# FCC TEST REPORT

For

Shenzhen Wonda Tech Co.，Ltd

4K Wifi Action Camera

Test Model: WS009

Additional Model No.: W4000A,WA020,WA021

| | | |
|---|---|---|
| Prepared for | : | Shenzhen Wonda Tech Co.，Ltd |
| Address | : | 5/F, RM502, Block E, East Zone, Shangxue Science and Technology Park, Bantian District, Shenzhen, China |

| | | |
|---|---|---|
| Prepared by | : | Shenzhen LCS Compliance Testing Laboratory Ltd. |
| Address | : | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China |
| Tel | : | (+86)755-82591330 |
| Fax | : | (+86)755-82591332 |
| Web | : | www.LCS-cert.com |
| Mail | : | webmaster@LCS-cert.com |

| | | |
|---|---|---|
| Date of receipt of test sample | : | June 10, 2016 |
| Number of tested samples | : | 1 |
| Sample number | : | 16032925 |
| Date of Test | : | June 10, 2016~June 18, 2016 |
| Date of Report | : | June 18, 2016 |

| **FCC TEST REPORT**<br>**FCC CFR 47 PART 15 C(15.247): 2015** | |
|---|---|
| **Report Reference No. ..... :** | **LCS1606130847E** |
| Date of Issue ..... : | June 18, 2016 |
| **Testing Laboratory Name..... :** | **Shenzhen LCS Compliance Testing Laboratory Ltd.** |
| Address ..... : | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China |
| Testing Location/ Procedure..... : | Full application of Harmonised standards ■<br>Partial application of Harmonised standards □<br>Other standard testing method □ |
| **Applicant's Name..... :** | **Shenzhen Wonda Tech Co.，Ltd** |
| Address ..... : | 5/F, RM502, Block E, East Zone, Shangxue Science and Technology Park, Bantian District, Shenzhen, China |
| **Test Specification** | |
| Standard ..... : | FCC CFR 47 PART 15 C(15.247): 2015 / ANSI C63.10: 2013 |
| **Test Report Form No..... :** | LCSEMC-1.0 |
| TRF Originator ..... : | Shenzhen LCS Compliance Testing Laboratory Ltd. |
| Master TRF..... : | Dated 2011-03 |
|  | |
| **Test Item Description. ..... :** | **4K Wifi Action Camera** |
| Trade Mark ..... : | N/A |
| Test Model..... : | WS009 |
| Ratings..... : | DC 3.7V by Li-ion Battery(900mAh)<br>Recharged voltage: DC 5V/ 500mA |
| Result ..... : | **Positive** |

| **Compiled by:** | **Supervised by:** | **Approved by:** |
|---|---|---|
| Calvin Weng/ Administrators | Glin Lu/ Technique principal | Gavin Liang/ Manager |

# FCC -- TEST REPORT

| | |
|---|---|
| **Test Report No. : LCS1606130847E** | June 18, 2016<br>Date of issue |

| | |
|---|---|
| Test Model..... | : WS009 |
| EUT..... | : 4K Wifi Action Camera |
| **Applicant.....** | **: Shenzhen Wonda Tech Co.，Ltd** |
| Address..... | : 5/F, RM502, Block E, East Zone, Shangxue Science and Technology Park, Bantian District, Shenzhen, China |
| Telephone..... | : / |
| Fax..... | : / |
| **Manufacturer.....** | **: Shenzhen Wonda Tech Co.，Ltd** |
| Address..... | : 5/F, RM502, Block E, East Zone, Shangxue Science and Technology Park, Bantian District, Shenzhen, China |
| Telephone..... | : / |
| Fax..... | : / |
| **Factory.....** | **: Shenzhen Wonda Tech Co.，Ltd** |
| Address..... | : 5/F, RM502, Block E, East Zone, Shangxue Science and Technology Park, Bantian District, Shenzhen, China |
| Telephone..... | : / |
| Fax..... | : / |

| | |
|---|---|
| **Test Result** | **Positive** |

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

# Revision History

| Revision | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 00 | 2016-06-18 | Initial Issue | Gavin Liang |
| | | | |
| | | | |

# TABLE OF CONTENTS

# 1. GENERAL INFORMATION

## 1.1. Description of Device (EUT)

| | | |
|---|---|---|
| EUT | : | 4K Wifi Action Camera |
| Test Model | : | WS009 |
| Additional Model No. | : | W4000A,WA020,WA021 |
| Model Declaration | : | PCB board, structure and internal of these model(s) are the same, so no additional models were tested. |
| Hardware Version | : | 96660 |
| Software Version | : | 1.0 |
| Power Supply | : | DC 3.7V by Li-ion Battery(900mAh)<br>Recharged voltage: DC 5V/ 500mA |
| WIFI(2.4GHz Band) | : | |
| Operating Frequency | : | 2412-2462MHz |
| Channel Spacing | : | 5MHz |
| Channel Number | : | 11 Channel for 20MHz bandwidth(2412~2462MHz)<br>7 channels for 40MHz bandwidth(2422~2452MHz) |
| Modulation Type | : | 802.11b: DSSS; 802.11g/n: OFDM |
| Antenna Description | : | FPCB Antenna, 2.43dBi(Max.) |

## 1.2. Support Equipment List

| Manufacturer | Description | Model | Serial Number | Certificate |
|---|---|---|---|---|
| Lenovo | AC/DC ADAPTER | ADP-90DD B | 36001941 | FCC VOC |
| Lenovo | Notebook | B470 | WB05067151 | FCC DOC |

## 1.3. External I/O

| I/O Port Description | Quantity | Cable |
|---|---|---|
| USB port | 1 | N/A |
| TF card slot | 1 | N/A |
| Mini HDMI port | 1 | N/A |

## 1.4. Description of Test Facility

CNAS Registration Number. is L4595.

FCC Registration Number. is 899208.

Industry Canada Registration Number. is 9642A-1.

VCCI Registration Number. is C-4260 and R-3804.

ESMD Registration Number. is ARCB0108.

UL Registration Number. is 100571-492.

TUV SUD Registration Number. is SCN1081.

TUV RH Registration Number. is UA 50296516-001

There is one 3m semi-anechoic chamber and one line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4: 2014 and CISPR 22/EN 55022/ CISPR 16-1-4:2010 SVSWR requirements.

## 1.5. List Of Measuring Equipments

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| EMC Receiver | R&S | ESCS 30 | 100174 | 9kHz – 2.75GHz | June 17,2016 | June 16,2017 |
| Signal analyzer | Agilent | E4448A(External mixers to 40GHz) | US44300469 | 9kHz~40GHz | July 16,2015 | July 15,2016 |
| LISN | MESS Tec | NNB-2/16Z | 99079 | 9KHz-30MHz | June 17,2016 | June 16,2017 |
| LISN (Support Unit) | EMCO | 3819/2NM | 9703-1839 | 9KHz-30MHz | June 17,2016 | June 16,2017 |
| RF Cable-CON | UTIFLEX | 3102-26886-4 | CB049 | 9KHz-30MHz | June 17,2016 | June 16,2017 |
| ISN | SCHAFFNER | ISN ST08 | 21653 | 9KHz-30MHz | June 17,2016 | June 16,2017 |
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 30M-1GHz 3m | June 17,2016 | June 16,2017 |
| Amplifier | SCHAFFNER | COA9231A | 18667 | 9kHz-2GHzz | June 17,2016 | June 16,2017 |
| Amplifier | Agilent | 8449B | 3008A02120 | 1GHz-26.5GHz | July 16,2015 | July 15,2016 |
| Amplifier | MITEQ | AMF-6F-260400 | 9121372 | 26.5GHz-40GHz | July 16,2015 | July 15,2016 |
| Spectrum Analyzer | Agilent | E4407B | MY41440292 | 9k-26.5GHz | July 16,2015 | July 15,2016 |
| MAX Signal Analyzer | Agilent | N9020A | MY50510140 | 20Hz~26.5GHz | Oct. 27, 2015 | Oct. 26, 2016 |
| Loop Antenna | R&S | HFH2-Z2 | 860004/001 | 9k-30MHz | June 17,2016 | June 16,2017 |
| By-log Antenna | SCHWARZBECK | VULB9163 | 9163-470 | 30MHz-1GHz | June 09,2016 | June 08,2017 |
| Horn Antenna | EMCO | 3115 | 6741 | 1GHz-18GHz | June 09,2016 | June 08,2017 |
| Horn Antenna | SCHWARZBECK | BBHA9170 | BBHA9170154 | 15GHz-40GHz | June 09,2016 | June 08,2017 |
| RF Cable-R03m | Jye Bao | RG142 | CB021 | 30MHz-1GHz | June 18,2015 | June 17,2016 |
| RF Cable-HIGH | SUHNER | SUCOFLEX 106 | 03CH03-HY | 1GHz-40GHz | June 17,2016 | June 16,2017 |
| Spectrum Meter | R&S | FSP 30 | 100023 | 9kHz-30GHz | June 17,2016 | June 16,2017 |
| Power Meter | R&S | NRVS | 100444 | DC-40GHz | June 17,2016 | June 16,2017 |
| Power Sensor | R&S | NRV-Z51 | 100458 | DC-30GHz | June 17,2016 | June 16,2017 |
| Power Sensor | R&S | NRV-Z32 | 10057 | 30MHz-6GHz | June 17,2016 | June 16,2017 |
| RF CABLE-1m | JYE Bao | RG142 | CB034-1m | 20MHz-7GHz | June 17,2016 | June 16,2017 |
| RF CABLE-2m | JYE Bao | RG142 | CB035-2m | 20MHz-1GHz | June 17,2016 | June 16,2017 |
| *Note: All equipment through GRGT EST calibration* | | | | | | |

## 1.6. Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

## 1.7. Measurement Uncertainty

| Test Item | | Frequency Range | Uncertainty | Note |
|---|---|---|---|---|
| Radiation Uncertainty | : | 9KHz~30MHz | 3.10dB | (1) |
| | | 30MHz~200MHz | 2.96dB | (1) |
| | | 200MHz~1000MHz | 3.10dB | (1) |
| | | 1GHz~26.5GHz | 3.80dB | (1) |
| | | 26.5GHz~40GHz | 3.90dB | (1) |
| Conduction Uncertainty | : | 150kHz~30MHz | 1.63dB | (1) |
| Power disturbance | : | 30MHz~300MHz | 1.60dB | (1) |

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 1.8. Description Of Test Modes

The EUT has been tested under operating condition.

For pre-testing, when performed power line conducted emission measurement, the input Voltage/Frequency AC 120V/60Hz and AC 240V/60Hz were used. Only recorded the worst case in this report.

The EUT was set to transmit at 100% duty cycle. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.

Worst-case mode and channel used for 150kHz-30 MHz power line conducted emissions was determined to be 802.11g mode(TX-Low Channel).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was determined to be 802.11g mode(TX-Low Channel).

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:
802.11b Mode: 1 Mbps, DSSS.
802.11g Mode: 6 Mbps, OFDM.
802.11n Mode HT20: MCS0, OFDM.
802.11n Mode HT40: MCS0, OFDM.

***Note: Using a temporary antenna connector for the EUT when the conducted measurements are performed.

Channel List & Frequency

802.11b/g/n(HT20)

| Frequency Band | Channel No. | Frequency(MHz) | Channel No. | Frequency(MHz) |
|---|---|---|---|---|
| 2412~2462MHz | 1 | 2412 | 7 | 2442 |
| | 2 | 2417 | 8 | 2447 |
| | 3 | 2422 | 9 | 2452 |
| | 4 | 2427 | 10 | 2457 |
| | 5 | 2432 | 11 | 2462 |
| | 6 | 2437 | -- | -- |

802.11n(HT40)

| Frequency Band | Channel No. | Frequency(MHz) | Channel No. | Frequency(MHz) |
|---|---|---|---|---|
| 2422~2452MHz | 1 | -- | 7 | 2442 |
| | 2 | -- | 8 | 2447 |
| | 3 | 2422 | 9 | 2452 |
| | 4 | 2427 | 10 | -- |
| | 5 | 2432 | 11 | -- |
| | 6 | 2437 | -- | -- |

# 2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10: 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd..

## 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure KDB558074 D01 DTS Meas Guidance v03r05 is required to be used for this kind of FCC 15.247 digital modulation device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

## 2.3. General Test Procedures

### 2.3.1 Conducted Emissions

According to the requirements in Section 6.2 of ANSI C63.10: 2013, AC power-line conducted emissions shall be measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

### 2.3.2 Radiated Emissions

The EUT is placed on a turn table and the turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10: 2013

# 3. SYSTEM TEST CONFIGURATION

## 3.1. Justification

The system was configured for testing in a continuous transmit condition.

## 3.2. EUT Exercise Software

N/A

## 3.3. Special Accessories

N/A

## 3.4. Block Diagram/Schematics

Please refer to the related document

## 3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

## 3.6. Test Setup

Please refer to the test setup photo.

# 4. SUMMARY OF TEST RESULTS

| Applied Standard: FCC Part 15 Subpart C | | |
|---|---|---|
| **FCC Rules** | **Description of Test** | **Result** |
| §15.247(b)(3) | Maximum Conducted Output Power | Compliant |
| §15.247(e) | Power Spectral Density | Compliant |
| §15.247(a)(2) | 6dB Bandwidth | Compliant |
| §15.209, §15.247(d) | Radiated and Conducted Spurious Emissions | Compliant |
| §15.205 | Emissions at Restricted Band | Compliant |
| §15.207(a) | Line Conducted Emissions | Compliant |
| §15.203 | Antenna Requirements | Compliant |

# 5. TEST RESULT

## 5.1. Maximum Conducted Output Power Measurement

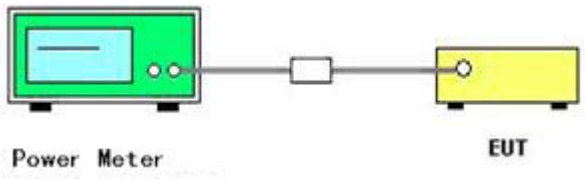
### 5.1.1. Standard Applicable

According to § 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt.

### 5.1.2. Test Procedures

The transmitter output (antenna port) was connected to the power meter.

### 5.1.3. Test Setup Layout




### 5.1.4. EUT Operation during Test

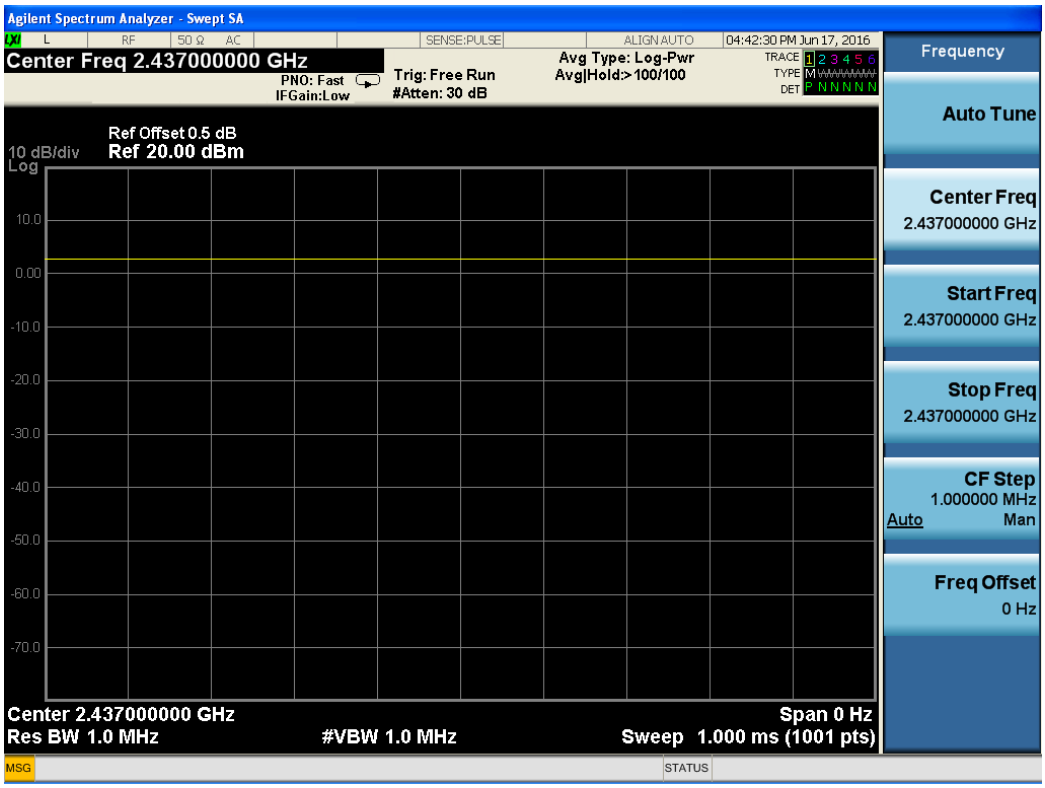
The EUT was programmed to be in continuously transmitting mode.

### 5.1.5. Test Result of Maximum Conducted Output Power

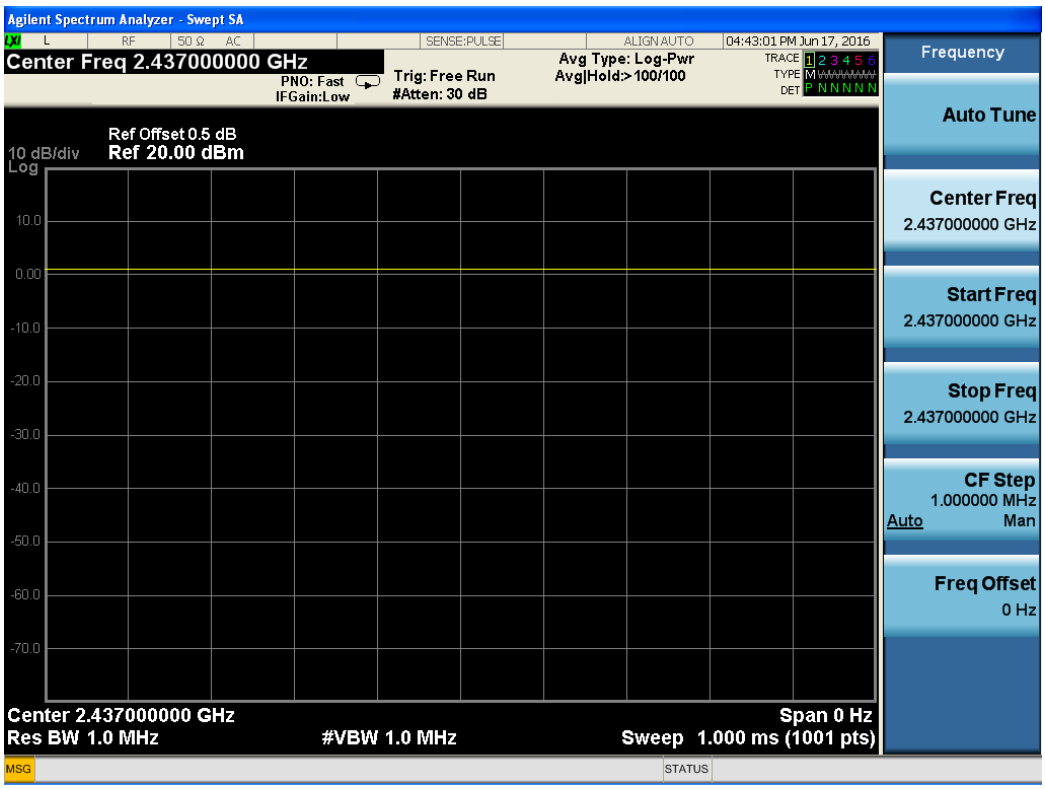
| Temperature | 25°C | Humidity | 60% |
|---|---|---|---|
| Test Engineer | Calvin | Configurations | 802.11b/g/n |

| Mode | Channel | Frequency (MHz) | Conducted Power (dBm, Average) | Max. Limit (dBm) | Result |
|---|---|---|---|---|---|
| 802.11b | 1 | 2412 | 8.50 | 30 | Complies |
| | 6 | 2437 | 8.25 | 30 | Complies |
| | 11 | 2462 | 8.37 | 30 | Complies |
| 802.11g | 1 | 2412 | 7.25 | 30 | Complies |
| | 6 | 2437 | 7.46 | 30 | Complies |
| | 11 | 2462 | 7.40 | 30 | Complies |
| 802.11n HT20 | 1 | 2412 | 7.60 | 30 | Complies |
| | 6 | 2437 | 7.94 | 30 | Complies |
| | 11 | 2462 | 7.90 | 30 | Complies |
| 802.11n HT40 | 3 | 2422 | 7.10 | 30 | Complies |
| | 6 | 2437 | 7.35 | 30 | Complies |
| | 9 | 2452 | 7.78 | 30 | Complies |

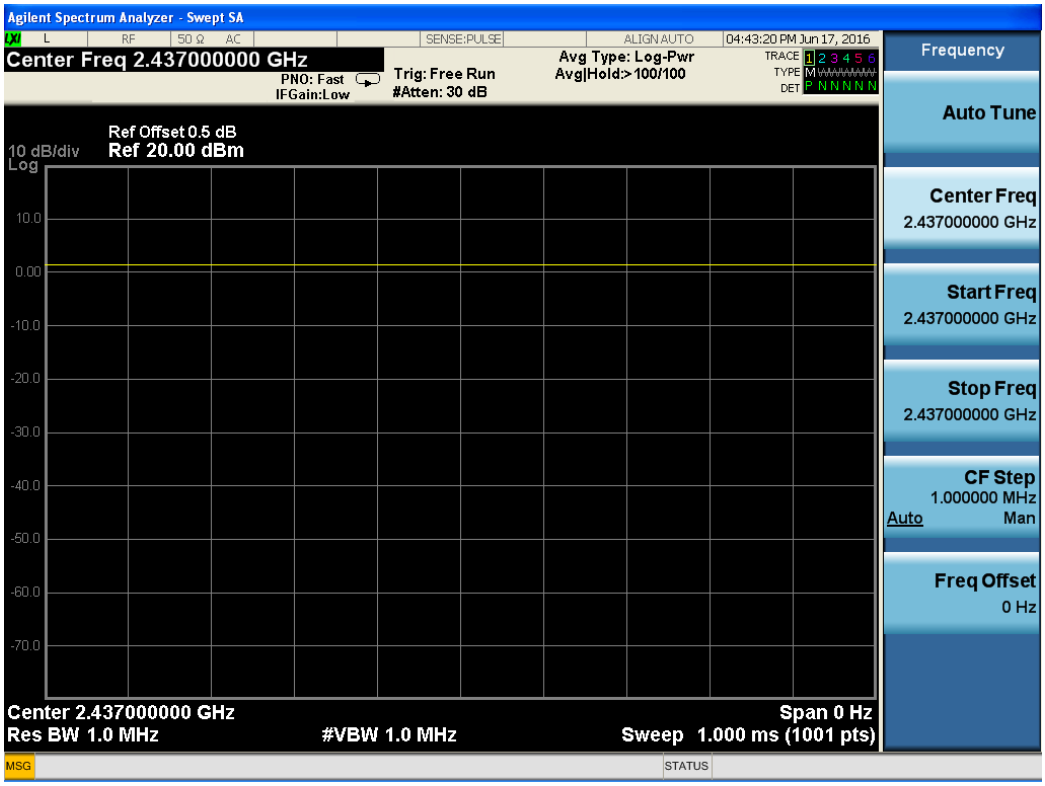
Duty cycle:




b




g


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.437000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:43:20 PM Jun 17, 2016
Ref Offset 0.5 dB
10 dB/div
Log
Ref 20.00 dBm
Center 2.437000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.437000000 GHz
Start Freq
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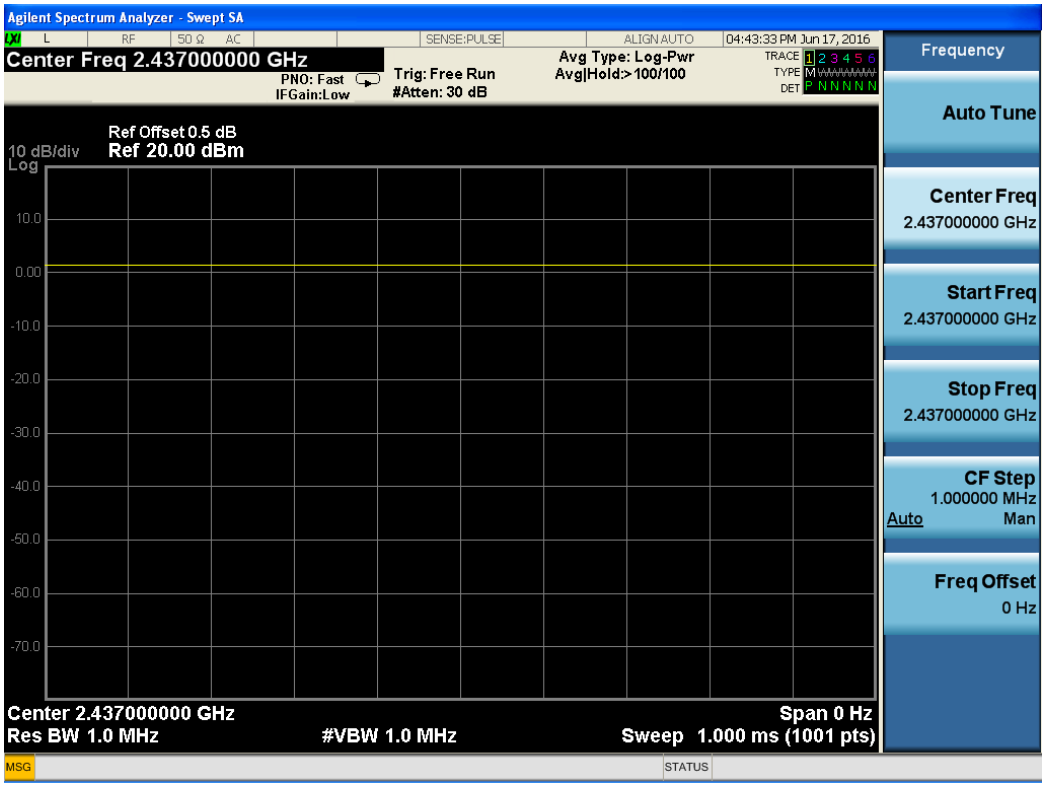
1.000000 MHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

n20


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.437000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:43:33 PM Jun 17, 2016
Ref Offset 0.5 dB
10 dB/div
Log
Ref 20.00 dBm
Center 2.437000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.437000000 GHz
Start Freq
2.437000000 GHz
Stop Freq
2.437000000 GHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

n40

## 5.2. Power Spectral Density Measurement

### 5.2.1. Standard Applicable

According to §15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 5.2.2. Test Procedures

1) The transmitter was connected directly to a Spectrum Analyzer through a directional couple.

2) The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.

3) Set the RBW = 3 kHz.

4) Set the VBW ≥ 3*RBW

5) Set the span to 1.5 times the DTS channel bandwidth.

6) Detector = peak.

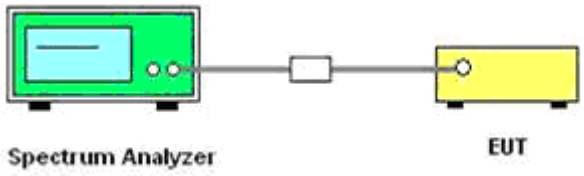
7) Sweep time = auto couple.

8) Trace mode = max hold.

9) Allow trace to fully stabilize.

10) Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW.

### 5.2.3. Test Setup Layout




### 5.2.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

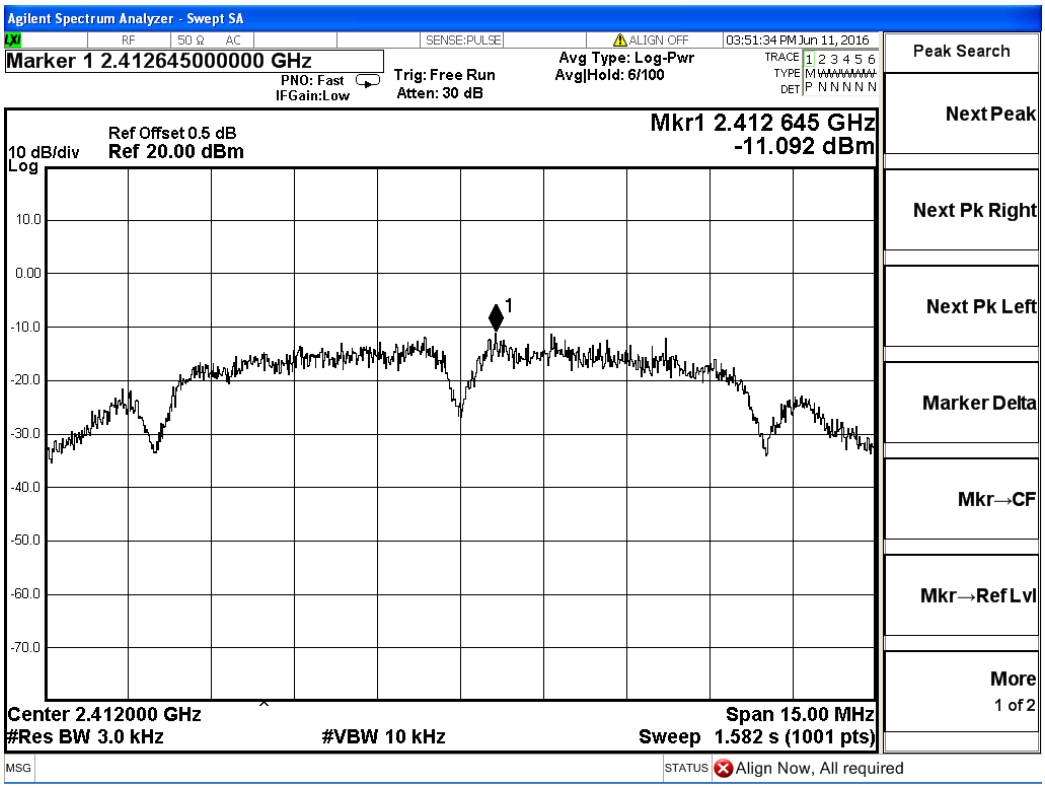
5.2.5. Test Result of Power Spectral Density

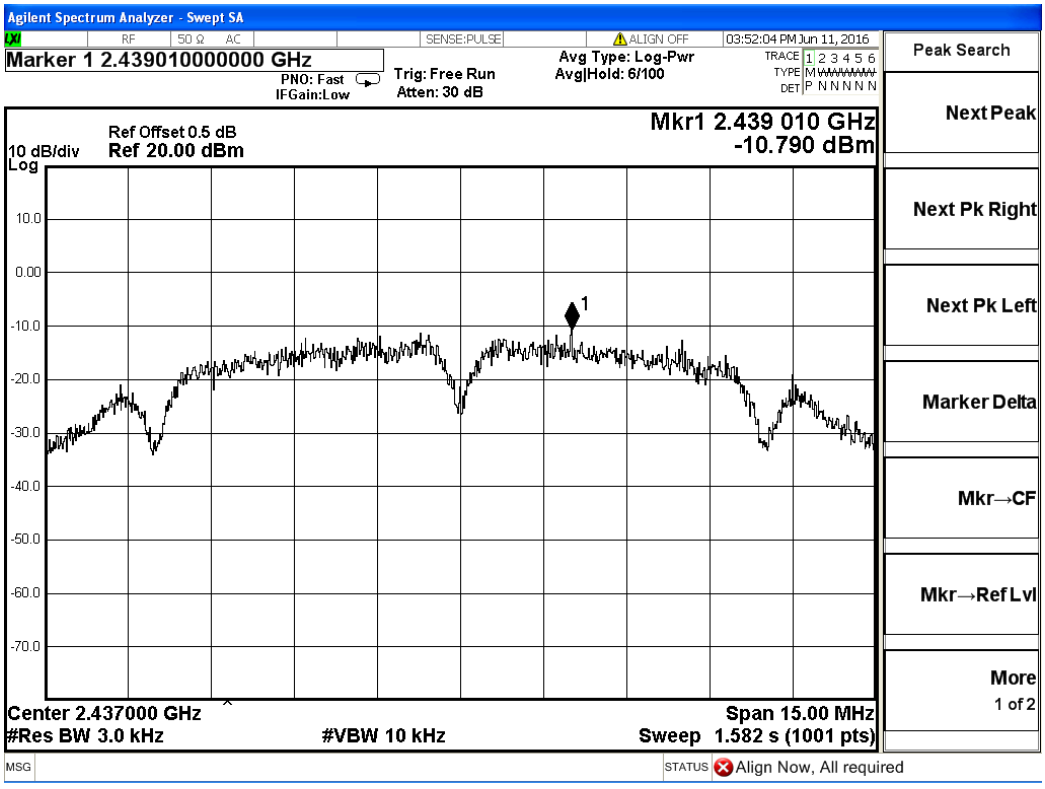
| Temperature | 25℃ | Humidity | 60% |
|---|---|---|---|
| Test Engineer | Calvin | Configurations | 802.11b/g/n |

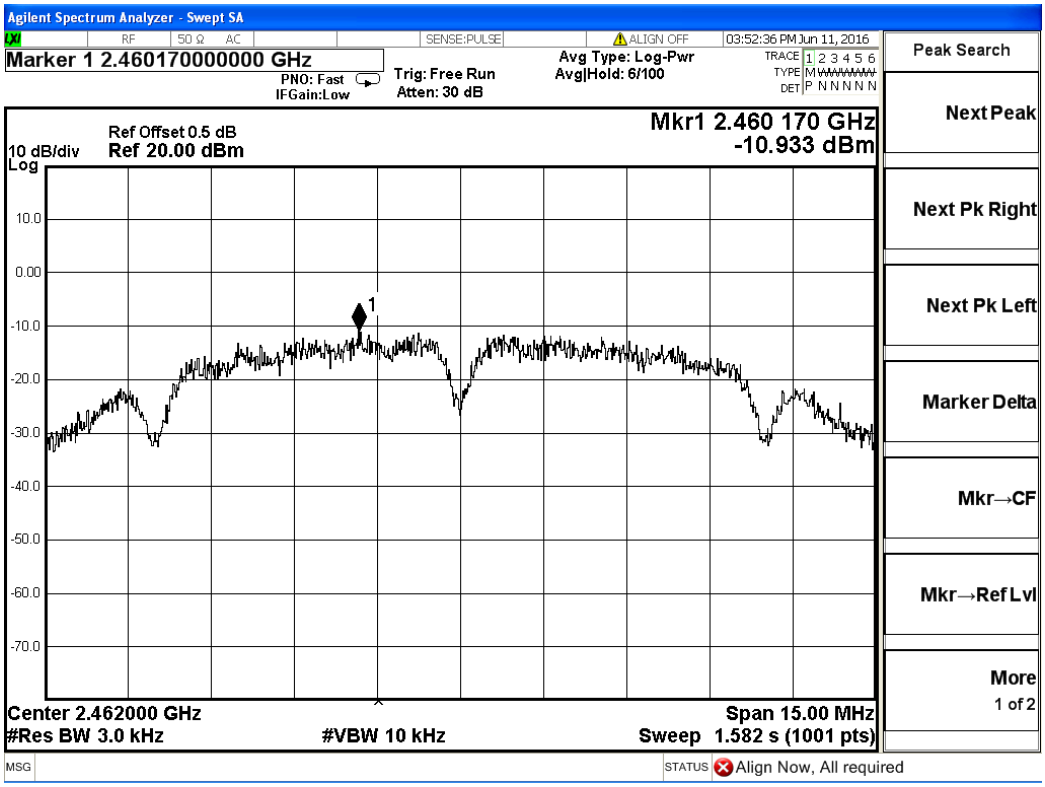
| Mode | Channel | Frequency (MHz) | Power Density (dBm/3KHz) | Max. Limit (dBm/3KHz) | Result |
|---|---|---|---|---|---|
| 802.11b | 1 | 2412 | -11.092 | 8 | Complies |
| | 6 | 2437 | -10.790 | 8 | Complies |
| | 11 | 2462 | -10.933 | 8 | Complies |
| 802.11g | 1 | 2412 | -17.501 | 8 | Complies |
| | 6 | 2437 | -15.772 | 8 | Complies |
| | 11 | 2462 | -16.010 | 8 | Complies |
| 802.11n HT20 | 1 | 2412 | -17.629 | 8 | Complies |
| | 6 | 2437 | -15.192 | 8 | Complies |
| | 11 | 2462 | -16.003 | 8 | Complies |
| 802.11n HT40 | 3 | 2422 | -21.957 | 8 | Complies |
| | 6 | 2437 | -18.289 | 8 | Complies |
| | 9 | 2452 | -21.268 | 8 | Complies |

Note: The measured power density (dBm) has the offset with cable loss already.

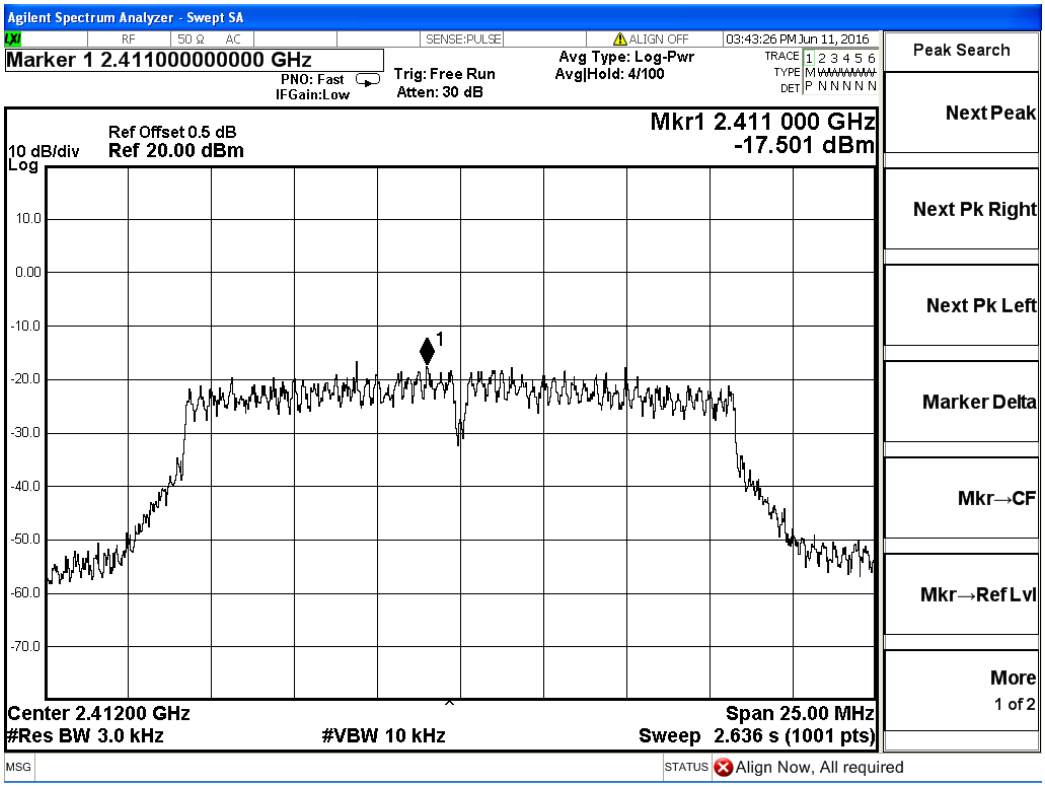
802.11b power density

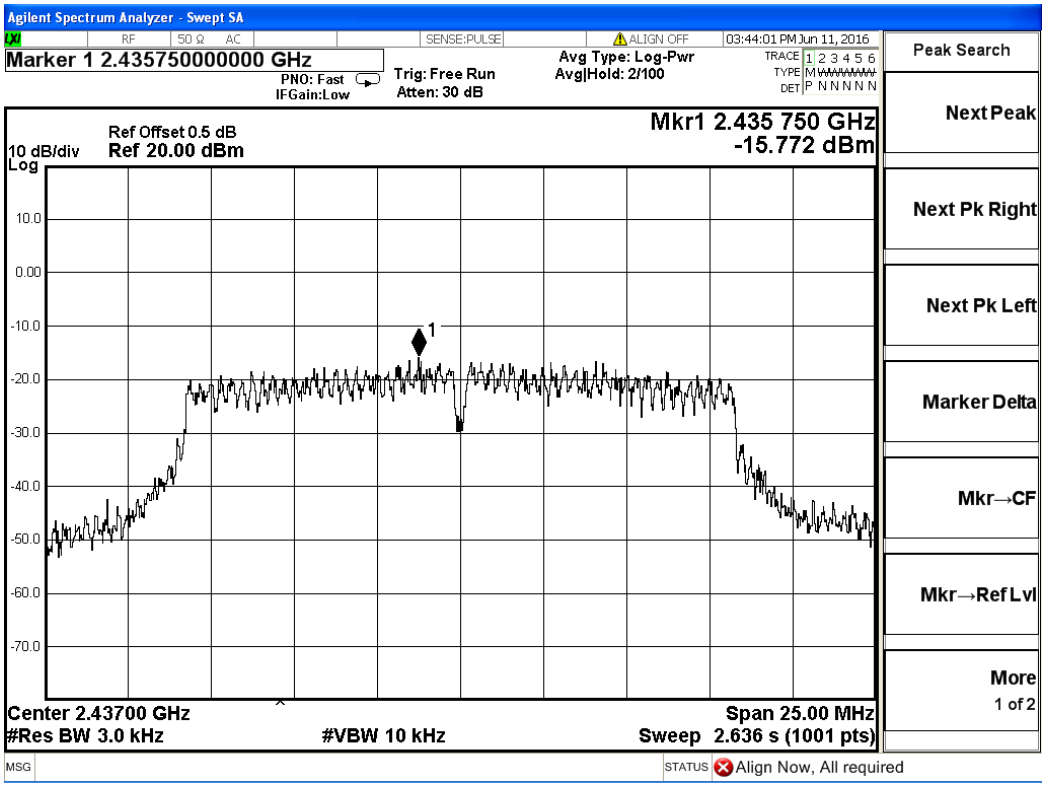


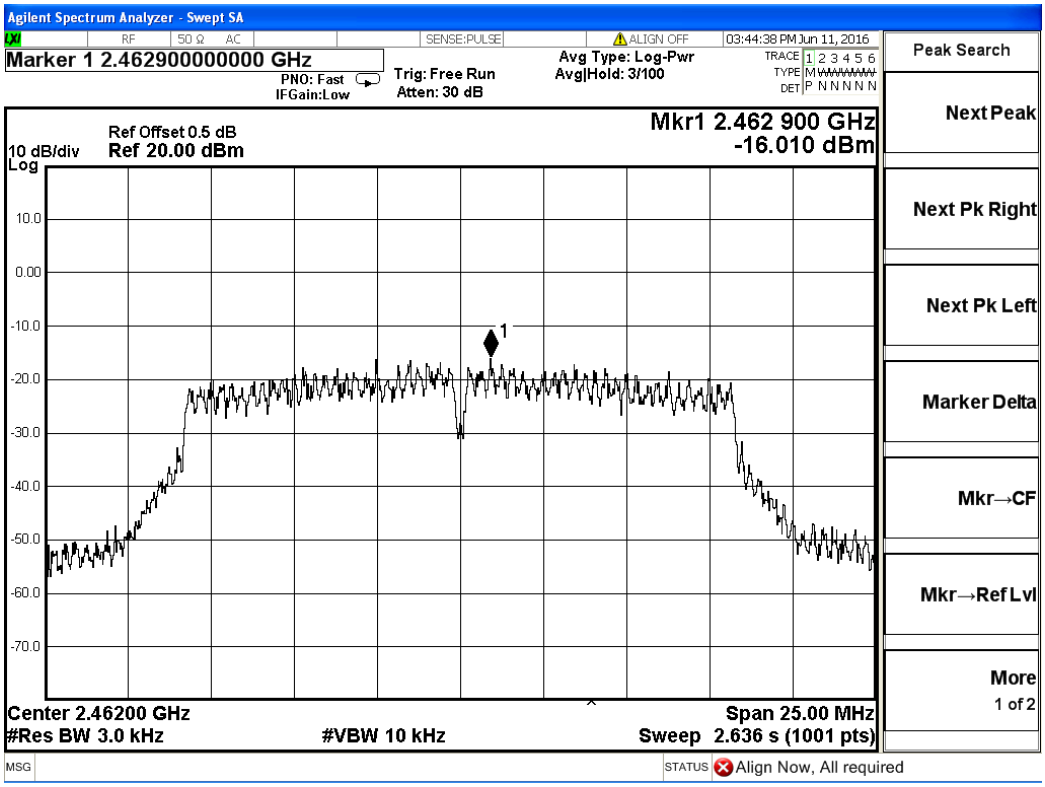





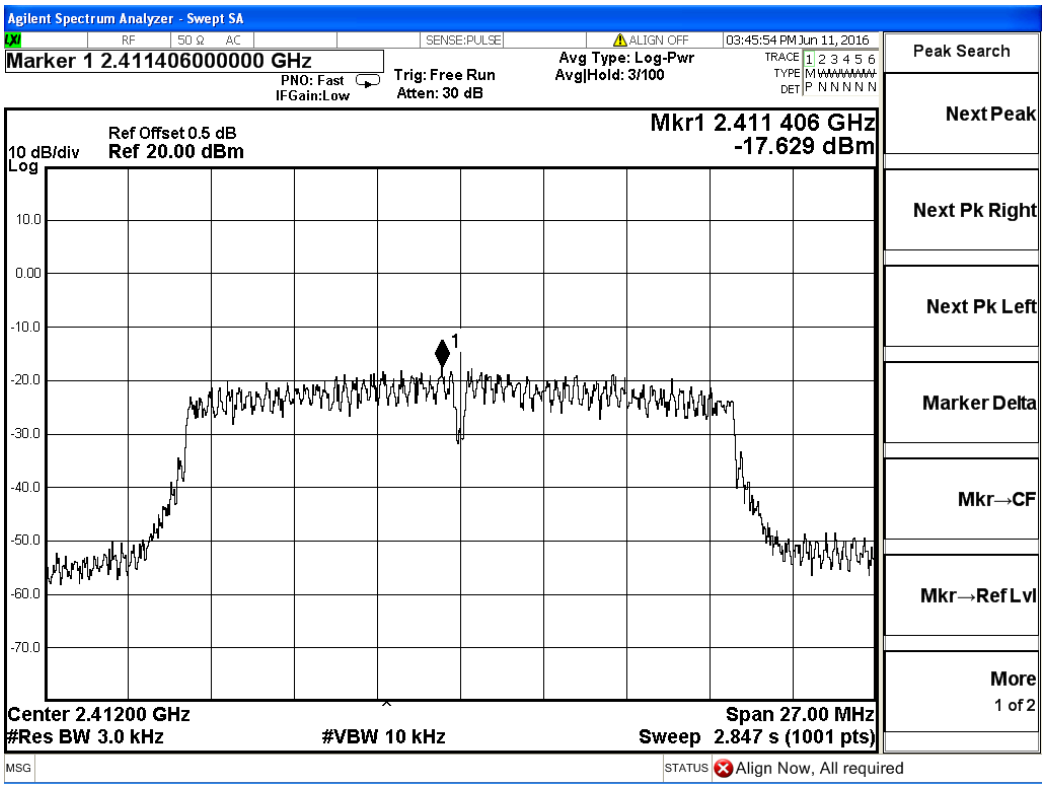

802.11g power density

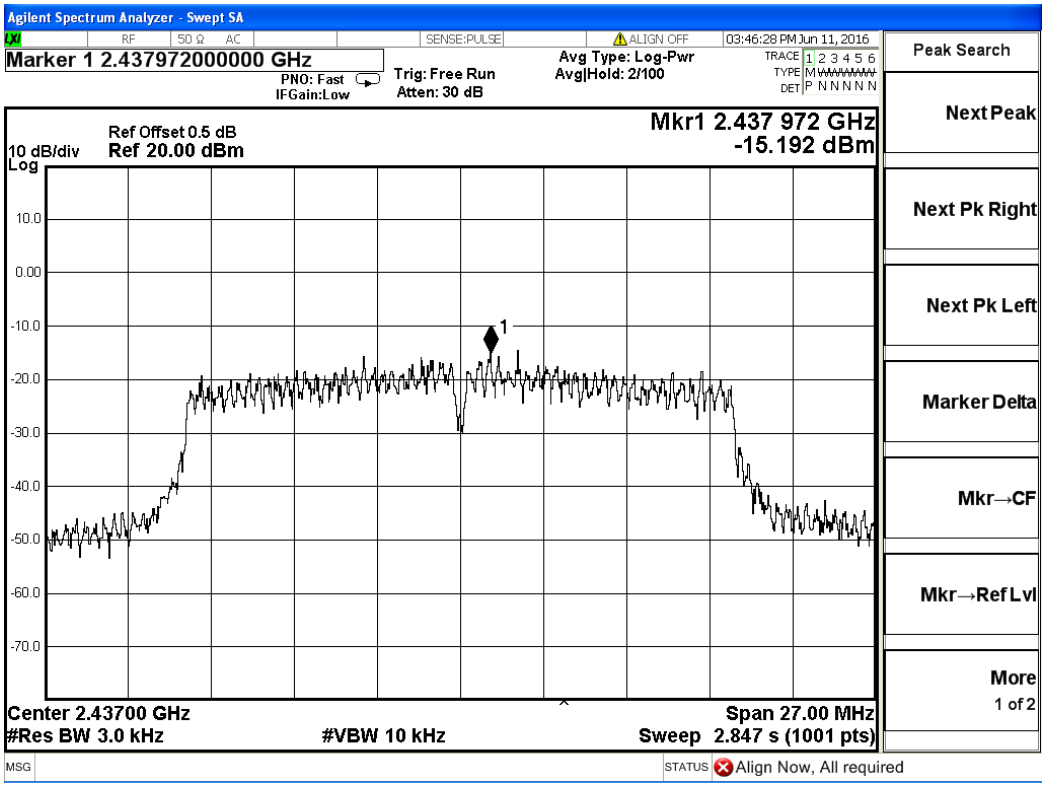


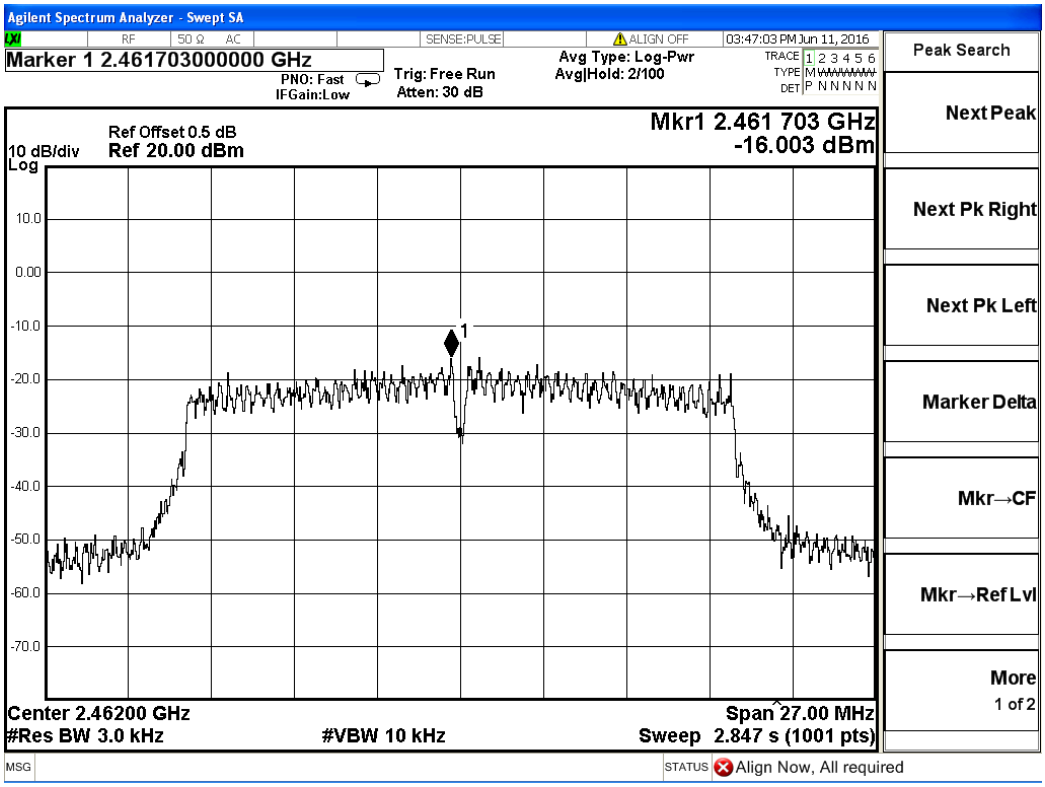

Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
03:44:01 PM Jun 11, 2016
Marker 1 2.435750000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 2/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.435 750 GHz
-15.772 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.43700 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 25.00 MHz
Sweep 2.636 s (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS
Align Now, All required


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
03:44:38 PM Jun 11, 2016
Marker 1 2.462900000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.462 900 GHz
-16.010 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.46200 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 25.00 MHz
Sweep 2.636 s (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS
Align Now, All required

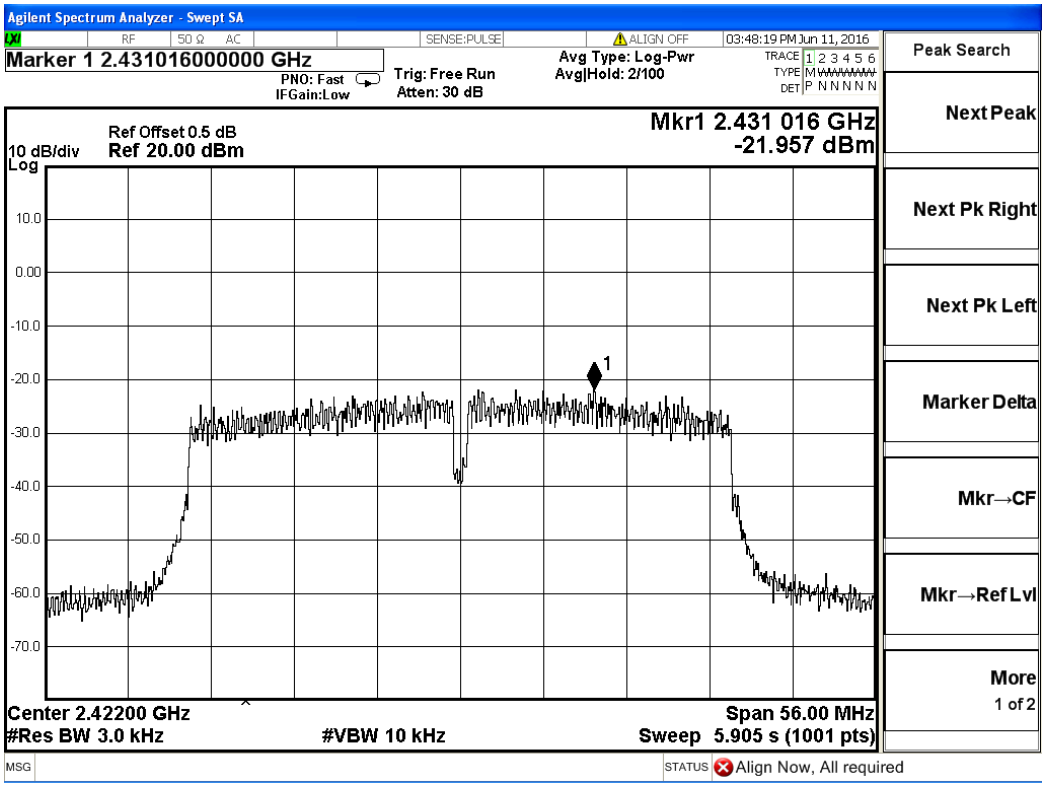
802.11n HT20 power density

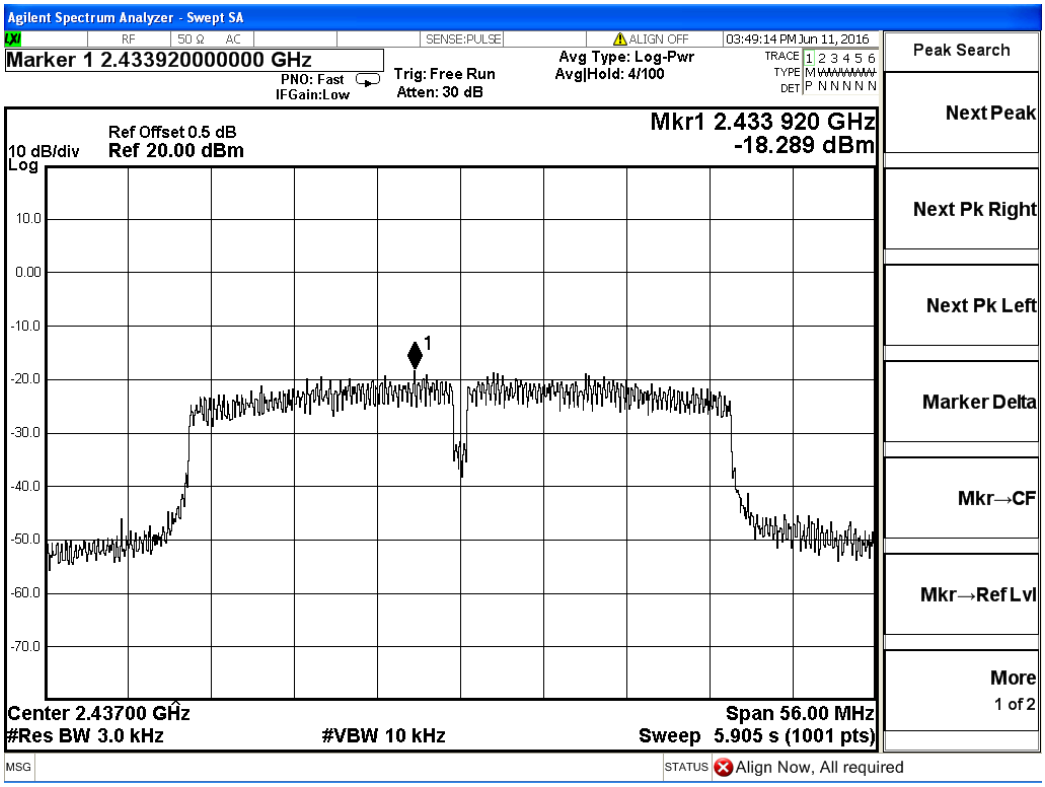


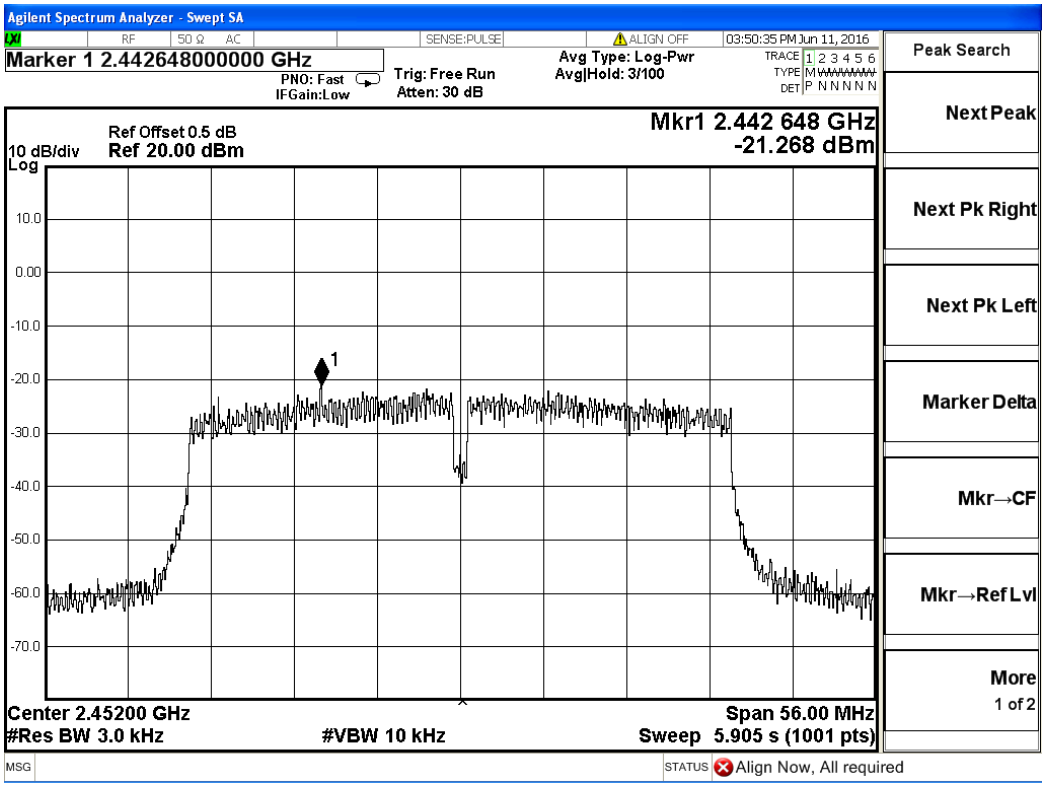






802.11n HT40 power density




Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
03:49:14 PM Jun 11, 2016
Marker 1 2.433920000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 4/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.433 920 GHz
-18.289 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.43700 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 56.00 MHz
Sweep 5.905 s (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS
Align Now, All required


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
03:50:35 PM Jun 11, 2016
Marker 1 2.442648000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.442 648 GHz
-21.268 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.45200 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 56.00 MHz
Sweep 5.905 s (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS
Align Now, All required

## 5.3. 6 dB Spectrum Bandwidth Measurement

### 5.3.1. Standard Applicable

According to §15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 5.3.2. Instruments Setting

The following table is the setting of the Spectrum Analyzer.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | > RBW |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | 100ms |

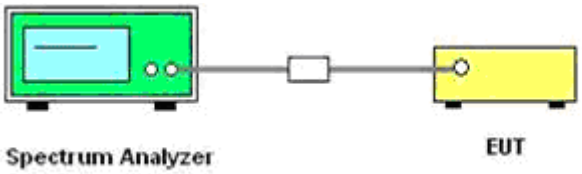
### 5.3.3. Test Procedures

1) The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

2) The resolution bandwidth and the video bandwidth were set according to KDB558074 D01 DTS Meas. Guidance v03r05.

3) Measured 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 6dB relative to the maximum level measured in the fundamental emission.

### 5.3.4. Test Setup Layout




### 5.3.5. EUT Operation during Test

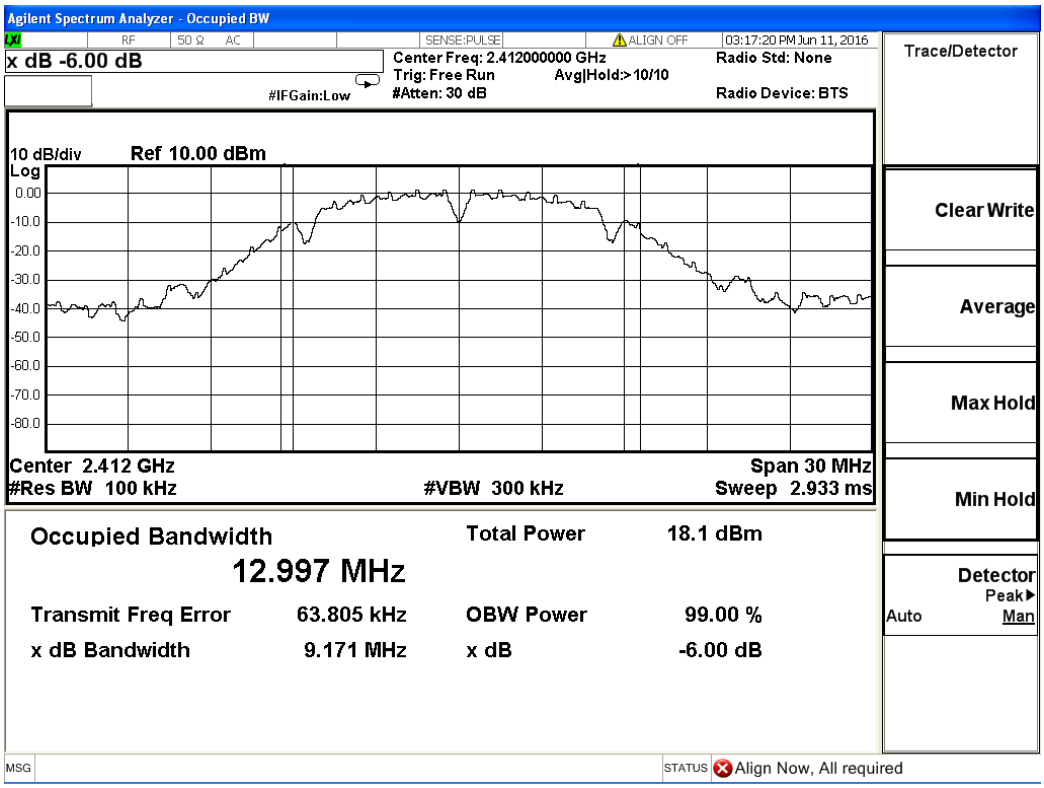
The EUT was programmed to be in continuously transmitting mode.

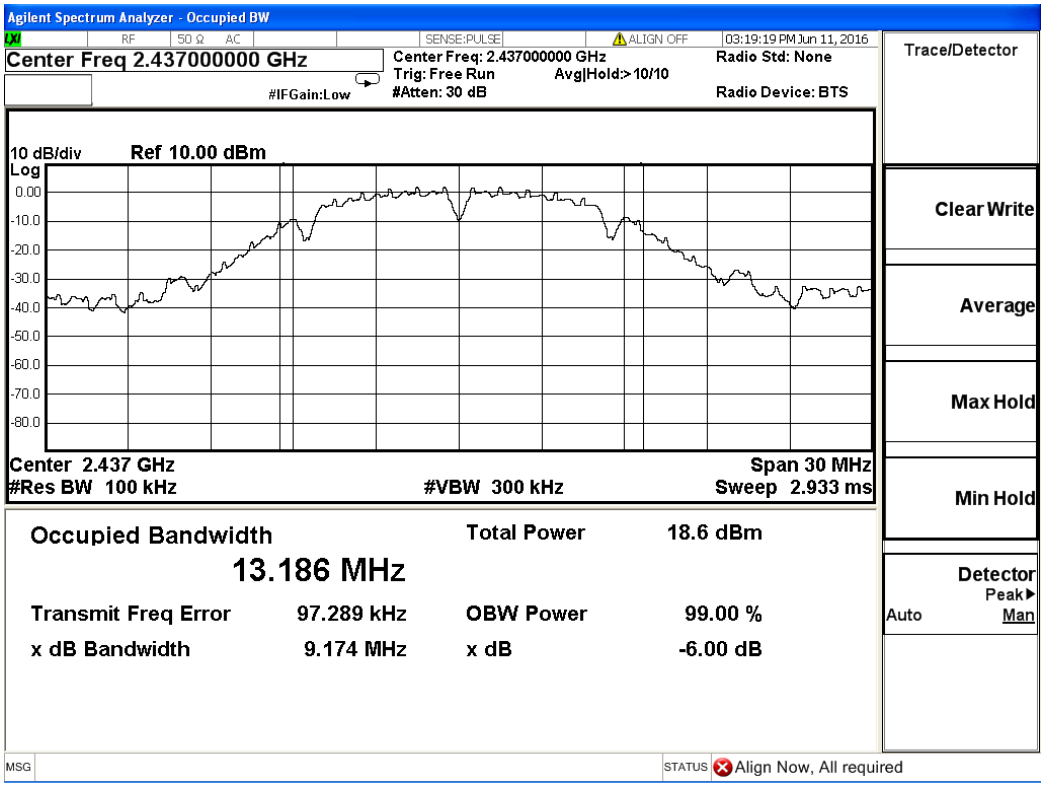
### 5.3.6. Test Result of Spectrum Bandwidth

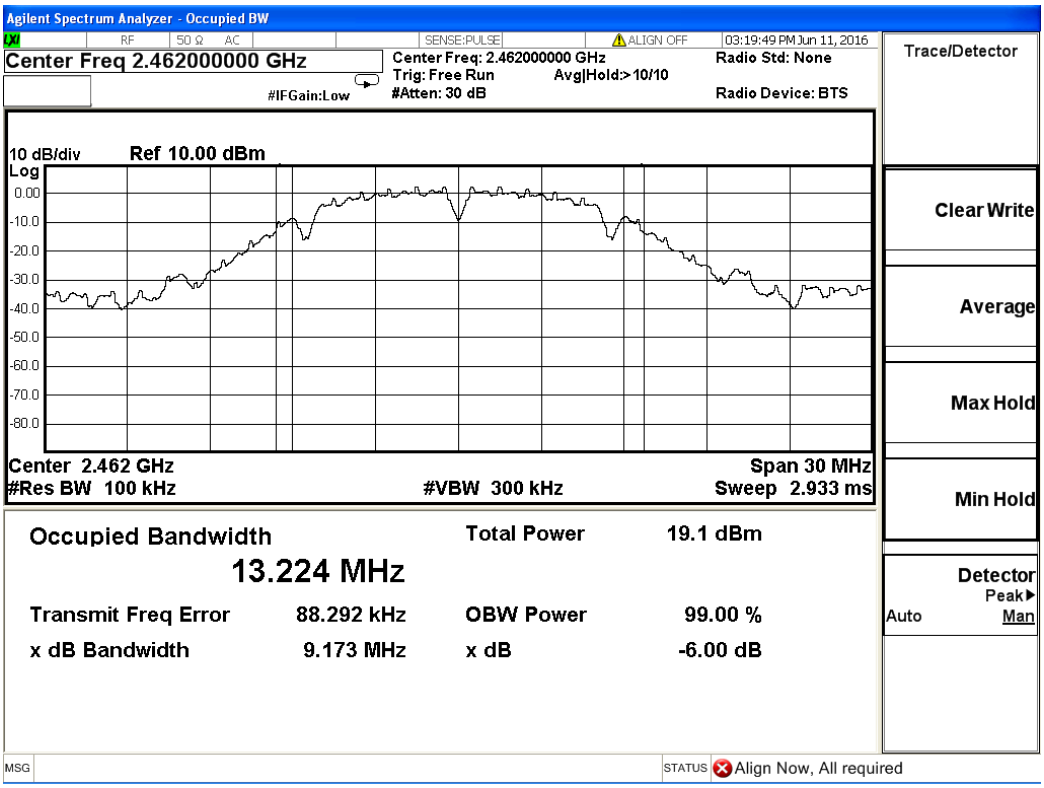
| Temperature | 25˚C | Humidity | 60% |
|---|---|---|---|
| Test Engineer | Calvin | Configurations | 802.11b/g/n |

| Mode | Channel | Frequency | 6dB Bandwidth (MHz) | 99% OBW(MHz) | Min. Limit for 6dB bandwidth (kHz) | Result |
|---|---|---|---|---|---|---|
| 802.11b | 1 | 2412 | 9.17 | 12.997 | 500 | Complies |
| | 6 | 2437 | 9.17 | 13.186 | 500 | Complies |
| | 11 | 2462 | 9.17 | 13.224 | 500 | Complies |
| 802.11g | 1 | 2412 | 16.40 | 16.409 | 500 | Complies |
| | 6 | 2437 | 16.42 | 16.476 | 500 | Complies |
| | 11 | 2462 | 16.40 | 16.482 | 500 | Complies |
| 802.11n HT20 | 1 | 2412 | 17.64 | 17.596 | 500 | Complies |
| | 6 | 2437 | 17.62 | 17.606 | 500 | Complies |
| | 11 | 2462 | 17.61 | 17.606 | 500 | Complies |
| 802.11n HT40 | 3 | 2422 | 36.33 | 35.914 | 500 | Complies |
| | 6 | 2437 | 36.13 | 35.901 | 500 | Complies |
| | 9 | 2452 | 36.16 | 35.897 | 500 | Complies |

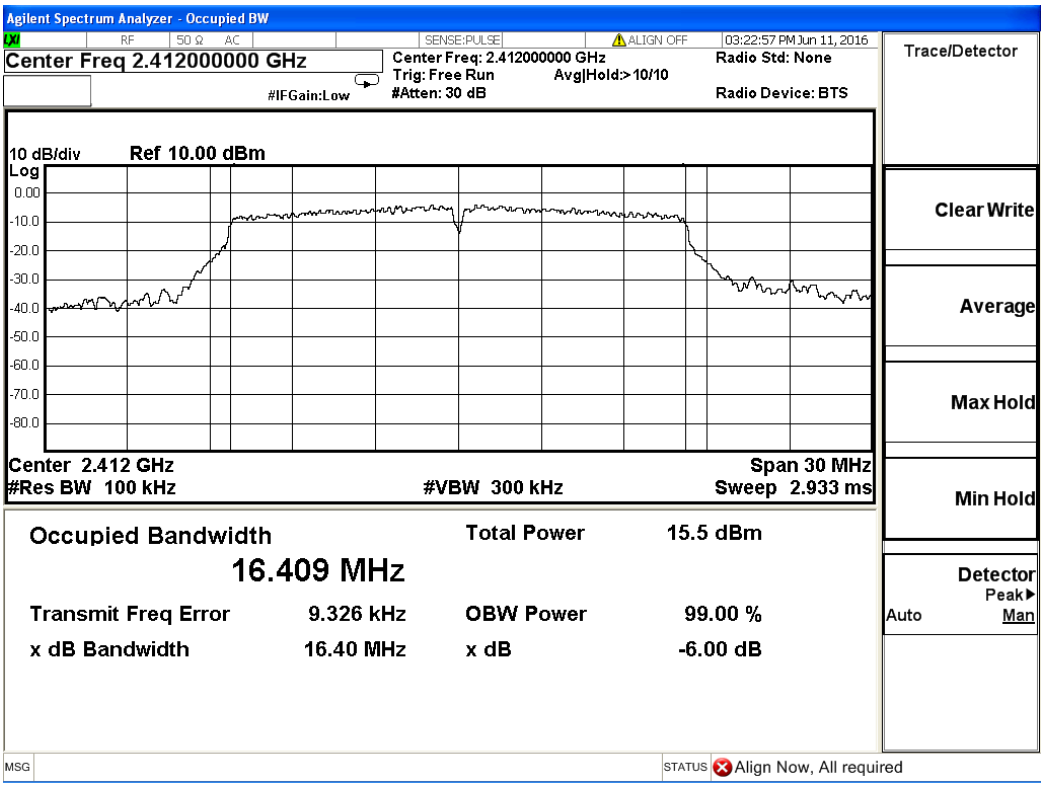
802.11b channel, 6dB bandwidth

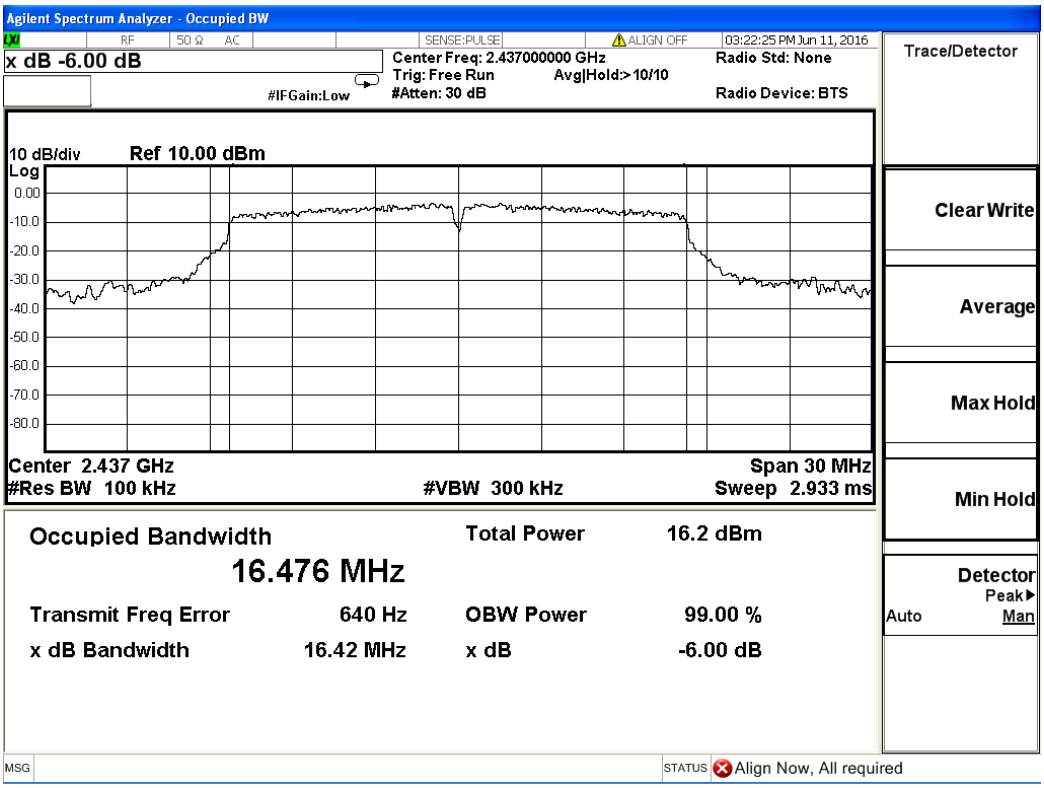


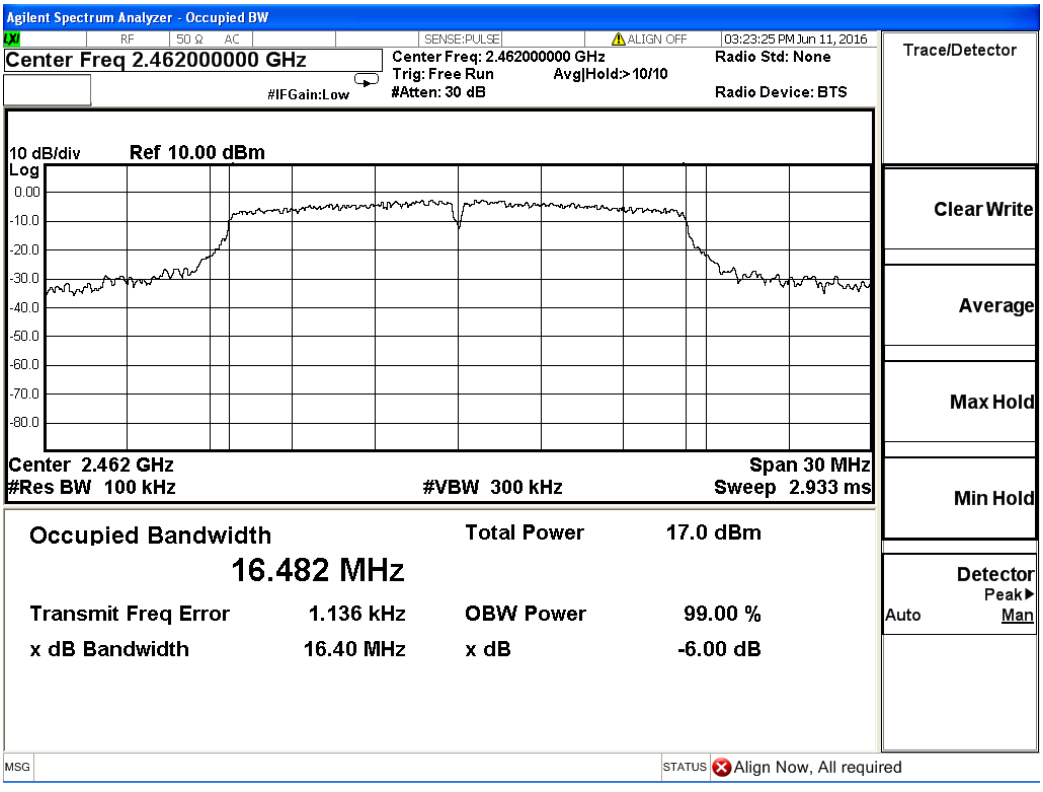





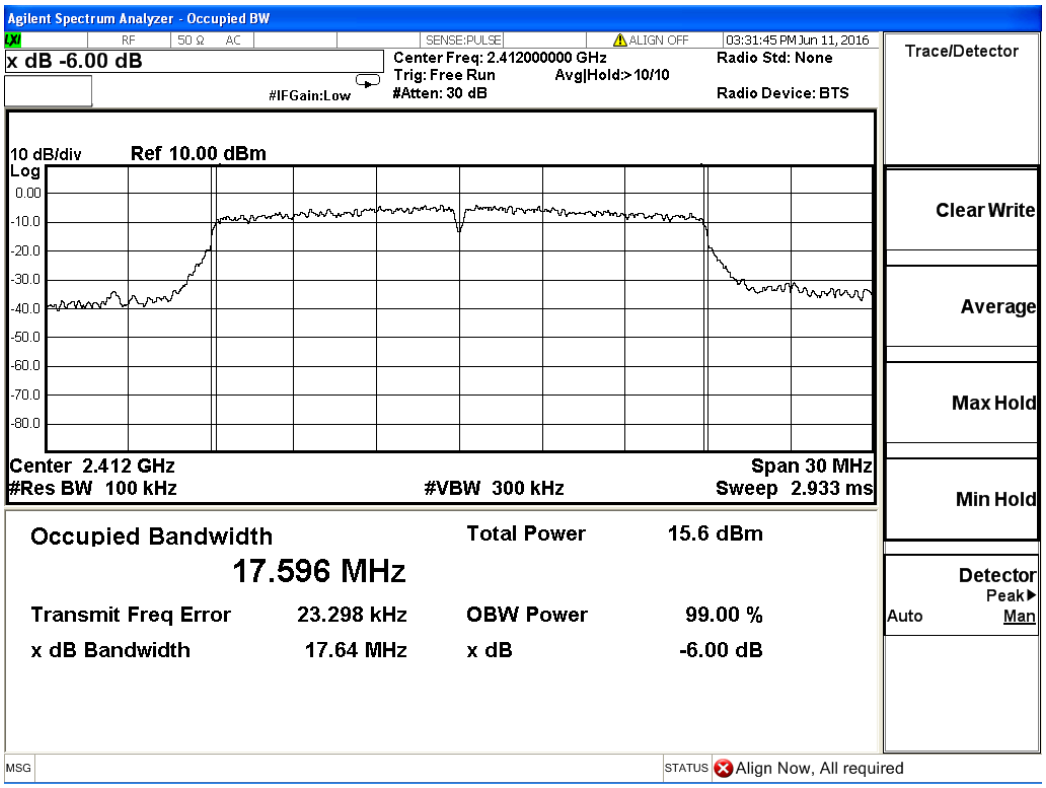

802.11g channel, 6dB bandwidth

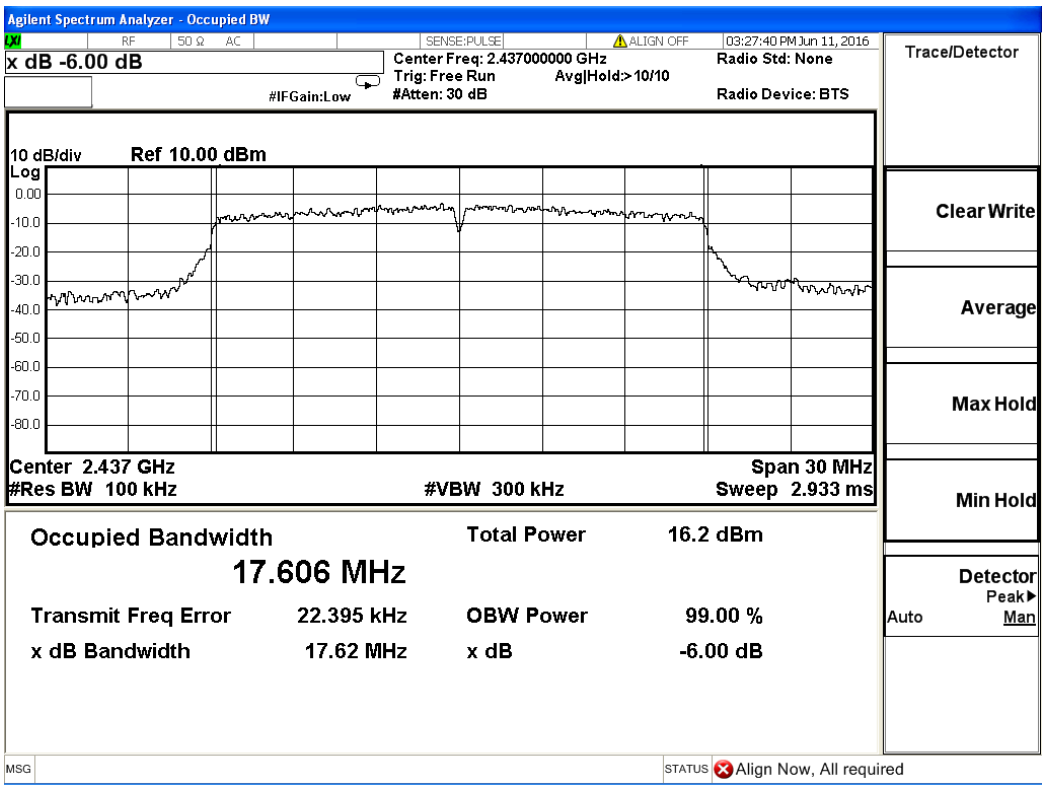


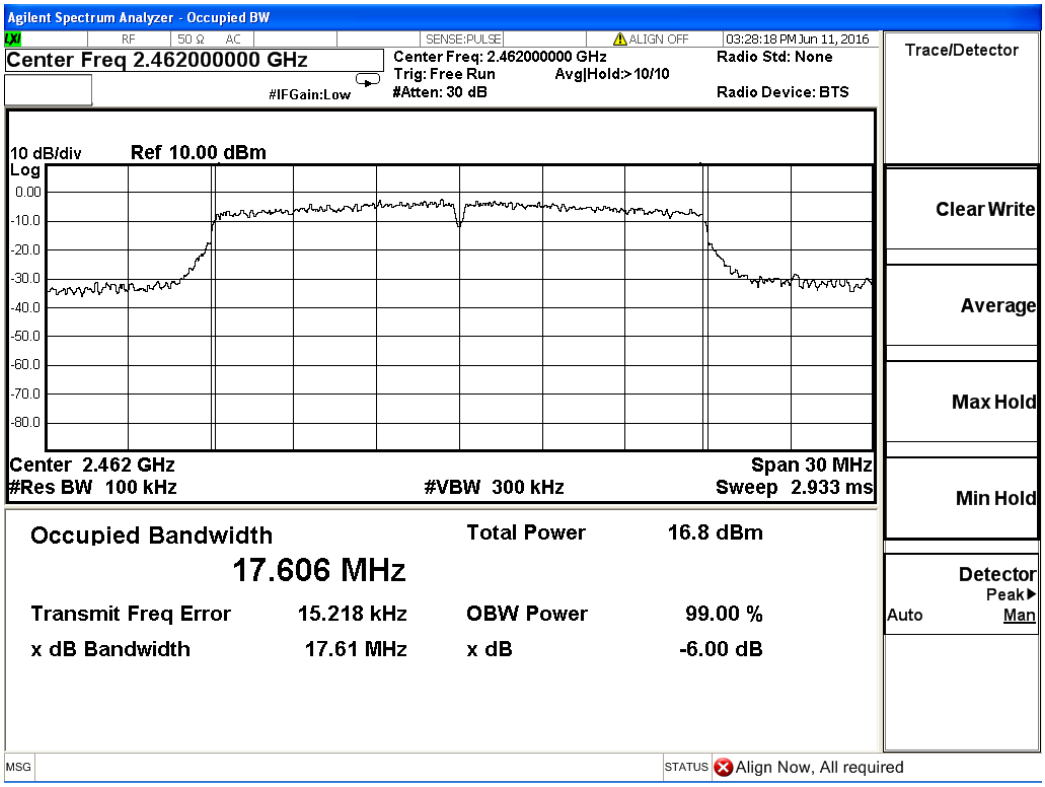

Agilent Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
03:22:25 PM Jun 11, 2016
x dB -6.00 dB
Center Freq: 2.437000000 GHz
Trig: Free Run Avg|Hold:>10/10
#Atten: 30 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Trace/Detector
10 dB/div Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.437 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 30 MHz
Sweep 2.933 ms
Occupied Bandwidth
16.476 MHz
Total Power 16.2 dBm
Transmit Freq Error 640 Hz
OBW Power 99.00 %
x dB Bandwidth 16.42 MHz
x dB -6.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Peak
Auto
Man
MSG
STATUS
Align Now, All required


Agilent Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
03:23:25 PM Jun 11, 2016
Center Freq 2.462000000 GHz
Center Freq: 2.462000000 GHz
Trig: Free Run Avg|Hold:>10/10
#Atten: 30 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Trace/Detector
10 dB/div Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.462 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 30 MHz
Sweep 2.933 ms
Occupied Bandwidth
16.482 MHz
Total Power 17.0 dBm
Transmit Freq Error 1.136 kHz
OBW Power 99.00 %
x dB Bandwidth 16.40 MHz
x dB -6.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Peak
Auto
Man
MSG
STATUS
Align Now, All required

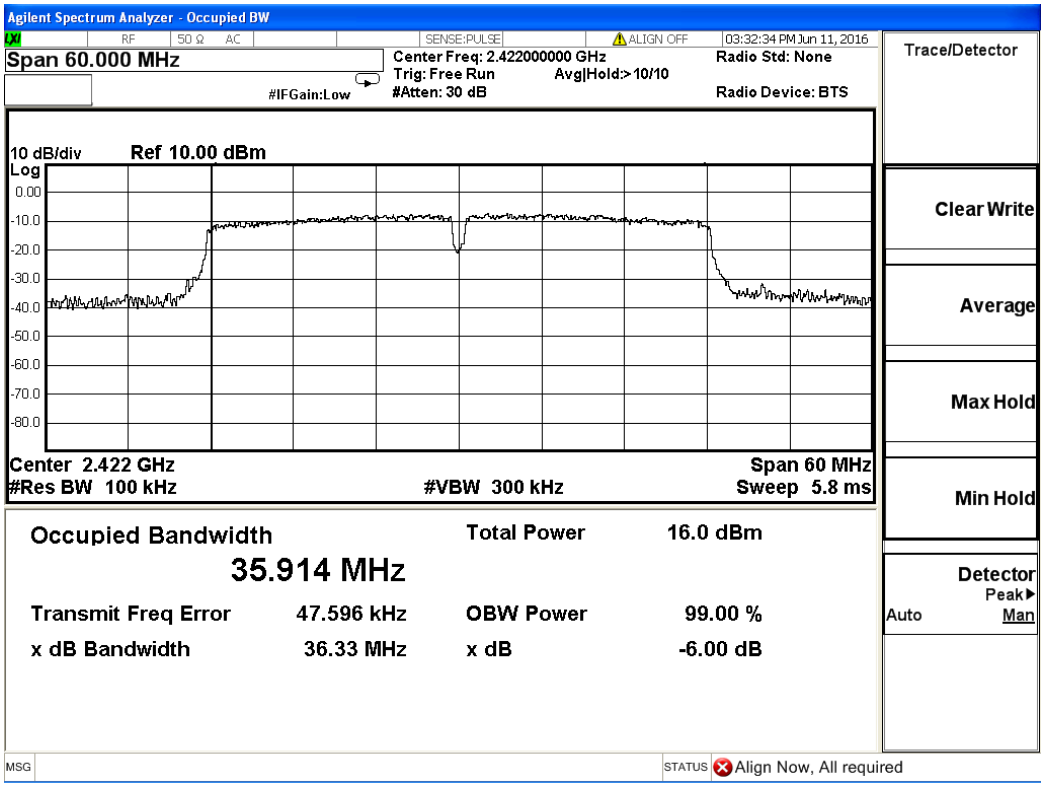
802.11n HT20 channel, 6dB bandwidth

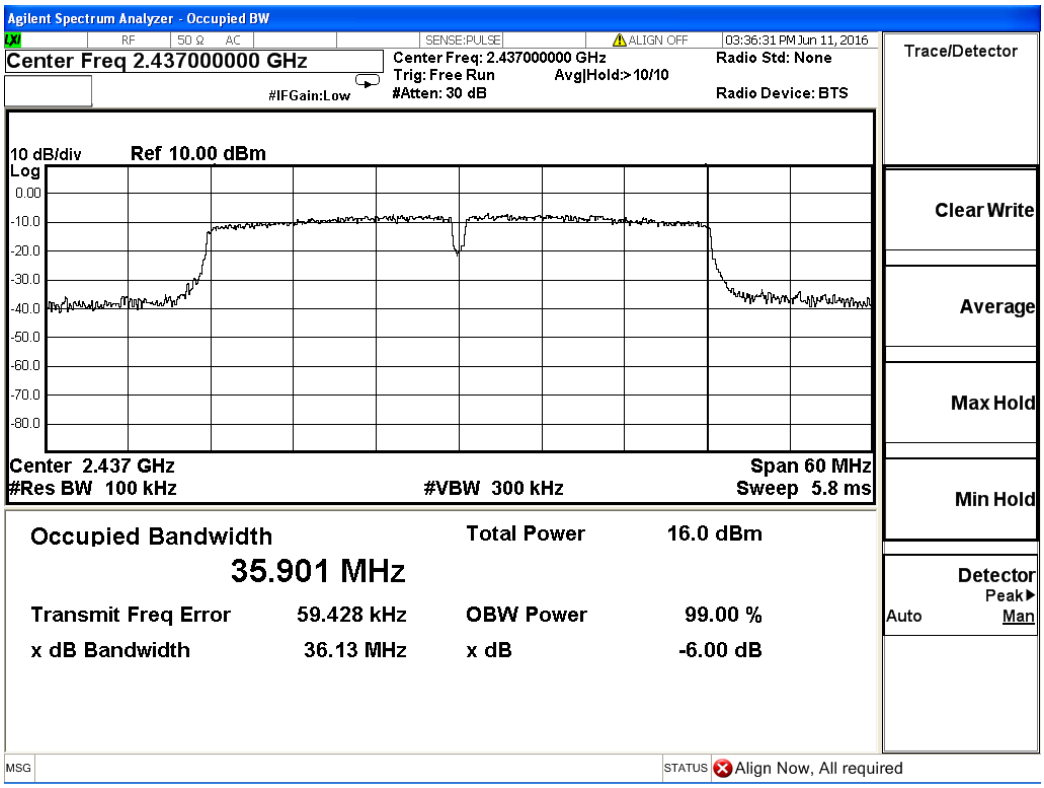


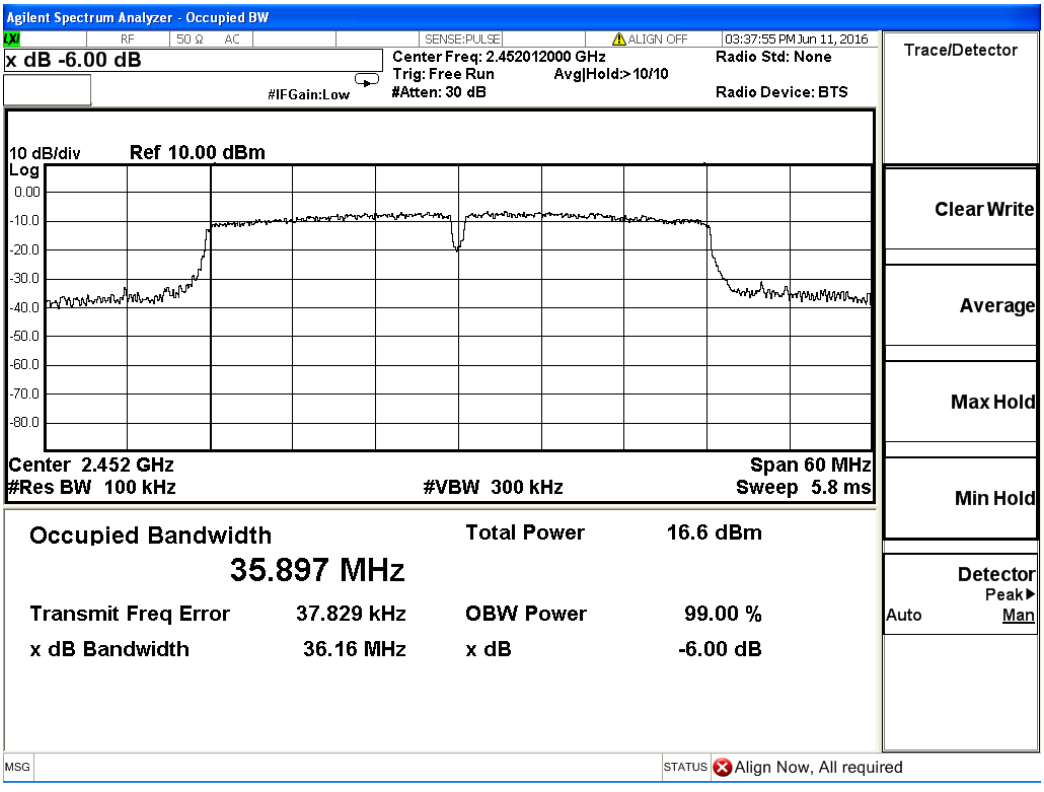






802.11n HT40 channel, 6dB bandwidth




Agilent Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
03:36:31 PM Jun 11, 2016
Center Freq 2.437000000 GHz
Center Freq: 2.437000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.437 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60 MHz
Sweep 5.8 ms
Occupied Bandwidth
35.901 MHz
Total Power 16.0 dBm
Transmit Freq Error 59.428 kHz
OBW Power 99.00 %
x dB Bandwidth 36.13 MHz
x dB -6.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Peak
Auto
Man
MSG
STATUS
Align Now, All required


Agilent Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
03:37:55 PM Jun 11, 2016
x dB -6.00 dB
Center Freq: 2.452012000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.452 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 60 MHz
Sweep 5.8 ms
Occupied Bandwidth
35.897 MHz
Total Power 16.6 dBm
Transmit Freq Error 37.829 kHz
OBW Power 99.00 %
x dB Bandwidth 36.16 MHz
x dB -6.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Peak
Auto
Man
MSG
STATUS
Align Now, All required

## 5.4. Radiated Emissions Measurement

### 5.4.1. Standard Applicable

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| 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 |

### 5.4.2. Instruments Setting

The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (Emission in restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |
| RB / VB (Emission in non-restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |

| Receiver Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 100kHz for QP |

5.4.3. Test Procedures

1) **Sequence of testing 9 kHz to 30 MHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

**Final measurement:**

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0 °to 360 °) and by rotating the elevation axes (0 °to 360 °).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) **Sequence of testing 30 MHz to 1 GHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

**Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (±45 °) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) **Sequence of testing 1 GHz to 18 GHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

**Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (±45 °) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) **Sequence of testing above 18 GHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

**Premeasurement:**

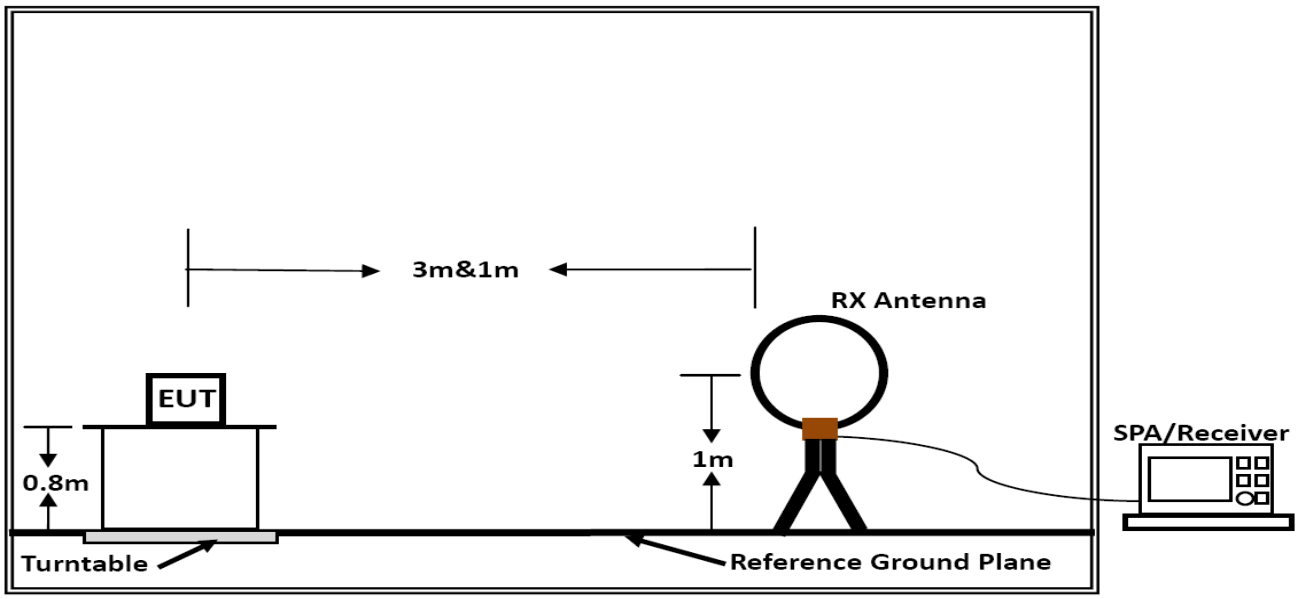
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

**Final measurement:**

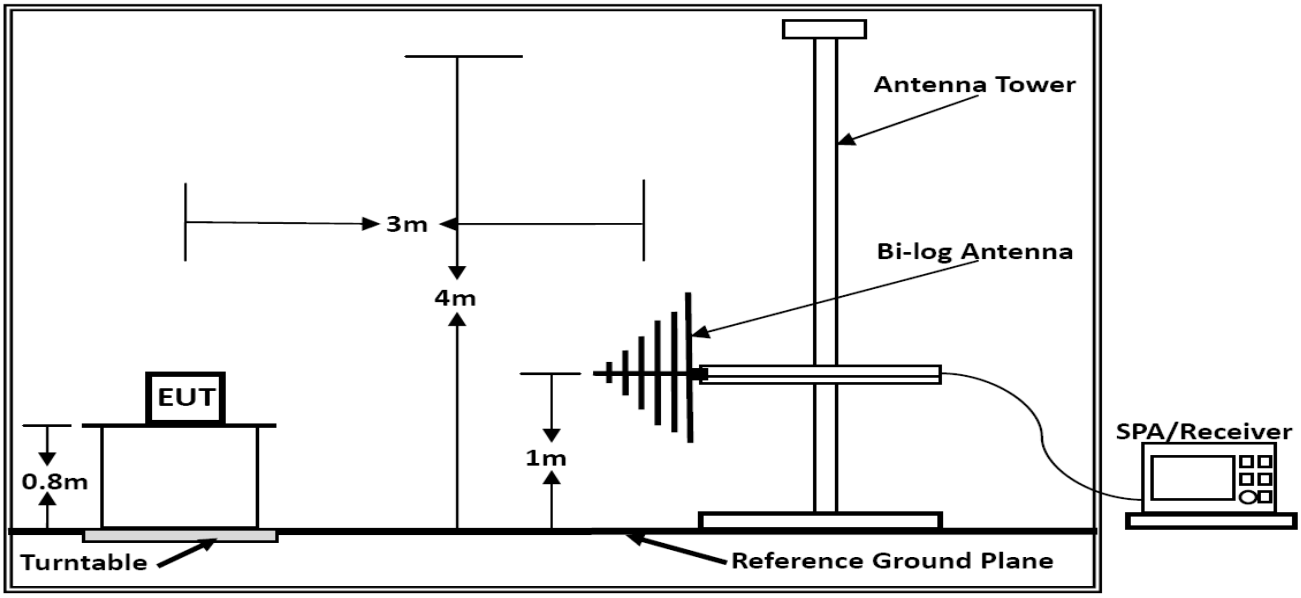
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

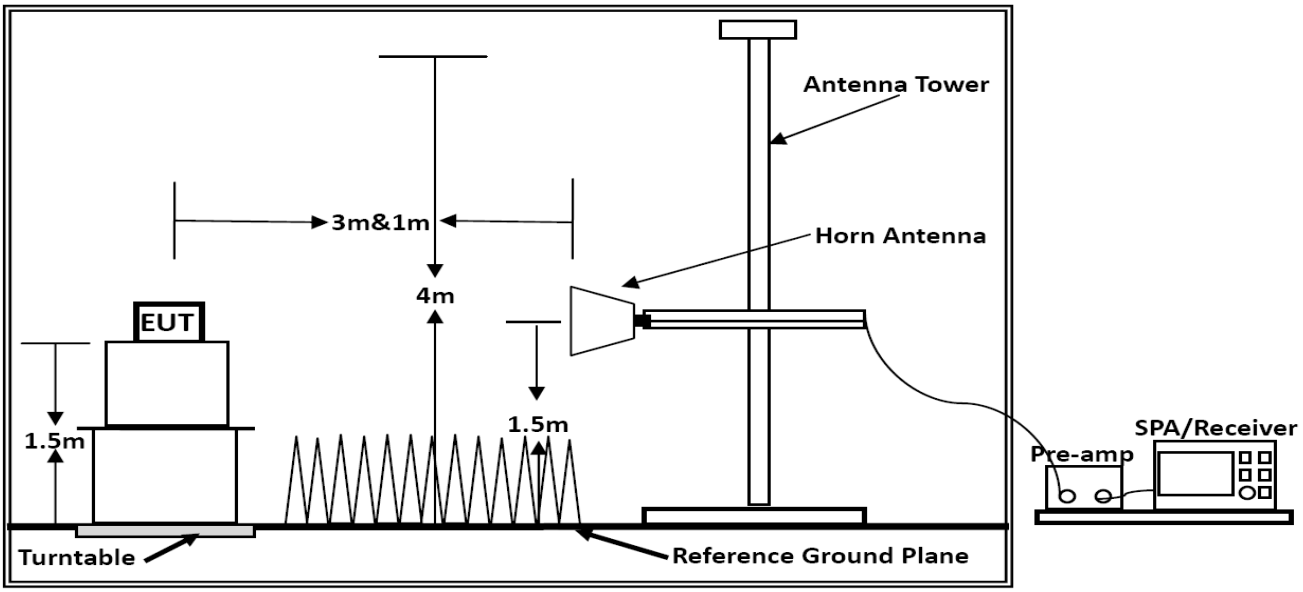
5.4.4. Test Setup Layout




**Below 30MHz**




**Below 1GHz**




**Above 1GHz**

5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.4.6. Results of Radiated Emissions (9kHz~30MHz)

| Temperature | 25℃ | Humidity | 60% |
|---|---|---|---|
| Test Engineer | Calvin | Configurations | 802.11b/g/n |

| Freq. (MHz) | Level (dBuV) | Over Limit (dB) | Over Limit (dBuV) | Remark |
|---|---|---|---|---|
| - | - | - | - | See Note |

Note:

The radiated emissions from 9kHz to 30MHz are at least 20dB below the official limit and no need to report.

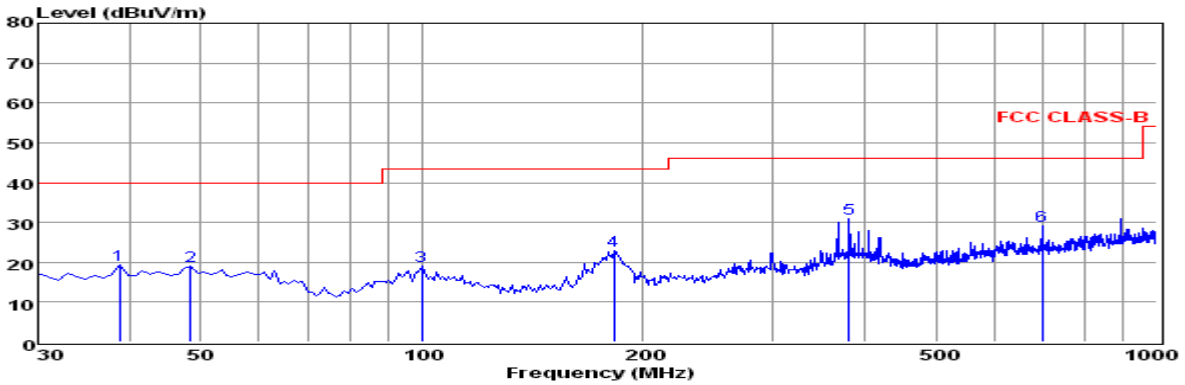
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

5.4.7. Results of Radiated Emissions (30MHz~1GHz)

| Temperature | 25℃ | Humidity | 60% |
|---|---|---|---|
| Test Engineer | Calvin | Configurations | 802.11g (Low Channel) |

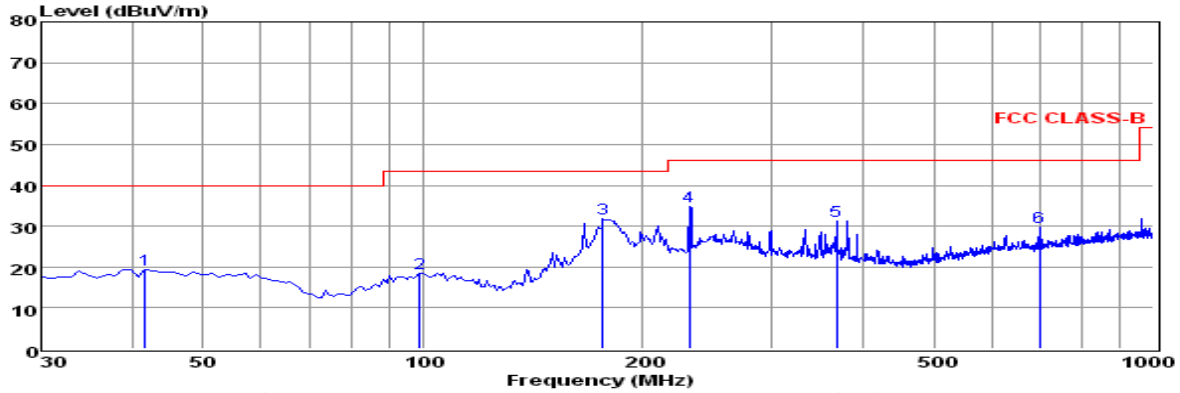
Horizontal:




| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 38.73 | 5.64 | 0.38 | 13.25 | 19.27 | 40.00 | -20.73 | QP |
| 2 | 48.43 | 5.20 | 0.35 | 13.34 | 18.89 | 40.00 | -21.11 | QP |
| 3 | 99.84 | 5.15 | 0.60 | 13.15 | 18.90 | 43.50 | -24.60 | QP |
| 4 | 182.29 | 12.19 | 0.89 | 9.88 | 22.96 | 43.50 | -20.54 | QP |
| 5 | 381.14 | 15.27 | 1.18 | 14.62 | 31.07 | 46.00 | -14.93 | QP |
| 6 | 698.33 | 8.61 | 1.59 | 18.80 | 29.00 | 46.00 | -17.00 | QP |

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Vertical:




| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 41.64 | 5.39 | 0.50 | 13.57 | 19.46 | 40.00 | -20.54 | QP |
| 2 | 98.87 | 4.80 | 0.61 | 13.09 | 18.50 | 43.50 | -25.00 | QP |
| 3 | 176.47 | 21.56 | 0.73 | 9.43 | 31.72 | 43.50 | -11.78 | QP |
| 4 | 231.76 | 22.02 | 0.98 | 11.72 | 34.72 | 46.00 | -11.28 | QP |
| 5 | 368.53 | 15.59 | 1.22 | 14.50 | 31.31 | 46.00 | -14.69 | QP |
| 6 | 698.33 | 9.24 | 1.59 | 18.80 | 29.63 | 46.00 | -16.37 | QP |

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

****Note:*

*Pre-scan all mode and recorded the worst case results in this report (802.11g (TX-Low Channel)).*

*Emission level (dBuV/m) = 20 log Emission level (uV/m).*

*Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.*

5.4.8. Results for Radiated Emissions (Above 1GHz)

Note: Only recorded the worst test result.

802.11b

TX-Low Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4824.02 | 52.45 | 33.06 | 35.04 | 3.94 | 54.41 | 74 | -19.59 | Peak | Horizontal |
| 4824.05 | 41.11 | 33.06 | 35.04 | 3.94 | 43.07 | 54 | -10.93 | Average | Horizontal |
| 4824.02 | 52.53 | 33.06 | 35.04 | 3.94 | 54.49 | 74 | -19.51 | Peak | Vertical |
| 4824.05 | 42.69 | 33.06 | 35.04 | 3.94 | 44.65 | 54 | -9.35 | Average | Vertical |

TX-Middle Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4874.07 | 51.11 | 33.16 | 35.15 | 3.96 | 53.08 | 74 | -20.92 | Peak | Horizontal |
| 4874.10 | 40.81 | 33.16 | 35.15 | 3.96 | 42.78 | 54 | -11.22 | Average | Horizontal |
| 4874.07 | 52.63 | 33.16 | 35.15 | 3.96 | 54.60 | 74 | -19.40 | Peak | Vertical |
| 4874.10 | 42.92 | 33.16 | 35.15 | 3.96 | 44.89 | 54 | -9.11 | Average | Vertical |

TX-High Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4924.03 | 52.01 | 33.26 | 35.14 | 3.98 | 54.11 | 74 | -19.89 | Peak | Horizontal |
| 4924.05 | 41.83 | 33.26 | 35.14 | 3.98 | 43.93 | 54 | -10.07 | Average | Horizontal |
| 4924.03 | 53.58 | 33.26 | 35.14 | 3.98 | 55.68 | 74 | -18.32 | Peak | Vertical |
| 4924.05 | 43.73 | 33.26 | 35.14 | 3.98 | 45.83 | 54 | -8.17 | Average | Vertical |

802.11g

TX-Low Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4824.10 | 53.57 | 33.06 | 35.04 | 3.94 | 55.53 | 74 | -18.47 | Peak | Horizontal |
| 4824.13 | 42.88 | 33.06 | 35.04 | 3.94 | 44.84 | 54 | -9.16 | Average | Horizontal |
| 4824.10 | 54.87 | 33.06 | 35.04 | 3.94 | 56.83 | 74 | -17.17 | Peak | Vertical |
| 4824.13 | 45.42 | 33.06 | 35.04 | 3.94 | 47.38 | 54 | -6.62 | Average | Vertical |

TX-Middle Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4874.11 | 52.11 | 33.16 | 35.15 | 3.96 | 54.08 | 74 | -19.92 | Peak | Horizontal |
| 4874.13 | 44.24 | 33.16 | 35.15 | 3.96 | 46.21 | 54 | -7.79 | Average | Horizontal |
| 4874.11 | 53.53 | 33.16 | 35.15 | 3.96 | 55.50 | 74 | -18.50 | Peak | Vertical |
| 4874.13 | 44.12 | 33.16 | 35.15 | 3.96 | 46.09 | 54 | -7.91 | Average | Vertical |

TX-High Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4924.14 | 52.58 | 33.26 | 35.14 | 3.98 | 54.68 | 74 | -19.32 | Peak | Horizontal |
| 4924.17 | 42.64 | 33.26 | 35.14 | 3.98 | 44.74 | 54 | -9.26 | Average | Horizontal |
| 4924.14 | 53.70 | 33.26 | 35.14 | 3.98 | 55.80 | 74 | -18.20 | Peak | Vertical |
| 4924.17 | 44.02 | 33.26 | 35.14 | 3.98 | 46.12 | 54 | -7.88 | Average | Vertical |

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TX-Low Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4824.07 | 52.92 | 33.06 | 35.04 | 3.94 | 54.88 | 74 | -19.12 | Peak | Horizontal |
| 4824.10 | 42.41 | 33.06 | 35.04 | 3.94 | 44.37 | 54 | -9.63 | Average | Horizontal |
| 4824.07 | 53.63 | 33.06 | 35.04 | 3.94 | 55.59 | 74 | -18.41 | Peak | Vertical |
| 4824.10 | 43.81 | 33.06 | 35.04 | 3.94 | 45.77 | 54 | -8.23 | Average | Vertical |

TX-Middle Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4874.11 | 50.03 | 33.16 | 35.15 | 3.96 | 52.00 | 74 | -22.00 | Peak | Horizontal |
| 4874.13 | 40.20 | 33.16 | 35.15 | 3.96 | 42.17 | 54 | -11.83 | Average | Horizontal |
| 4874.11 | 52.11 | 33.16 | 35.15 | 3.96 | 54.08 | 74 | -19.92 | Peak | Vertical |
| 4874.13 | 43.26 | 33.16 | 35.15 | 3.96 | 45.23 | 54 | -8.77 | Average | Vertical |

TX-High Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4924.07 | 51.34 | 33.26 | 35.14 | 3.98 | 53.44 | 74 | -20.56 | Peak | Horizontal |
| 4924.10 | 41.90 | 33.26 | 35.14 | 3.98 | 44.00 | 54 | -10.00 | Average | Horizontal |
| 4924.07 | 52.55 | 33.26 | 35.14 | 3.98 | 54.65 | 74 | -19.35 | Peak | Vertical |
| 4924.10 | 43.03 | 33.26 | 35.14 | 3.98 | 45.13 | 54 | -8.87 | Average | Vertical |

802.11n HT40

TX-Low Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4844.05 | 50.44 | 33.06 | 35.04 | 3.94 | 52.40 | 74 | -21.60 | Peak | Horizontal |
| 4844.07 | 40.10 | 33.06 | 35.04 | 3.94 | 42.06 | 54 | -11.94 | Average | Horizontal |
| 4844.05 | 51.85 | 33.06 | 35.04 | 3.94 | 53.81 | 74 | -20.19 | Peak | Vertical |
| 4844.07 | 41.98 | 33.06 | 35.04 | 3.94 | 43.94 | 54 | -10.06 | Average | Vertical |

TX-Middle Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4874.03 | 50.73 | 33.16 | 35.15 | 3.96 | 52.70 | 74 | -21.30 | Peak | Horizontal |
| 4874.05 | 40.39 | 33.16 | 35.15 | 3.96 | 42.36 | 54 | -11.64 | Average | Horizontal |
| 4874.03 | 51.59 | 33.16 | 35.15 | 3.96 | 53.56 | 74 | -20.44 | Peak | Vertical |
| 4874.05 | 41.62 | 33.16 | 35.15 | 3.96 | 43.59 | 54 | -10.41 | Average | Vertical |

TX-High Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4904.04 | 49.44 | 33.26 | 35.14 | 3.98 | 51.54 | 74 | -22.46 | Peak | Horizontal |
| 4904.07 | 39.74 | 33.26 | 35.14 | 3.98 | 41.84 | 54 | -12.16 | Average | Horizontal |
| 4904.04 | 50.31 | 33.26 | 35.14 | 3.98 | 52.41 | 74 | -21.59 | Peak | Vertical |
| 4904.07 | 41.05 | 33.26 | 35.14 | 3.98 | 43.15 | 54 | -10.85 | Average | Vertical |

***Notes:***

1. *Measuring frequencies from 9k~10th harmonic or 26.5GHz (which is less), No emission found between lowest internal used/generated frequency to 30MHz.*
2. *Radiated emissions measured in frequency range from 30MHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.*
3. *The radiated emissions from 18GHz to 25GHz are at least 20dB below the official limit and no need to report.*

5.4.9. Results of Band Edges Test (Radiated)

Note: Only recorded the worst test result.

802.11b

TX-Low Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2377.34 | 48.01 | 32.89 | 35.16 | 3.51 | 49.25 | 74 | -24.75 | Peak | Horizontal |
| 2377.37 | 38.51 | 32.90 | 35.16 | 3.51 | 39.76 | 54 | -14.24 | Average | Horizontal |
| 2390.00 | 51.43 | 32.92 | 35.16 | 3.54 | 52.73 | 74 | -21.27 | Peak | Horizontal |
| 2389.97 | 40.86 | 32.92 | 35.16 | 3.54 | 42.16 | 54 | -11.84 | Average | Horizontal |
| 2400.00 | 57.38 | 32.92 | 35.16 | 3.54 | 58.68 | 74 | -15.32 | Peak | Horizontal |
| 2399.97 | 47.02 | 32.92 | 35.16 | 3.54 | 48.32 | 54 | -5.68 | Average | Horizontal |
| 2377.34 | 48.80 | 32.89 | 35.16 | 3.51 | 50.04 | 74 | -23.96 | Peak | Vertical |
| 2377.37 | 39.43 | 32.90 | 35.16 | 3.51 | 40.68 | 54 | -13.32 | Average | Vertical |
| 2390.00 | 51.44 | 32.92 | 35.16 | 3.54 | 52.74 | 74 | -21.26 | Peak | Vertical |
| 2389.97 | 41.70 | 32.92 | 35.16 | 3.54 | 43.00 | 54 | -11.00 | Average | Vertical |
| 2400.00 | 59.57 | 32.92 | 35.16 | 3.54 | 60.87 | 74 | -13.13 | Peak | Vertical |
| 2399.97 | 48.55 | 32.92 | 35.16 | 3.54 | 49.85 | 54 | -4.15 | Average | Vertical |

TX-High Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2483.50 | 50.73 | 33.06 | 35.18 | 3.60 | 52.21 | 74 | -21.79 | Peak | Horizontal |
| 2483.53 | 39.98 | 33.08 | 35.18 | 3.60 | 41.48 | 54 | -12.52 | Average | Horizontal |
| 2487.51 | 48.94 | 33.08 | 35.18 | 3.62 | 50.46 | 74 | -23.54 | Peak | Horizontal |
| 2487.54 | 39.01 | 33.08 | 35.18 | 3.62 | 40.53 | 54 | -13.47 | Average | Horizontal |
| 2483.50 | 52.32 | 33.06 | 35.18 | 3.60 | 53.80 | 74 | -20.20 | Peak | Vertical |
| 2483.53 | 41.20 | 33.08 | 35.18 | 3.60 | 42.70 | 54 | -11.30 | Average | Vertical |
| 2487.51 | 49.51 | 33.08 | 35.18 | 3.62 | 51.03 | 74 | -22.97 | Peak | Vertical |
| 2487.54 | 40.44 | 33.08 | 35.18 | 3.62 | 41.96 | 54 | -12.04 | Average | Vertical |

802.11g

TX-Low Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2377.67 | 49.82 | 32.89 | 35.16 | 3.51 | 51.06 | 74 | -22.94 | Peak | Horizontal |
| 2377.70 | 39.49 | 32.90 | 35.16 | 3.51 | 40.74 | 54 | -13.26 | Average | Horizontal |
| 2390.00 | 53.54 | 32.92 | 35.16 | 3.54 | 54.84 | 74 | -19.16 | Peak | Horizontal |
| 2389.97 | 42.93 | 32.92 | 35.16 | 3.54 | 44.23 | 54 | -9.77 | Average | Horizontal |
| 2400.00 | 57.10 | 32.92 | 35.16 | 3.54 | 58.40 | 74 | -15.60 | Peak | Horizontal |
| 2399.97 | 46.66 | 32.92 | 35.16 | 3.54 | 47.96 | 54 | -6.04 | Average | Horizontal |
| 2377.67 | 51.19 | 32.89 | 35.16 | 3.51 | 52.43 | 74 | -21.57 | Peak | Vertical |
| 2377.70 | 40.93 | 32.90 | 35.16 | 3.51 | 42.18 | 54 | -11.82 | Average | Vertical |
| 2390.00 | 54.84 | 32.92 | 35.16 | 3.54 | 56.14 | 74 | -17.86 | Peak | Vertical |
| 2389.97 | 43.02 | 32.92 | 35.16 | 3.54 | 44.32 | 54 | -9.68 | Average | Vertical |
| 2400.00 | 58.83 | 32.92 | 35.16 | 3.54 | 60.13 | 74 | -13.87 | Peak | Vertical |
| 2399.97 | 48.53 | 32.92 | 35.16 | 3.54 | 49.83 | 54 | -4.17 | Average | Vertical |

TX-High Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2483.50 | 50.73 | 33.06 | 35.18 | 3.60 | 52.21 | 74 | -21.79 | Peak | Horizontal |
| 2483.53 | 39.79 | 33.08 | 35.18 | 3.60 | 41.29 | 54 | -12.71 | Average | Horizontal |
| 2486.74 | 52.52 | 33.08 | 35.18 | 3.62 | 54.04 | 74 | -19.96 | Peak | Horizontal |
| 2486.77 | 40.35 | 33.08 | 35.18 | 3.62 | 41.87 | 54 | -12.13 | Average | Horizontal |
| 2483.50 | 50.76 | 33.06 | 35.18 | 3.60 | 52.24 | 74 | -21.76 | Peak | Vertical |
| 2483.53 | 40.80 | 33.08 | 35.18 | 3.60 | 42.30 | 54 | -11.70 | Average | Vertical |
| 2486.74 | 53.08 | 33.08 | 35.18 | 3.62 | 54.60 | 74 | -19.40 | Peak | Vertical |
| 2486.77 | 42.04 | 33.08 | 35.18 | 3.62 | 43.56 | 54 | -10.44 | Average | Vertical |

802.11n(HT20)

TX-Low Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2377.51 | 50.04 | 32.89 | 35.16 | 3.51 | 51.28 | 74 | -22.72 | Peak | Horizontal |
| 2377.53 | 38.52 | 32.9 | 35.16 | 3.51 | 39.77 | 54 | -14.23 | Average | Horizontal |
| 2390.00 | 52.25 | 32.92 | 35.16 | 3.54 | 53.55 | 74 | -20.45 | Peak | Horizontal |
| 2389.97 | 41.26 | 32.92 | 35.16 | 3.54 | 42.56 | 54 | -11.44 | Average | Horizontal |
| 2400.00 | 58.55 | 32.92 | 35.16 | 3.54 | 59.85 | 74 | -14.15 | Peak | Horizontal |
| 2399.97 | 48.27 | 32.92 | 35.16 | 3.54 | 49.57 | 54 | -4.43 | Average | Horizontal |
| 2377.51 | 50.49 | 32.89 | 35.16 | 3.51 | 51.73 | 74 | -22.27 | Peak | Vertical |
| 2377.53 | 39.67 | 32.9 | 35.16 | 3.51 | 40.92 | 54 | -13.08 | Average | Vertical |
| 2390.00 | 52.56 | 32.92 | 35.16 | 3.54 | 53.86 | 74 | -20.14 | Peak | Vertical |
| 2389.97 | 42.52 | 32.92 | 35.16 | 3.54 | 43.82 | 54 | -10.18 | Average | Vertical |
| 2400.00 | 60.07 | 32.92 | 35.16 | 3.54 | 61.37 | 74 | -12.63 | Peak | Vertical |
| 2399.97 | 48.56 | 32.92 | 35.16 | 3.54 | 49.86 | 54 | -4.14 | Average | Vertical |

TX-High Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2483.50 | 49.43 | 33.06 | 35.18 | 3.60 | 50.91 | 74 | -23.09 | Peak | Horizontal |
| 2483.53 | 39.52 | 33.08 | 35.18 | 3.60 | 41.02 | 54 | -12.98 | Average | Horizontal |
| 2488.61 | 51.04 | 33.08 | 35.18 | 3.62 | 52.56 | 74 | -21.44 | Peak | Horizontal |
| 2488.64 | 40.43 | 33.08 | 35.18 | 3.62 | 41.95 | 54 | -12.05 | Average | Horizontal |
| 2483.50 | 50.61 | 33.06 | 35.18 | 3.60 | 52.09 | 74 | -21.91 | Peak | Vertical |
| 2483.53 | 41.28 | 33.08 | 35.18 | 3.60 | 42.78 | 54 | -11.22 | Average | Vertical |
| 2488.61 | 51.79 | 33.08 | 35.18 | 3.62 | 53.31 | 74 | -20.69 | Peak | Vertical |
| 2488.64 | 41.07 | 33.08 | 35.18 | 3.62 | 42.59 | 54 | -11.61 | Average | Vertical |

802.11n(HT40)

TX-Low Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2378.13 | 49.38 | 32.89 | 35.16 | 3.51 | 50.62 | 74 | -23.38 | Peak | Horizontal |
| 2378.15 | 38.75 | 32.90 | 35.16 | 3.51 | 40.00 | 54 | -14.00 | Average | Horizontal |
| 2390.00 | 51.25 | 32.92 | 35.16 | 3.54 | 52.55 | 74 | -21.45 | Peak | Horizontal |
| 2389.98 | 40.38 | 32.92 | 35.16 | 3.54 | 41.68 | 54 | -12.32 | Average | Horizontal |
| 2400.00 | 52.43 | 32.92 | 35.16 | 3.54 | 53.73 | 74 | -20.27 | Peak | Horizontal |
| 2399.97 | 42.48 | 32.92 | 35.16 | 3.54 | 43.78 | 54 | -10.22 | Average | Horizontal |
| 2378.13 | 50.16 | 32.89 | 35.16 | 3.51 | 51.40 | 74 | -22.60 | Peak | Vertical |
| 2378.15 | 40.75 | 32.90 | 35.16 | 3.51 | 42.00 | 54 | -12.00 | Average | Vertical |
| 2390.00 | 52.10 | 32.92 | 35.16 | 3.54 | 53.40 | 74 | -20.60 | Peak | Vertical |
| 2389.98 | 41.89 | 32.92 | 35.16 | 3.54 | 43.19 | 54 | -10.81 | Average | Vertical |
| 2400.00 | 54.38 | 32.92 | 35.16 | 3.54 | 55.68 | 74 | -18.32 | Peak | Vertical |
| 2399.97 | 47.49 | 32.92 | 35.16 | 3.54 | 48.79 | 54 | -5.21 | Average | Vertical |

TX-High Channel

| Freq. MHz | Reading dBuv | Ant. Fac. dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 2483.50 | 49.42 | 33.06 | 35.18 | 3.60 | 50.90 | 74 | -23.10 | Peak | Horizontal |
| 2483.53 | 39.21 | 33.08 | 35.18 | 3.60 | 40.71 | 54 | -13.29 | Average | Horizontal |
| 2489.57 | 50.34 | 33.08 | 35.18 | 3.62 | 51.86 | 74 | -22.14 | Peak | Horizontal |
| 2489.60 | 40.08 | 33.08 | 35.18 | 3.62 | 41.60 | 54 | -12.40 | Average | Horizontal |
| 2483.50 | 50.06 | 33.06 | 35.18 | 3.60 | 51.54 | 74 | -22.46 | Peak | Vertical |
| 2483.53 | 39.75 | 33.08 | 35.18 | 3.60 | 41.25 | 54 | -12.75 | Average | Vertical |
| 2489.57 | 50.96 | 33.08 | 35.18 | 3.62 | 52.48 | 74 | -21.52 | Peak | Vertical |
| 2489.60 | 40.64 | 33.08 | 35.18 | 3.62 | 42.16 | 54 | -11.84 | Average | Vertical |

## 5.5. Conducted Spurious Emissions and Band Edges Test

### 5.5.1. Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a)is not required. In addition, 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) (see §15.205(c)).

### 5.5.2. Instruments Setting

The following table is the setting of the spectrum analyzer.

| Spectrum Parameter | Setting |
|---|---|
| Detector | Peak |
| Attenuation | Auto |
| RB / VB (Emission in restricted band) | 100KHz/300KHz |
| RB / VB (Emission in non-restricted band) | 100KHz/300KHz |

### 5.5.3. Test Procedures

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

The spectrum from 9kHz to 26.5GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

### 5.5.4. Test Setup Layout

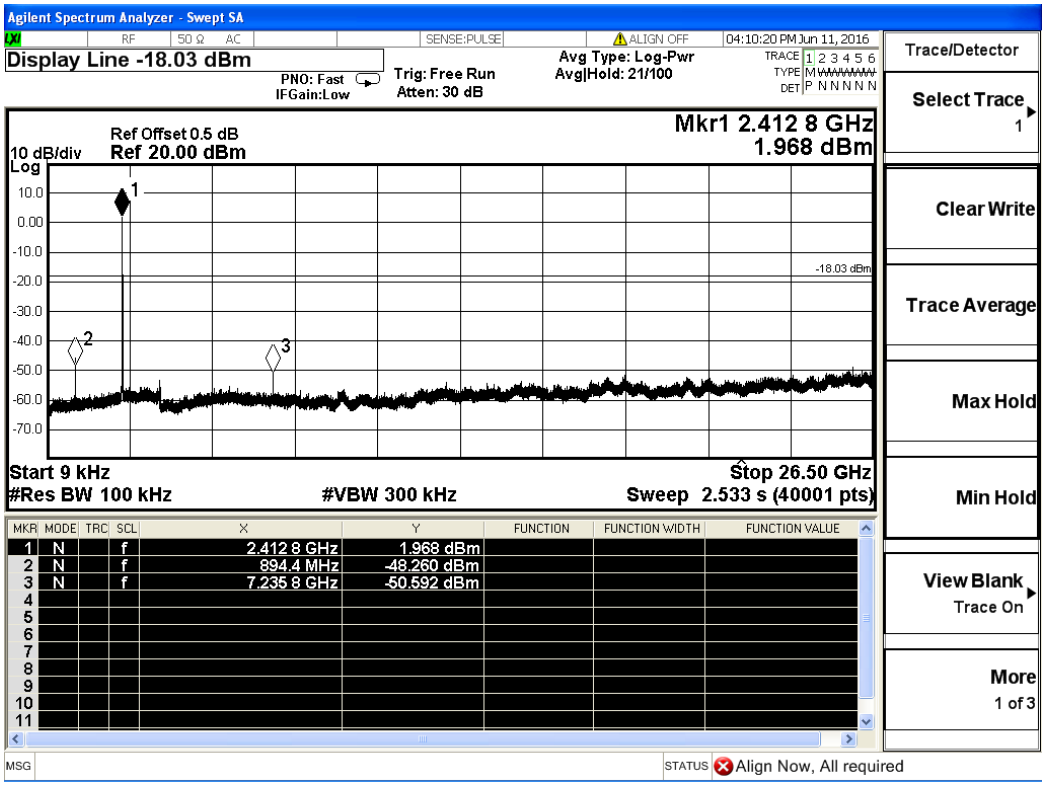
This test setup layout is the same as that shown in section 5.3.4.

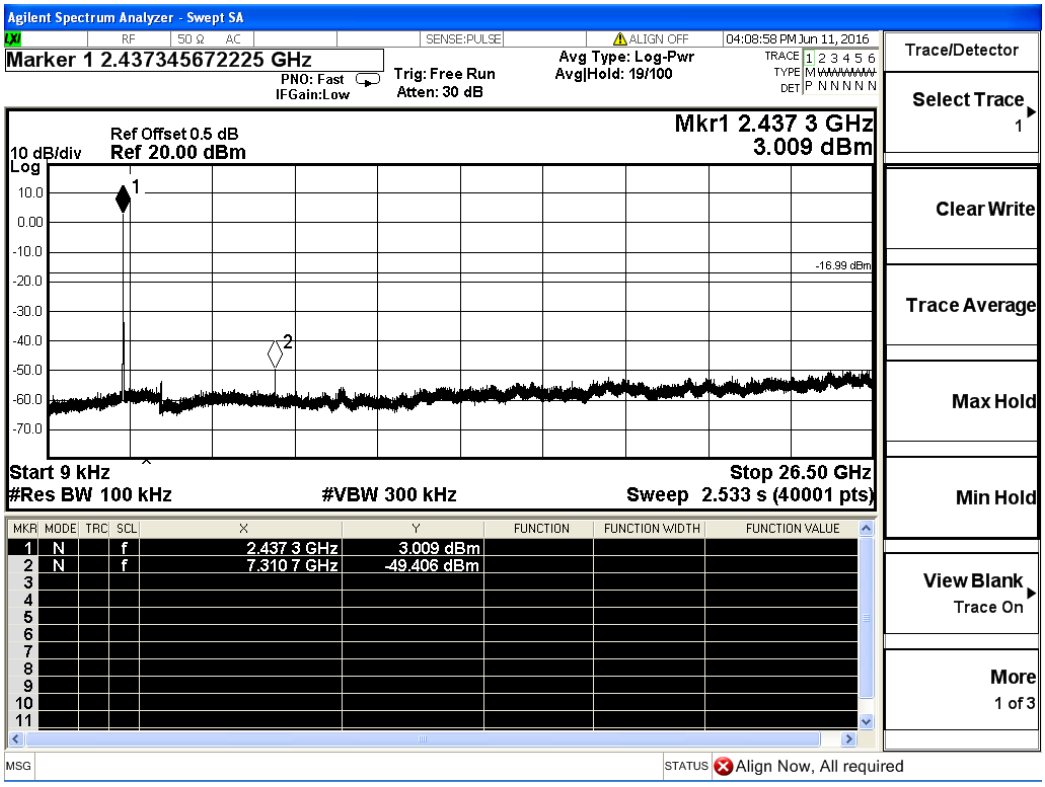
### 5.5.5. EUT Operation during Test

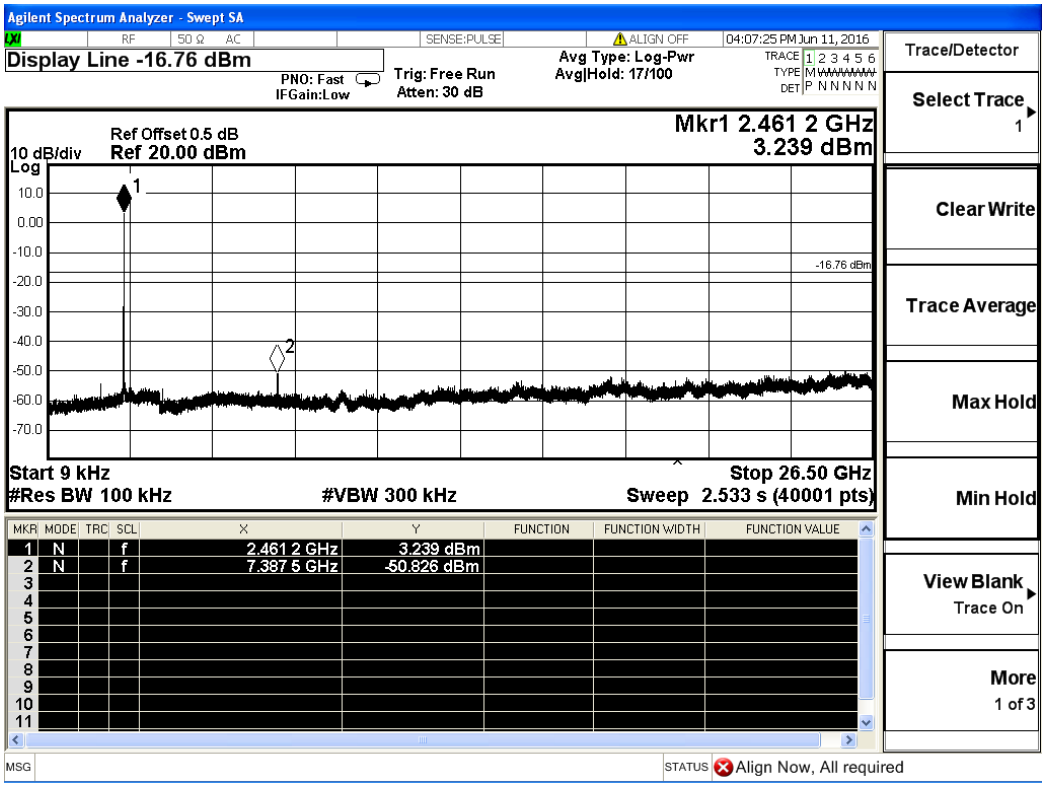
The EUT was programmed to be in continuously transmitting mode.

## 5.5.6. Test Results of Conducted Spurious Emissions

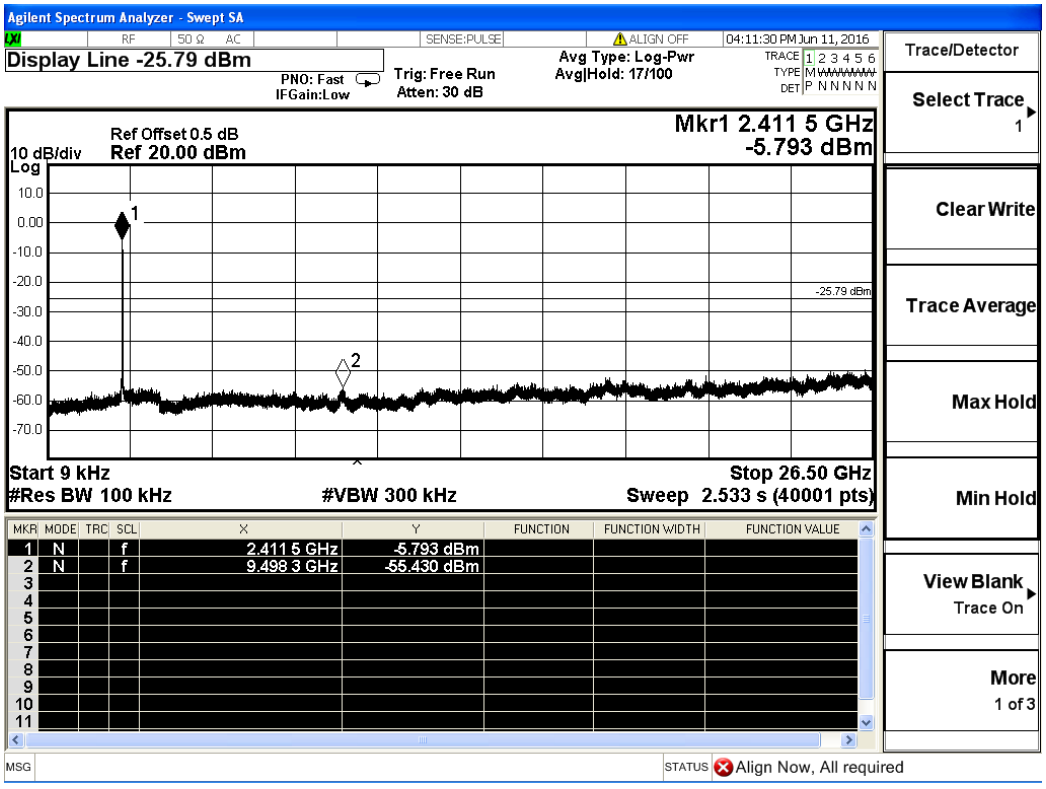
**802.11b**

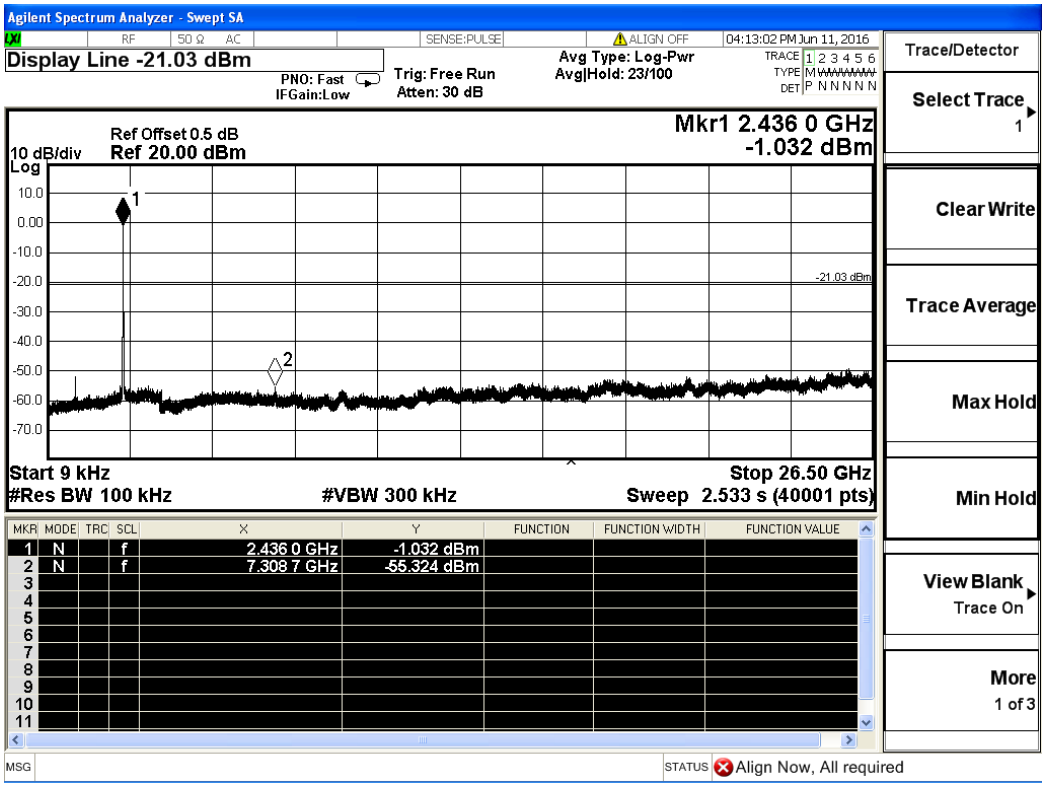


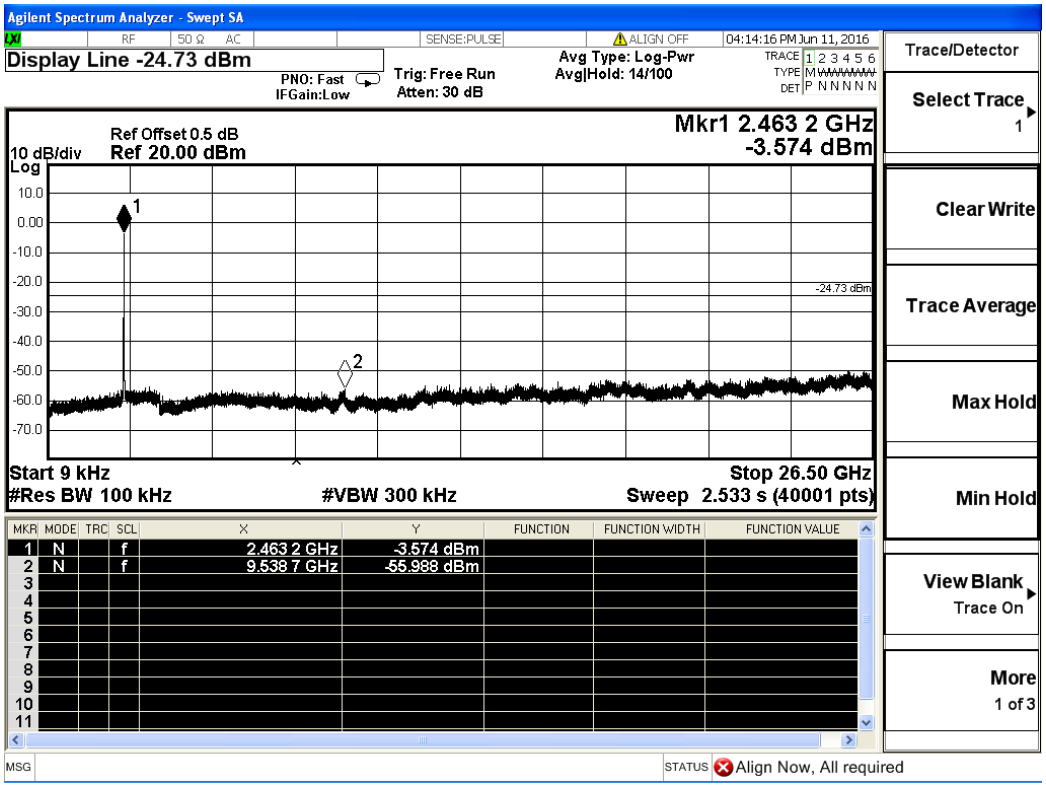




Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
04:07:25 PM Jun 11, 2016
Display Line -16.76 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 17/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.461 2 GHz
3.239 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-16.76 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.533 s (40001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N f 2.461 2 GHz 3.239 dBm
2 N f 7.387 5 GHz -50.826 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
MSG
STATUS Align Now, All required

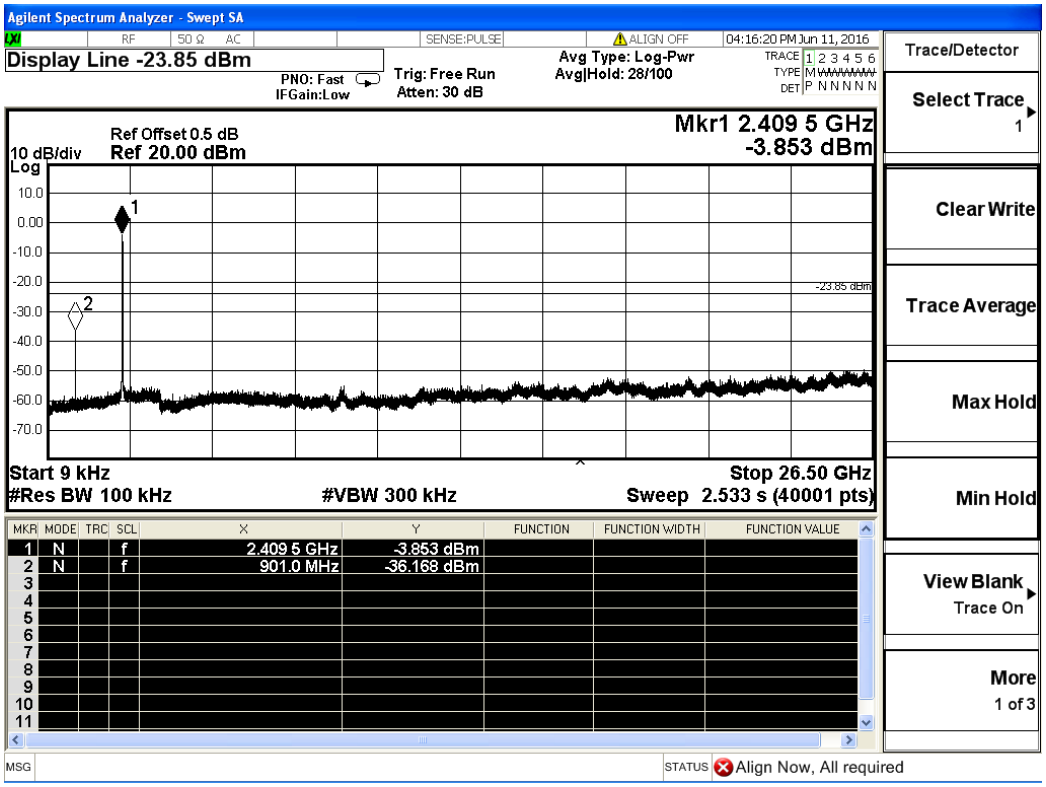
## 802.11g

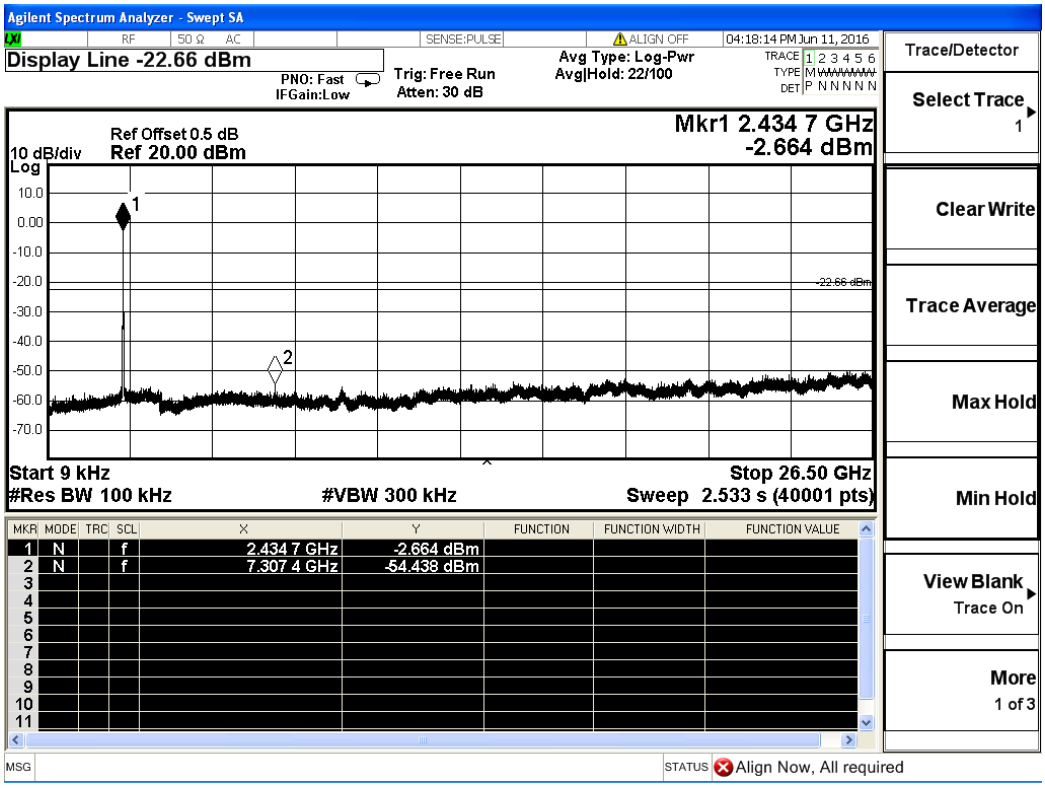

Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
04:11:30 PM Jun 11, 2016
Display Line -25.79 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 17/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.411 5 GHz
-5.793 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-25.79 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.533 s (40001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N f 2.411 5 GHz -5.793 dBm
2 N f 9.498 3 GHz -55.430 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
MSG
STATUS Align Now, All required

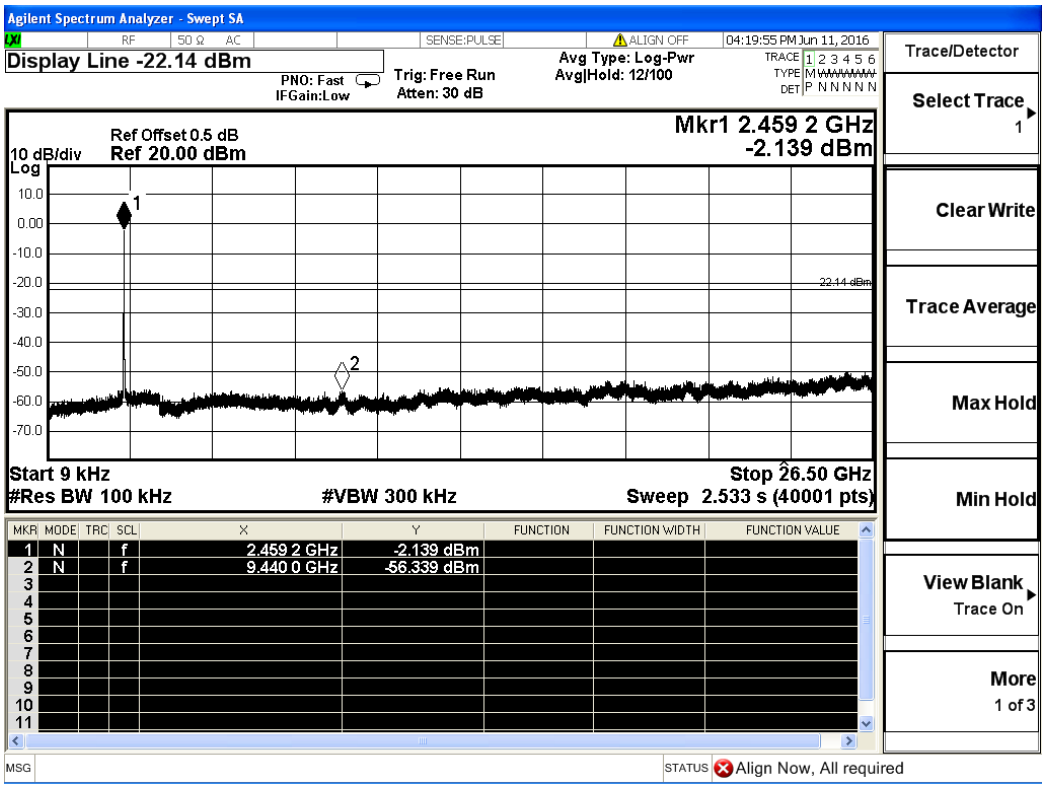

Agilent Spectrum Analyzer - Swept SA
Display Line -21.03 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 23/100
04:13:02 PM Jun 11, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.436 0 GHz
-1.032 dBm
-21.03 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.533 s (40001 pts)
1 N 1 f 2.436 0 GHz -1.032 dBm
2 N 1 f 7.308 7 GHz -55.324 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
Align Now, All required


Agilent Spectrum Analyzer - Swept SA
Display Line -24.73 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 14/100
04:14:16 PM Jun 11, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.463 2 GHz
-3.574 dBm
-24.73 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.533 s (40001 pts)
1 N 1 f 2.463 2 GHz -3.574 dBm
2 N 1 f 9.538 7 GHz -55.988 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
Align Now, All required

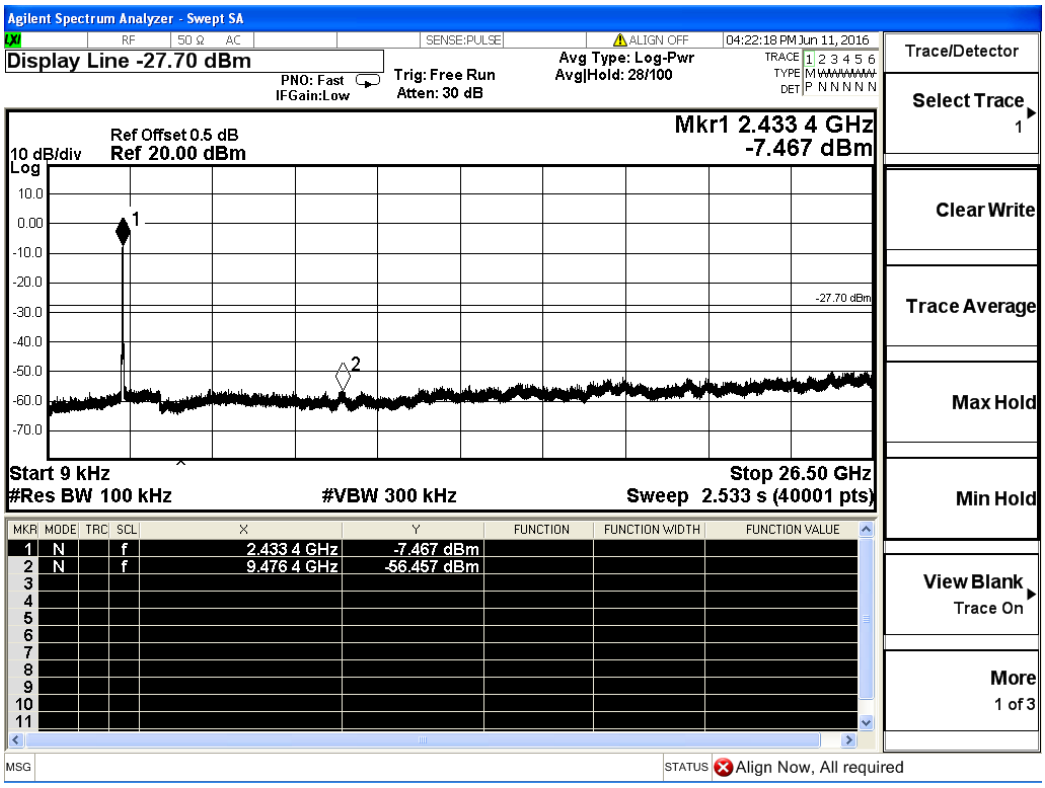
## 802.11n HT20

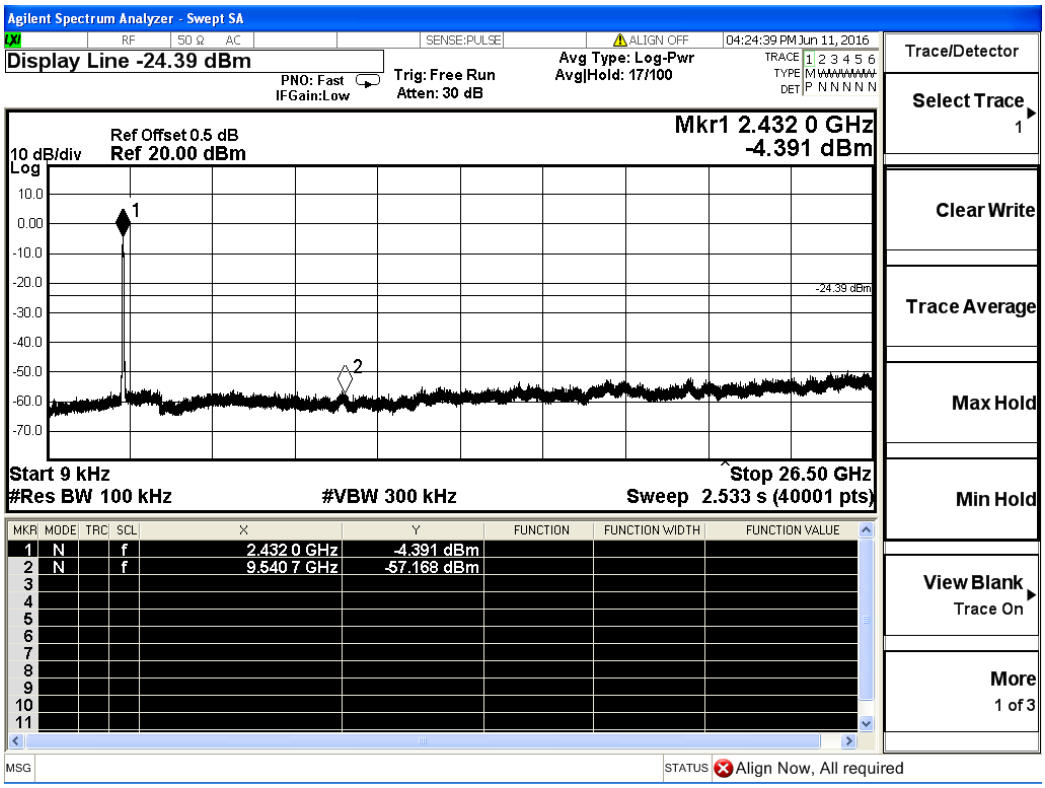

Agilent Spectrum Analyzer - Swept SA
Display Line -23.85 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 28/100
04:16:20 PM Jun 11, 2016
Ref Offset 0.5 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.409 5 GHz
-3.853 dBm
-23.85 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.533 s (40001 pts)
1 N 1 f 2.409 5 GHz -3.853 dBm
2 N 1 f 901.0 MHz -36.168 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
Align Now, All required

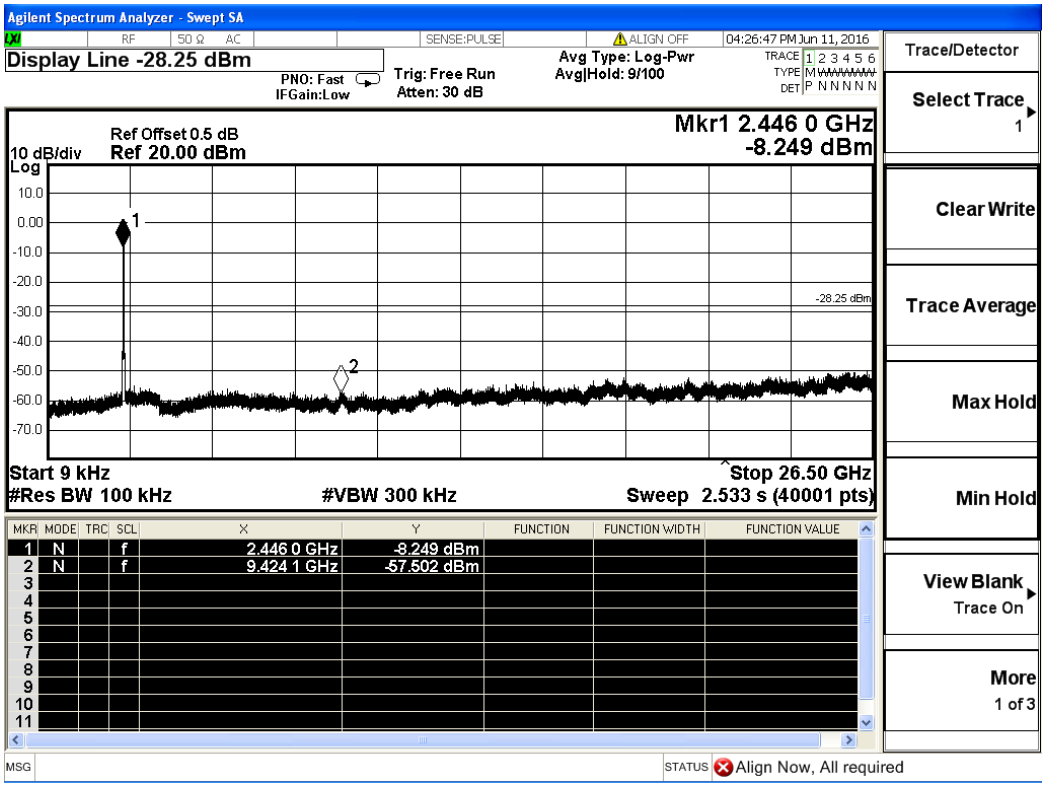

Agilent Spectrum Analyzer - Swept SA
Display Line -22.66 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 22/100
04:18:14 PM Jun 11, 2016
Ref Offset 0.5 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.434 7 GHz
-2.664 dBm
-22.66 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.533 s (40001 pts)
1 N 1 f 2.434 7 GHz -2.664 dBm
2 N 1 f 7.307 4 GHz -54.438 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
Align Now, All required


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
04:19:55 PM Jun 11, 2016
Display Line -22.14 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 12/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.459 2 GHz
-2.139 dBm
22.14 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.533 s (40001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N f 2.459 2 GHz -2.139 dBm
2 N f 9.440 0 GHz -56.339 dBm
MSG
STATUS Align Now, All required
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3

## 802.11n HT40

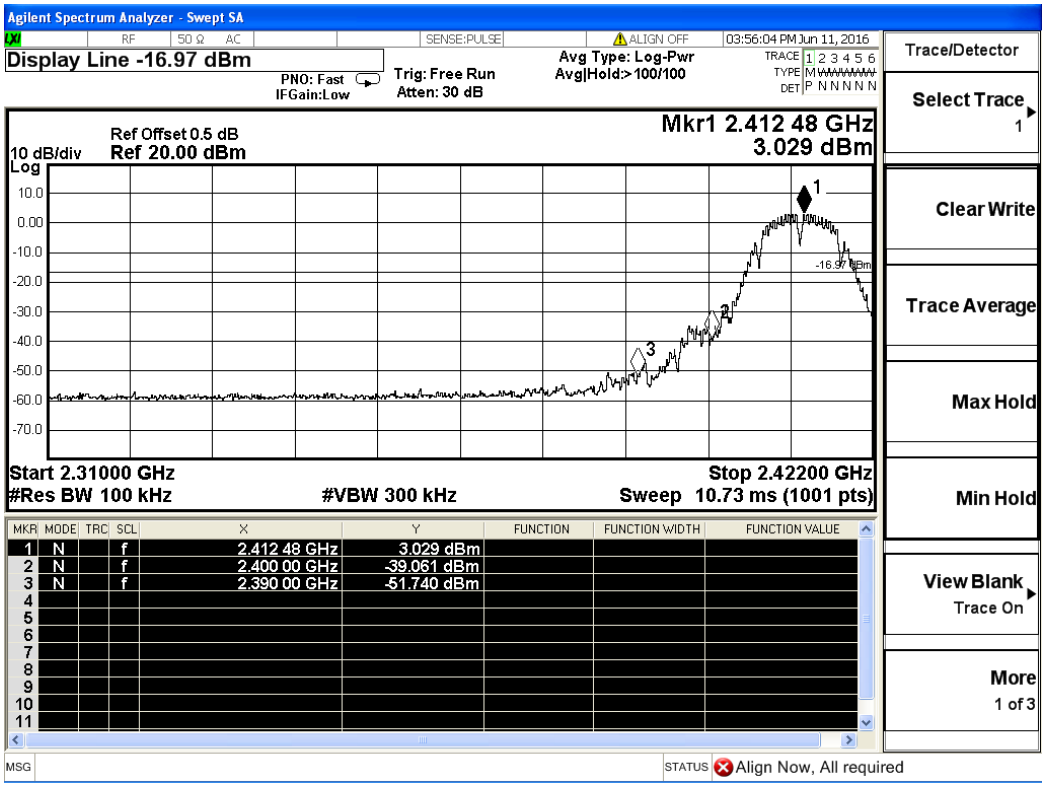

Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
04:22:18 PM Jun 11, 2016
Display Line -27.70 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 28/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.433 4 GHz
-7.467 dBm
-27.70 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.533 s (40001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N f 2.433 4 GHz -7.467 dBm
2 N f 9.476 4 GHz -56.457 dBm
MSG
STATUS Align Now, All required
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3

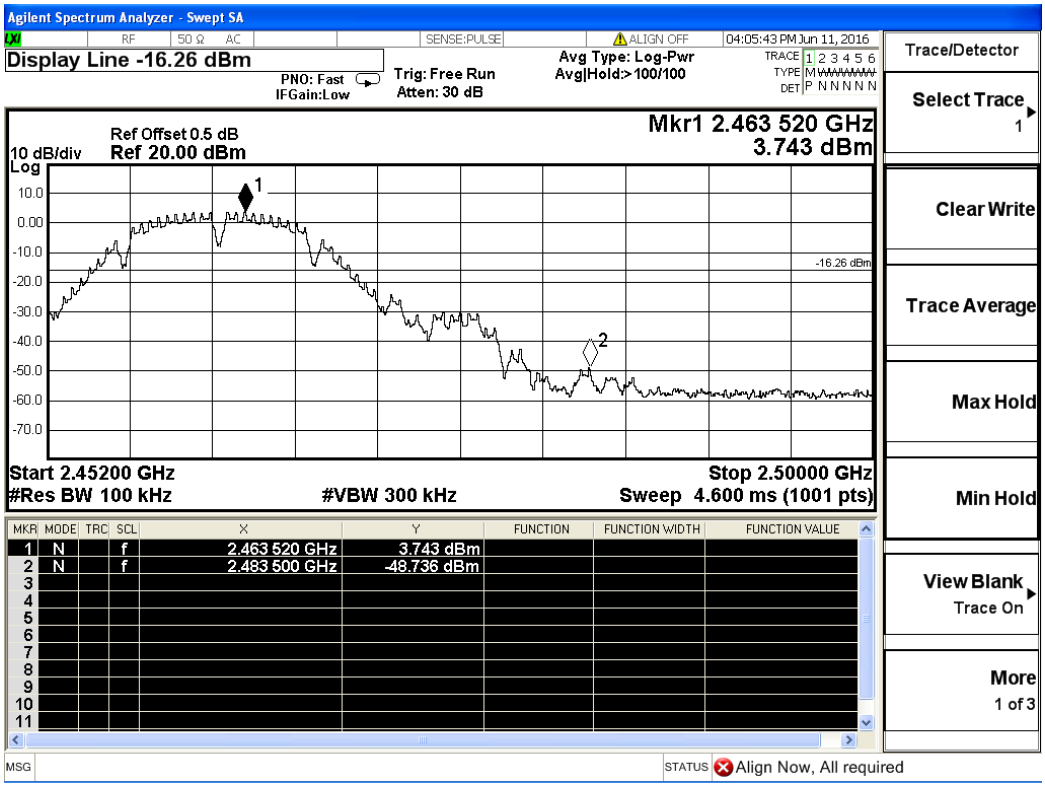

Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
04:24:39 PM Jun 11, 2016
Display Line -24.39 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 17/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.432 0 GHz
-4.391 dBm
-24.39 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.533 s (40001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N f 2.432 0 GHz -4.391 dBm
2 N f 9.540 7 GHz -57.168 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
MSG
STATUS Align Now, All required


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
04:26:47 PM Jun 11, 2016
Display Line -28.25 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 9/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.446 0 GHz
-8.249 dBm
-28.25 dBm
Start 9 kHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.533 s (40001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N f 2.446 0 GHz -8.249 dBm
2 N f 9.424 1 GHz -57.502 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
MSG
STATUS Align Now, All required

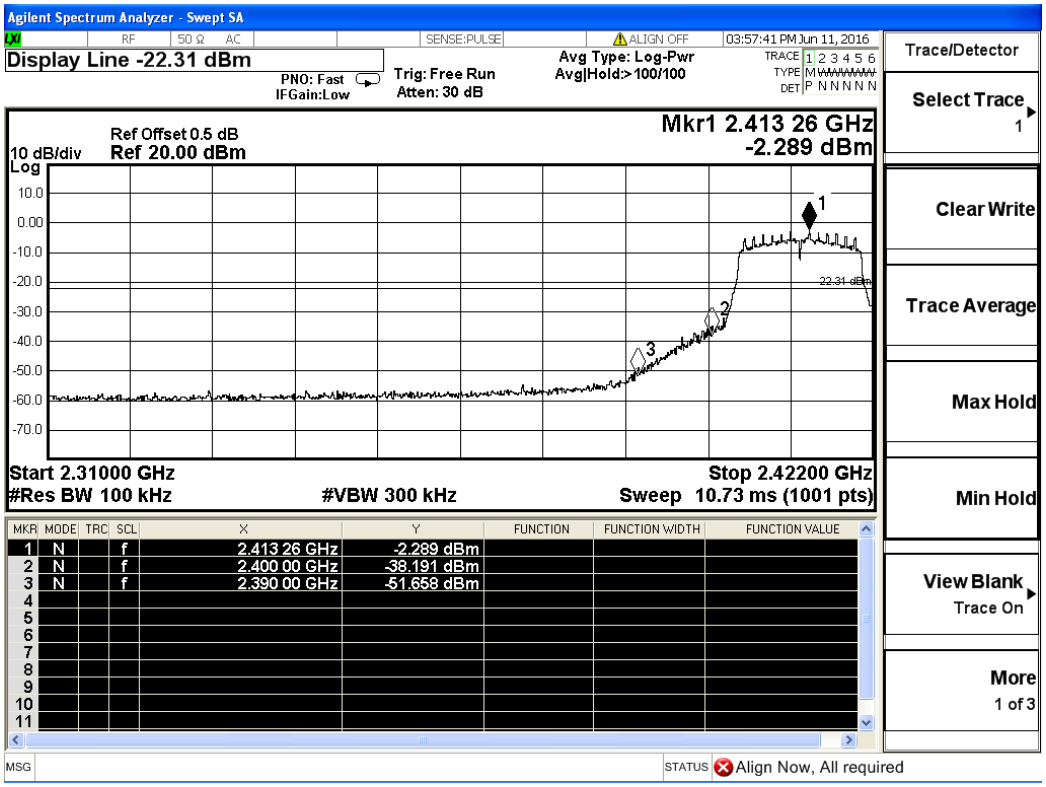
## 5.5.7. Test Results of Band Edges Test

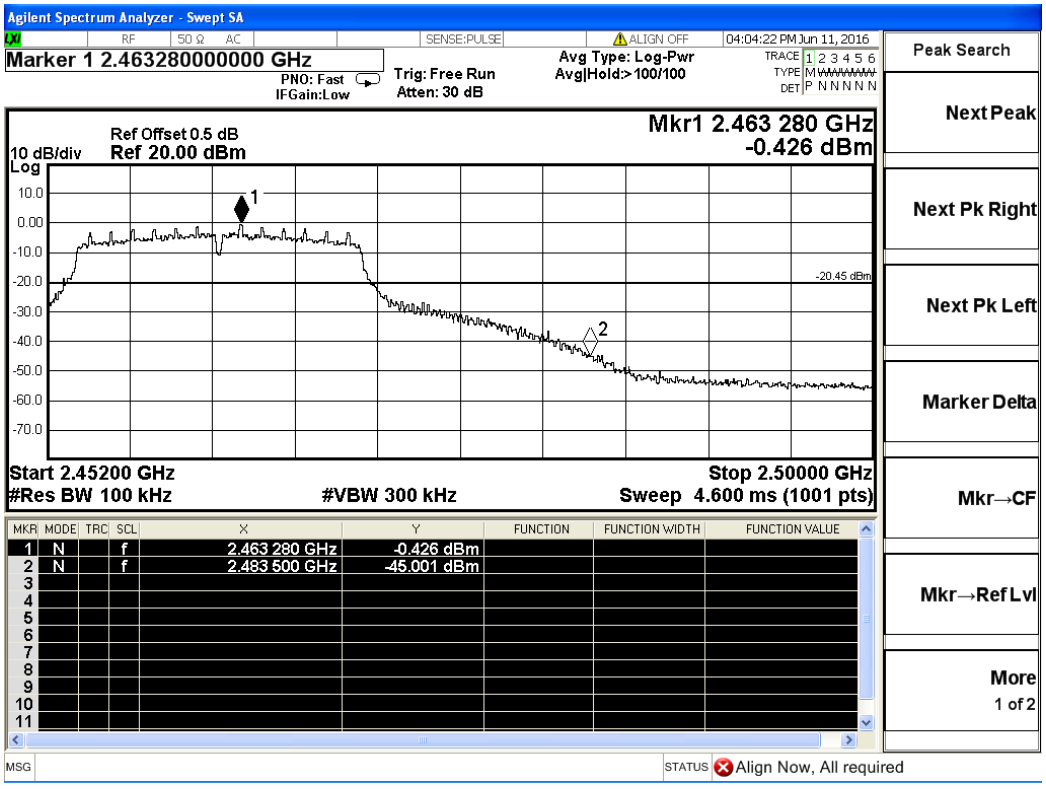
**802.11b**



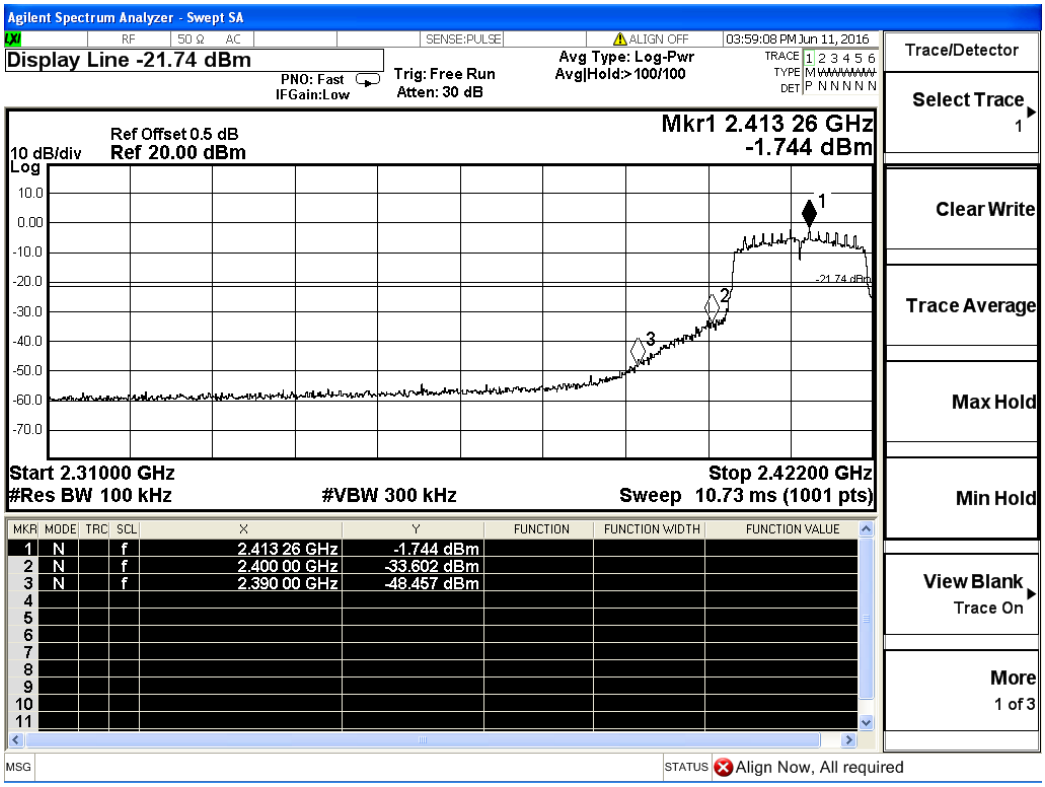



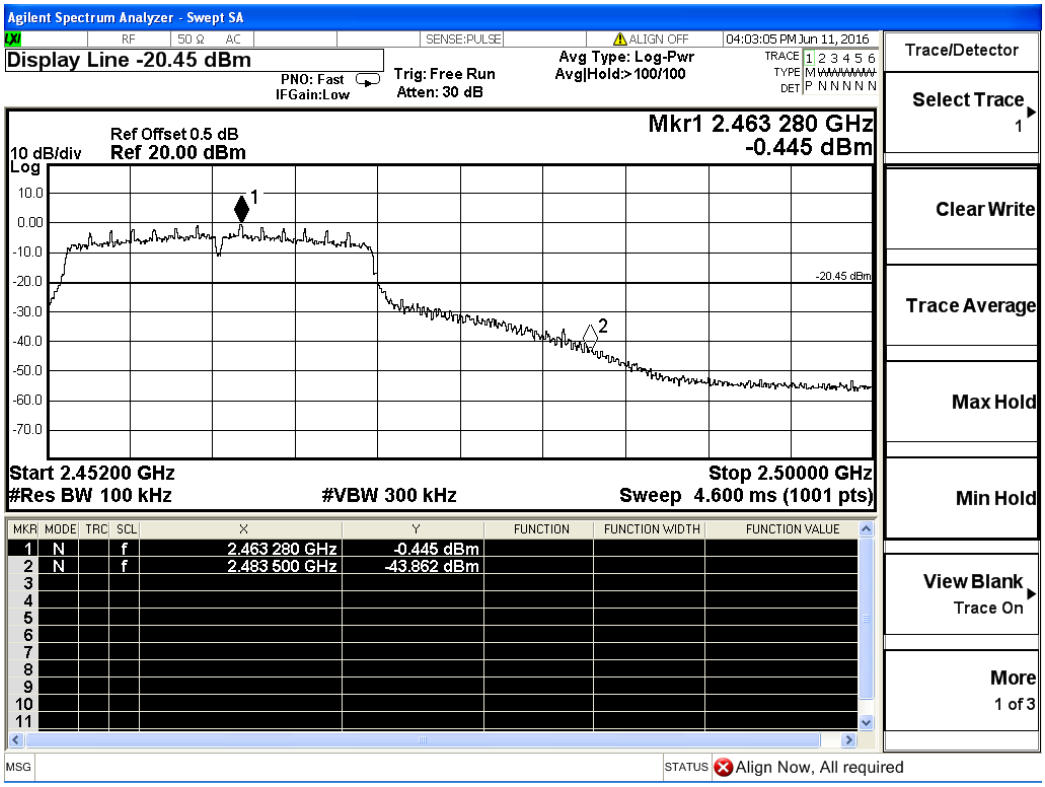
## 802.11g


Agilent Spectrum Analyzer - Swept SA
Display Line -22.31 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
03:57:41 PM Jun 11, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.413 26 GHz
-2.289 dBm
22.31 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.42200 GHz
Sweep 10.73 ms (1001 pts)
1 N 1 f 2.413 26 GHz -2.289 dBm
2 N 1 f 2.400 00 GHz -38.191 dBm
3 N 1 f 2.390 00 GHz -51.658 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
Align Now, All required

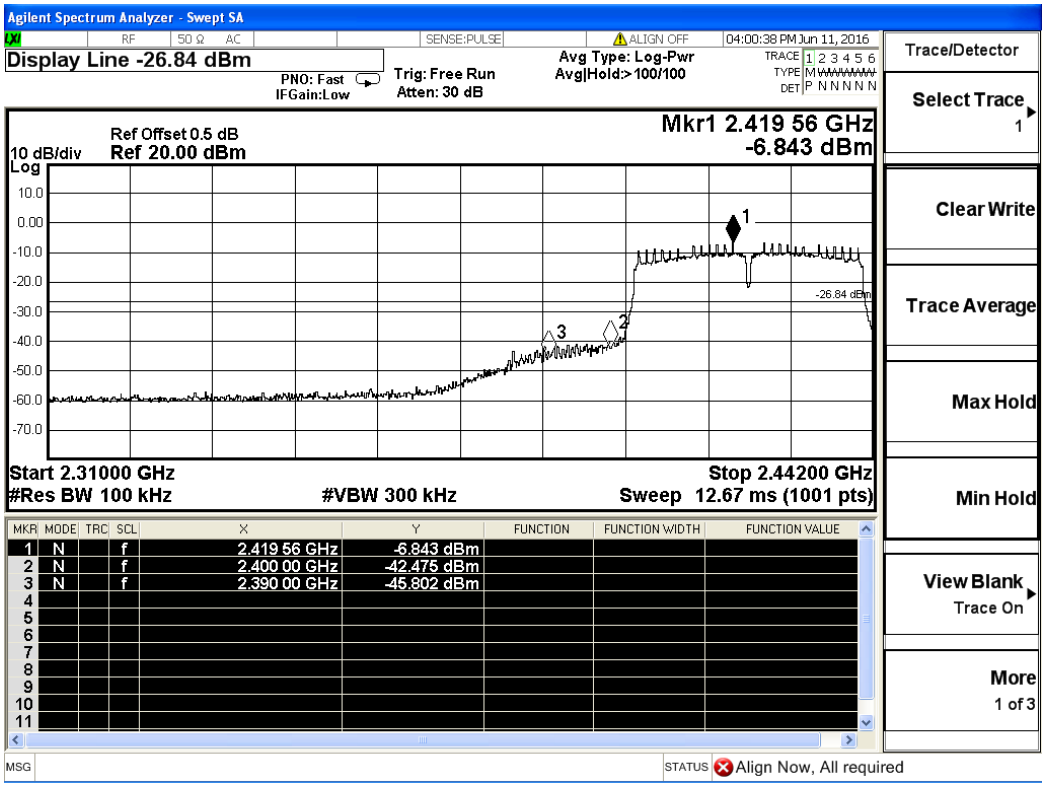

Agilent Spectrum Analyzer - Swept SA
Marker 1 2.463280000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:04:22 PM Jun 11, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.463 280 GHz
-0.426 dBm
-20.45 dBm
Start 2.45200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 4.600 ms (1001 pts)
1 N 1 f 2.463 280 GHz -0.426 dBm
2 N 1 f 2.483 500 GHz -45.001 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More 1 of 2
Align Now, All required

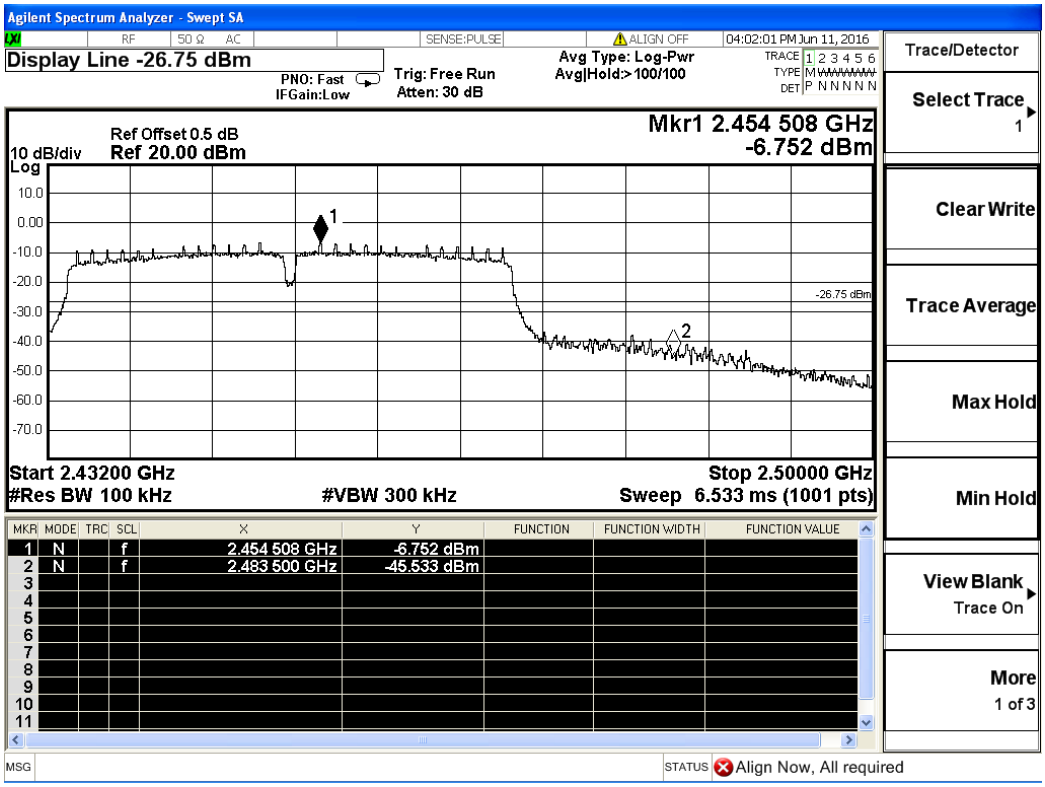
## 802.11n HT20


Agilent Spectrum Analyzer - Swept SA
Display Line -21.74 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
03:59:08 PM Jun 11, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.413 26 GHz
-1.744 dBm
-21.74 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.42200 GHz
Sweep 10.73 ms (1001 pts)
1 N 1 f 2.413 26 GHz -1.744 dBm
2 N 1 f 2.400 00 GHz -33.602 dBm
3 N 1 f 2.390 00 GHz -48.457 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
MSG
STATUS Align Now, All required


Agilent Spectrum Analyzer - Swept SA
Display Line -20.45 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:03:05 PM Jun 11, 2016
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.463 280 GHz
-0.445 dBm
-20.45 dBm
Start 2.45200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 4.600 ms (1001 pts)
1 N 1 f 2.463 280 GHz -0.445 dBm
2 N 1 f 2.483 500 GHz -43.862 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
MSG
STATUS Align Now, All required

## 802.11n HT40


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
04:00:38 PM Jun 11, 2016
Display Line -26.84 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.419 56 GHz
-6.843 dBm
-26.84 dBm
Start 2.31000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.44200 GHz
Sweep 12.67 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N f 2.419 56 GHz -6.843 dBm
2 N f 2.400 00 GHz -42.475 dBm
3 N f 2.390 00 GHz -45.802 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
MSG
STATUS Align Now, All required


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:PULSE
ALIGN OFF
04:02:01 PM Jun 11, 2016
Display Line -26.75 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 0.5 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.454 508 GHz
-6.752 dBm
-26.75 dBm
Start 2.43200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 6.533 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N f 2.454 508 GHz -6.752 dBm
2 N f 2.483 500 GHz -45.533 dBm
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3
MSG
STATUS Align Now, All required

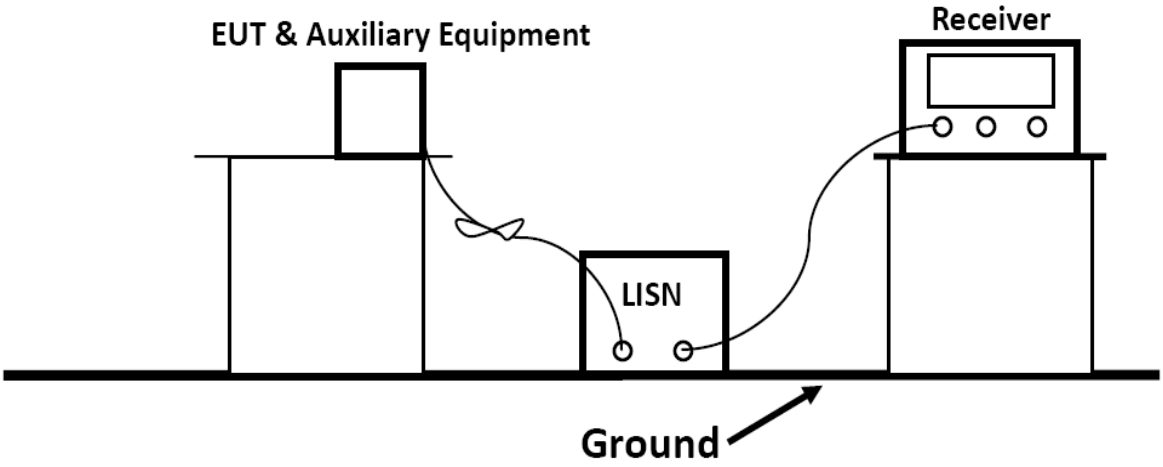
## 5.6. Power line conducted emissions

### 5.6.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (MHz) | Limits (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

### 5.6.2 Block Diagram of Test Setup



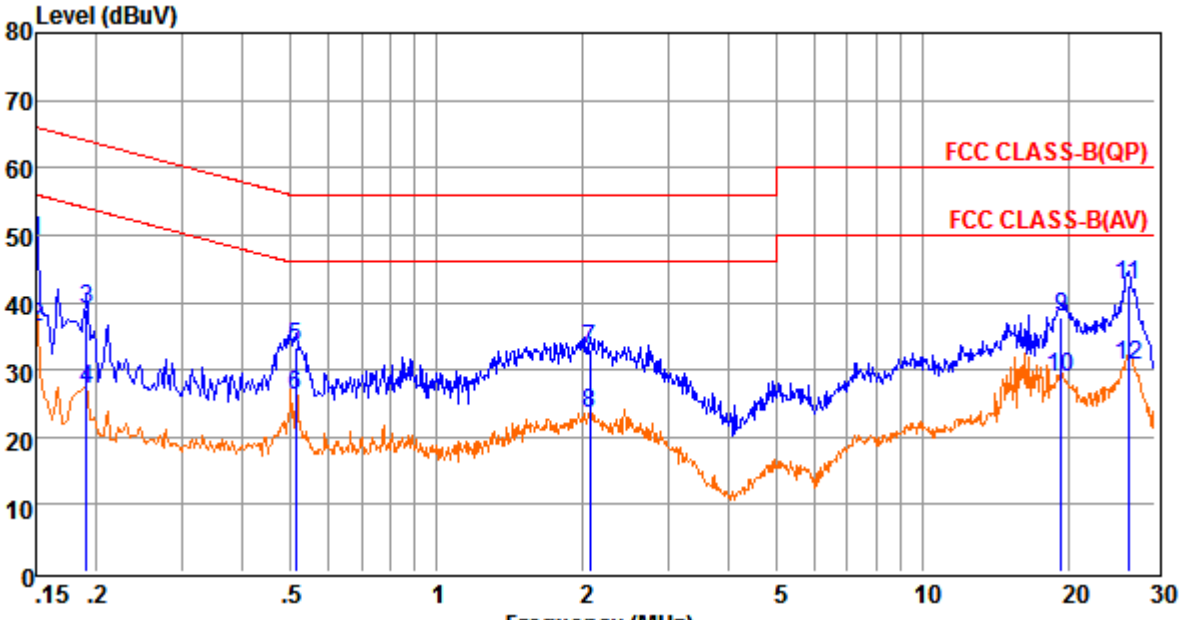

### 5.6.3 Test Results

PASS.

The test data please refer to following page.

*Test Result For Line Power Input AC 120V/60Hz (Worst Case)*

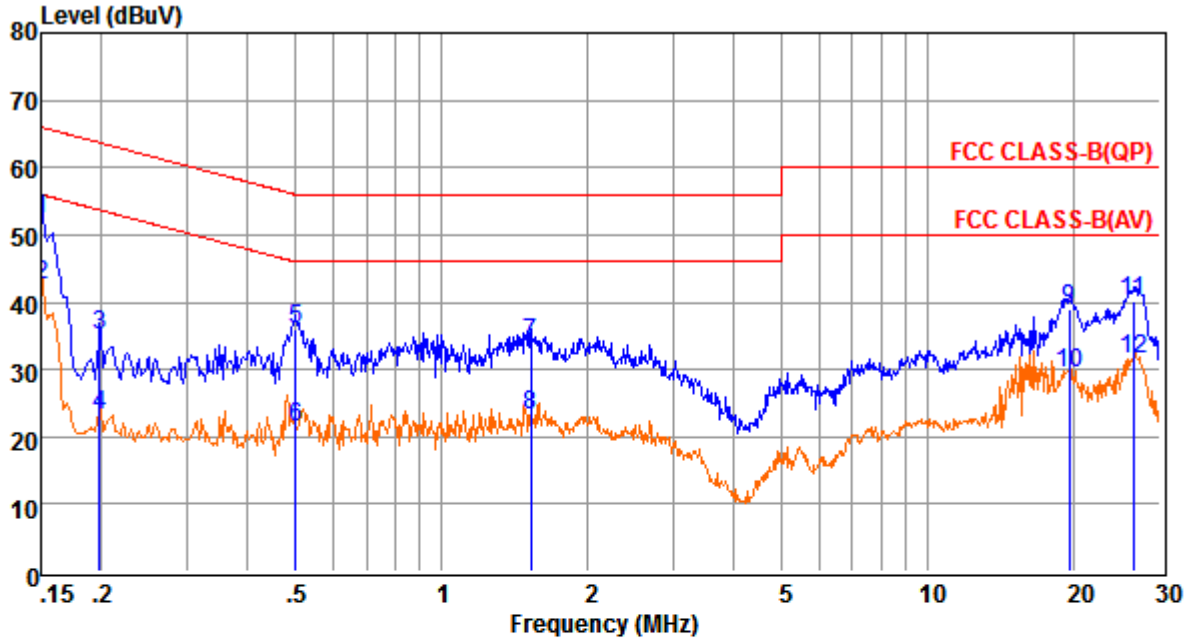
*Line:*




| | Freq MHz | Reading dBuV | LisnFac dB | CabLos dB | Atten Fac dB | Measured dBuV | Limit dBuV | Over dB | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.15000 | 29.58 | 9.57 | 0.02 | 10.00 | 49.17 | 66.00 | -16.83 | QP |
| 2 | 0.15010 | 16.84 | 9.57 | 0.02 | 10.00 | 36.43 | 55.99 | -19.56 | Average |
| 3 | 0.19039 | 19.28 | 9.62 | 0.02 | 10.00 | 38.92 | 64.02 | -25.10 | QP |
| 4 | 0.19049 | 7.45 | 9.62 | 0.02 | 10.00 | 27.09 | 54.02 | -26.93 | Average |
| 5 | 0.51278 | 13.76 | 9.62 | 0.04 | 10.00 | 33.42 | 56.00 | -22.58 | QP |
| 6 | 0.51288 | 6.54 | 9.62 | 0.04 | 10.00 | 26.20 | 46.00 | -19.80 | Average |
| 7 | 2.06586 | 13.22 | 9.64 | 0.05 | 10.00 | 32.91 | 56.00 | -23.09 | QP |
| 8 | 2.06686 | 3.82 | 9.64 | 0.05 | 10.00 | 23.51 | 46.00 | -22.49 | Average |
| 9 | 19.22360 | 17.83 | 9.75 | 0.12 | 10.00 | 37.70 | 60.00 | -22.30 | QP |
| 10 | 19.22460 | 8.94 | 9.75 | 0.12 | 10.00 | 28.81 | 50.00 | -21.19 | Average |
| 11 | 26.41779 | 22.67 | 9.71 | 0.13 | 10.00 | 42.51 | 60.00 | -17.49 | QP |
| 12 | 26.41879 | 10.74 | 9.71 | 0.13 | 10.00 | 30.58 | 50.00 | -19.42 | Average |

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.

Neutral:




| | Freq MHz | Reading dBuV | LisnFac dB | CabLos dB | Atten_Fac dB | Measured dBuV | Limit dBuV | Over dB | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.15000 | 32.74 | 9.70 | 0.02 | 10.00 | 52.46 | 66.00 | -13.54 | QP |
| 2 | 0.15010 | 22.95 | 9.70 | 0.02 | 10.00 | 42.67 | 55.99 | -13.32 | Average |
| 3 | 0.19758 | 15.36 | 9.59 | 0.02 | 10.00 | 34.97 | 63.71 | -28.74 | QP |
| 4 | 0.19768 | 3.59 | 9.59 | 0.02 | 10.00 | 23.20 | 53.71 | -30.51 | Average |
| 5 | 0.50203 | 16.43 | 9.62 | 0.04 | 10.00 | 36.09 | 56.00 | -19.91 | QP |
| 6 | 0.50213 | 1.70 | 9.62 | 0.04 | 10.00 | 21.36 | 46.00 | -24.64 | Average |
| 7 | 1.52736 | 14.21 | 9.63 | 0.05 | 10.00 | 33.89 | 56.00 | -22.11 | QP |
| 8 | 1.52836 | 3.41 | 9.63 | 0.05 | 10.00 | 23.09 | 46.00 | -22.91 | Average |
| | 919.53160 | 19.06 | 9.87 | 0.12 | 10.00 | 39.05 | 60.00 | -20.95 | QP |
| | 1019.53260 | 9.58 | 9.87 | 0.12 | 10.00 | 29.57 | 50.00 | -20.43 | Average |
| | 1126.41779 | 20.28 | 9.83 | 0.13 | 10.00 | 40.24 | 60.00 | -19.76 | QP |
| | 1226.41879 | 11.68 | 9.83 | 0.13 | 10.00 | 31.64 | 50.00 | -18.36 | Average |

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.

****Note: Pre-scan all mode and recorded the worst case results in this report (802.11g (TX-Low Channel)).*

## 5.7. Antenna Requirements

### 5.7.1. Standard Applicable

According to §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. 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### 5.8.2. Antenna Connector Construction

The FPCB antenna(2.43dBi Max.) used for transmitting is permanently attached and no consideration of replacement. Please see EUT photo for details.

### 5.8.3. Results: Compliance.

----------THE END OF REPORT----------