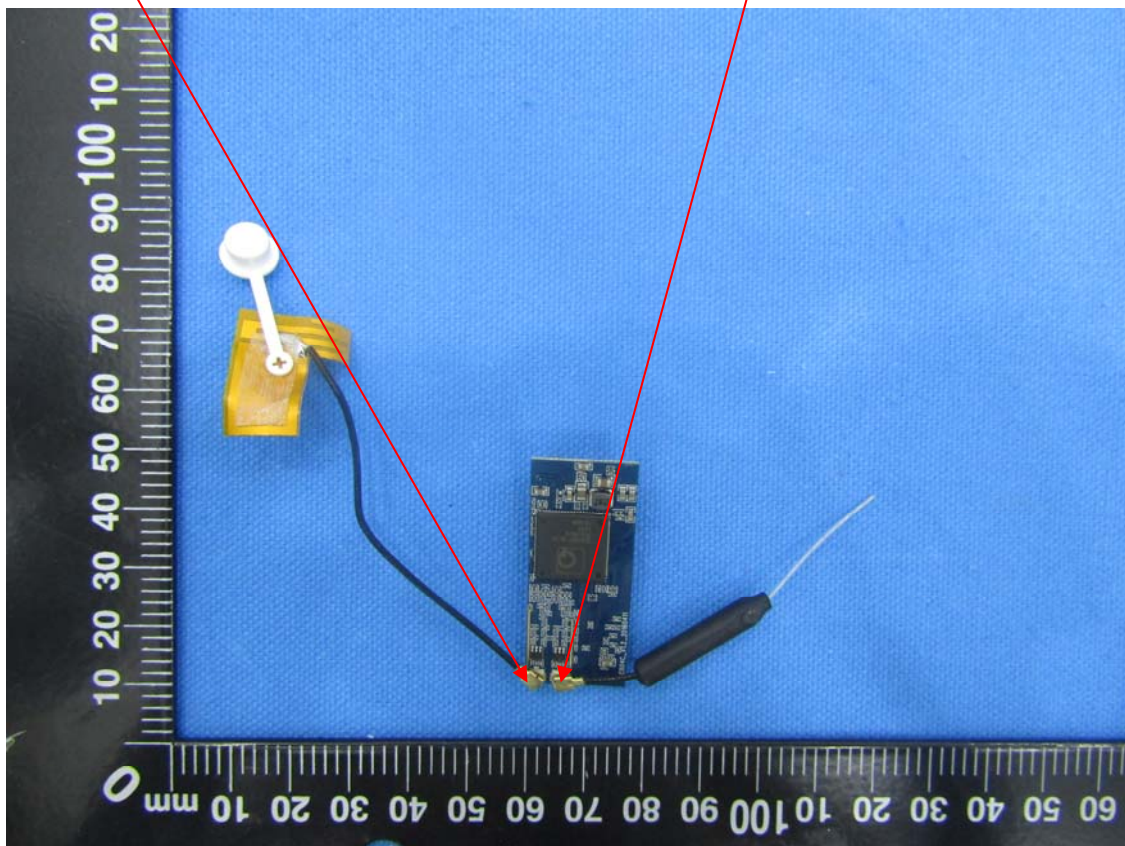
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is a Integral Antenna, The directional gains of antenna used for transmitting for antenna port 1 is 0dBi and antenna port 2 is 2dBi

Antenna port 1

Antenna port 2



10 PHOTOGRAPH OF TEST

10.1 Radiated Emission



10.2 Conducted Emission

