# FCC Test Report

Report No.: AGC07782190502FE05

| | | |
|---|---|---|
| **FCC ID** | : | 2ATFVBTAB-7Q2 |
| **APPLICATION PURPOSE** | : | Original Equipment |
| **PRODUCT DESIGNATION** | : | Tablet pc |
| **BRAND NAME** | : | Bible-Pad |
| **MODEL NAME** | : | BTAB-7Q2 |
| **CLIENT** | : | KOU-ZONE ELECTRONICS COMPANY LIMITED |
| **DATE OF ISSUE** | : | Jun. 03, 2019 |
| **STANDARD(S)**<br>**TEST PROCEDURE(S)** | : | FCC Part 15.247 |
| **REPORT VERSION** | : | V1.0 |

***A***ttestation of ***G***lobal ***C***ompliance (Shenzhen) Co., Ltd

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## REPORT REVISE RECORD

| Report Version | Revise Time | Issued Date | Valid Version | Notes |
|---|---|---|---|---|
| V1.0 | / | Jun. 03, 2019 | Valid | Initial Release |

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## 1. VERIFICATION OF CONFORMITY

| | |
|---|---|
| **Applicant** | KOU-ZONE ELECTRONICS COMPANY LIMITED |
| **Address** | KINGSWELL COMM TOWER NO.171-173 LOCKHART RD WANCHAI HK |
| **manufacturer** | KOU-ZONE ELECTRONICS COMPANY LIMITED |
| **Address** | KINGSWELL COMM TOWER NO.171-173 LOCKHART RD WANCHAI HK |
| **Factory** | KOU-ZONE ELECTRONICS COMPANY LIMITED |
| **Address** | KINGSWELL COMM TOWER NO.171-173 LOCKHART RD WANCHAI HK |
| **Product Designation** | Tablet pc |
| **Brand Name** | Bible-Pad |
| **Test Model** | BTAB-7Q2 |
| **Date of test** | May 28, 2019 to Jun. 03, 2019 |
| **Deviation** | None |
| **Condition of Test Sample** | Normal |
| **Test Result** | Pass |
| **Report Template** | AGCRT-US-BGN/RF |

We hereby certify that:

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

| | | |
|---|---|---|
| Tested By | Draven Li(Li Ming Liang) | Jun. 03, 2019 |
| Reviewed By | Max Zhang(Zhang Yi) | Jun. 03, 2019 |
| Approved By | Forrest Lei(Lei Yonggang)<br>Authorized Officer | Jun. 03, 2019 |

# 2. GENERAL INFORMATION

## 2.1. PRODUCT DESCRIPTION

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

A major technical description of EUT is described as following

| | |
|---|---|
| **Operation Frequency** | 2.412 GHz～2.462GHz |
| **Output Power(Average)** | IEEE 802.11b:15.14dBm; IEEE 802.11g:13.57dBm;<br>IEEE 802.11n(20):11.25dBm; IEEE 802.11n(40):10.83dBm |
| **Modulation** | DSSS(DBPSK/DQPSK/CCK);OFDM(BPSK/QPSK/16-QAM/64-QAM) |
| **Number of channels** | 11 |
| **Hardware Version** | YKQ8W-RK3326-V0.1(BGA 2019.01.23) |
| **Software Version** | Android 9.0 |
| **Antenna Designation** | PIFA antenna |
| **Antenna Gain** | 1.0dBi |
| **Power Supply** | DC 5V by adapter or DC 3.7V by battery |

## 2.2. TABLE OF CARRIER FREQUENCYS

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

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

### 2.3. IEEE 802.11N MODULATION SCHEME

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

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

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

This submittal(s) (test report) is intended for **FCC ID: 2ATFVBTAB-7Q2** filing to comply with the FCC Part 15 requirements.

### 2.5. TEST METHODOLOGY

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

### 2.6. SPECIAL ACCESSORIES

Refer to section 5.2.

### 2.7. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

## 3. MEASUREMENT UNCERTAINTY

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

- Uncertainty of Conducted Emission, Uc = ±3.2 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±3.9 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB

## 4. DESCRIPTION OF TEST MODES

| NO. | TEST MODE DESCRIPTION |
|---|---|
| 1 | Low channel TX |
| 2 | Middle channel TX |
| 3 | High channel TX |
| 4 | Normal operating |
| Note:<br>Transmit by 802.11b with Date rate (1/2/5.5/11)<br>Transmit by 802.11g with Date rate (6/9/12/18/24/36/48/54)<br>Transmit by 802.11n (20MHz) with Date rate (6.5/13/19.5/26/39/52/58.5/65)<br>Transmit by 802.11n (40MHz) with Date rate (13.5/27/40.5/54/81/108/121.5/135) | |

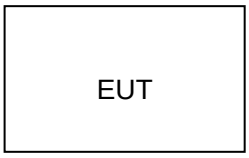
**Note:**

1. The EUT has been set to operate continuously on the lowest, middle and highest operation frequency Individually, and the eut is operating at its maximum duty cycle>or equal 98%
2. All modes under which configure applicable have been tested and the worst mode test data recording in the test report, if no other mode data.
3. The test software is the RtkTestAPP-v2.0.0_20170425 which can set the EUT into the individual test modes

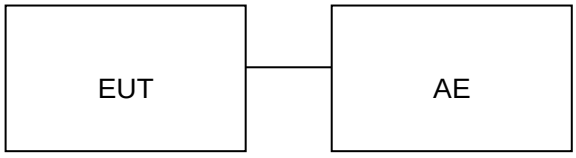
# 5. SYSTEM TEST CONFIGURATION

## 5.1. CONFIGURATION OF EUT SYSTEM

Radiated Emission Configure :




Conducted Emission Configure :




## 5.2. EQUIPMENT USED IN EUT SYSTEM

| Item | Equipment | Model No. | ID or Specification | Remark |
|---|---|---|---|---|
| 1 | Tablet pc | BTAB-7Q2 | 2ATFVBTAB-7Q2 | EUT |
| 2 | Adapter | ANU-Q-520 | DC 5V/2A | AE |

## 5.3. SUMMARY OF TEST RESULTS

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

## 6. TEST FACILITY

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

**TEST EQUIPMENT OF CONDUCTED EMISSION TEST**

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

**TEST EQUIPMENT OF RADIATED EMISSION TEST**

| Equipment | Manufacturer | Model | S/N | Cal. Date | Cal. Due |
|---|---|---|---|---|---|
| TEST RECEIVER | R&S | ESCI | 10096 | Jun. 12, 2018 | Jun. 11, 2019 |
| EXA Signal Analyzer | Aglient | N9010A | MY53470504 | Dec. 20, 2018 | Dec. 19, 2019 |
| Power sensor | Aglient | U2021XA | MY54110007 | Sep. 20, 2018 | Sep. 19, 2019 |
| 2.4GHz Fliter | Micro-tronics | 087 | N/A | Jun. 12, 2018 | Jun. 11, 2019 |
| Attenuator | Weinachel Corp | 58-30-33 | N/A | Jun. 12, 2018 | Jun. 11, 2019 |
| Horn antenna | SCHWARZBECK | BBHA 9170 | #768 | Sep. 21, 2017 | Sep. 20, 2020 |
| Active loop antenna (9K-30MHz) | ZHINAN | ZN30900C | 18051 | Jun. 14, 2018 | Jun. 13, 2020 |
| Double-Ridged Waveguide Horn | ETS LINDGREN | 3117 | 00034609 | May. 26, 2018 | May. 25, 2020 |
| Broadband Preamplifier | ETS LINDGREN | 3117PA | 00225134 | Oct. 25, 2018 | Oct. 24, 2019 |
| ANTENNA | SCHWARZBECK | VULB9168 | D69250 | Sep. 28, 2017 | Sep. 27, 2019 |

# 7. OUTPUT POWER

## 7.1. MEASUREMENT PROCEDURE

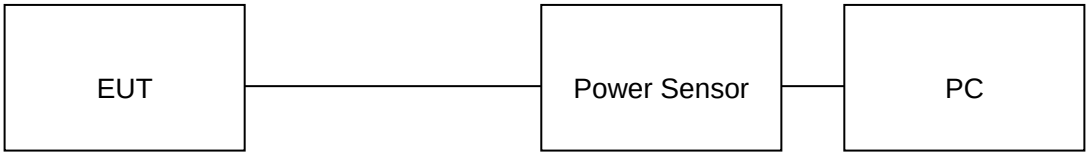
For average power test:

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

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

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

**AVERAGE POWER SETUP**



## 7.3. LIMITS AND MEASUREMENT RESULT

| | |
|---|---|
| **TEST ITEM** | OUTPUT POWER |
| **TEST MODE** | 802.11b with data rate 1 |

| Frequency (GHz) | Average Power (dBm) | Applicable Limits (dBm) | Pass or Fail |
|---|---|---|---|
| 2.412 | 14.86 | 30 | Pass |
| 2.437 | **15.14** | 30 | Pass |
| 2.462 | 14.63 | 30 | Pass |

| | |
|---|---|
| **TEST ITEM** | OUTPUT POWER |
| **TEST MODE** | 802.11g with data rate 6 |

| Frequency (GHz) | Average Power (dBm) | Applicable Limits (dBm) | Pass or Fail |
|---|---|---|---|
| 2.412 | 13.23 | 30 | Pass |
| 2.437 | **13.57** | 30 | Pass |
| 2.462 | 12.75 | 30 | Pass |

| | |
|---|---|
| **TEST ITEM** | OUTPUT POWER |
| **TEST MODE** | 802.11n 20 with data rate 6.5 |

| Frequency (GHz) | Average Power (dBm) | Applicable Limits (dBm) | Pass or Fail |
|---|---|---|---|
| 2.412 | **11.25** | 30 | Pass |
| 2.437 | 11.12 | 30 | Pass |
| 2.462 | 11.08 | 30 | Pass |

| | |
|---|---|
| **TEST ITEM** | OUTPUT POWER |
| **TEST MODE** | 802.11n 40 with data rate 13.5 |

| Frequency (GHz) | Average Power (dBm) | Applicable Limits (dBm) | Pass or Fail |
|---|---|---|---|
| 2.422 | **10.83** | 30 | Pass |
| 2.437 | 10.06 | 30 | Pass |
| 2.452 | 10.25 | 30 | Pass |

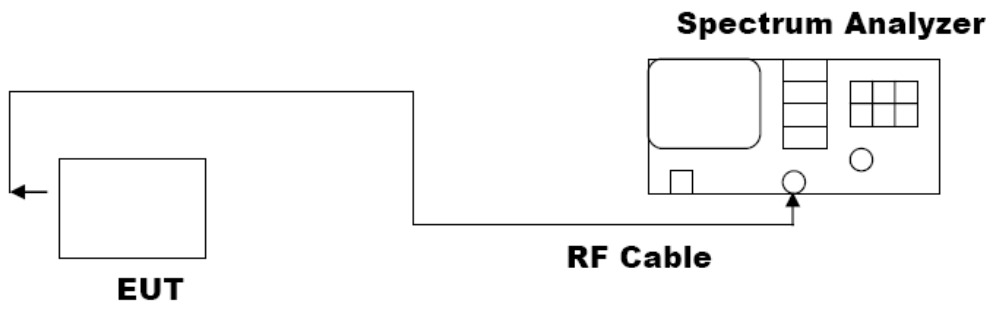
# 8. 6 DB BANDWIDTH

## 8.1. MEASUREMENT PROCEDURE

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

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

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



### 8.3. LIMITS AND MEASUREMENT RESULTS

| | |
|---|---|
| **TEST ITEM** | 6DB BANDWIDTH |
| **TEST MODE** | 802.11b with data rate 11 |

| **LIMITS AND MEASUREMENT RESULT** | | | |
|---|---|---|---|
| **Applicable Limits** | **Applicable Limits** | | |
| | **Test Data (MHz)** | | **Criteria** |
| >500KHZ | Low Channel | 9.010 | PASS |
| | Middle Channel | 8.562 | PASS |
| | High Channel | 8.076 | PASS |

| | |
|---|---|
| **TEST ITEM** | 6DB BANDWIDTH |
| **TEST MODE** | 802.11g with data rate 54 |

| **LIMITS AND MEASUREMENT RESULT** | | | |
|---|---|---|---|
| **Applicable Limits** | **Applicable Limits** | | |
| | **Test Data (MHz)** | | **Criteria** |
| >500KHZ | Low Channel | 16.35 | PASS |
| | Middle Channel | 16.37 | PASS |
| | High Channel | 16.36 | PASS |

| | |
|---|---|
| **TEST ITEM** | 6DB BANDWIDTH |
| **TEST MODE** | 802.11n 20 with data rate 65 |

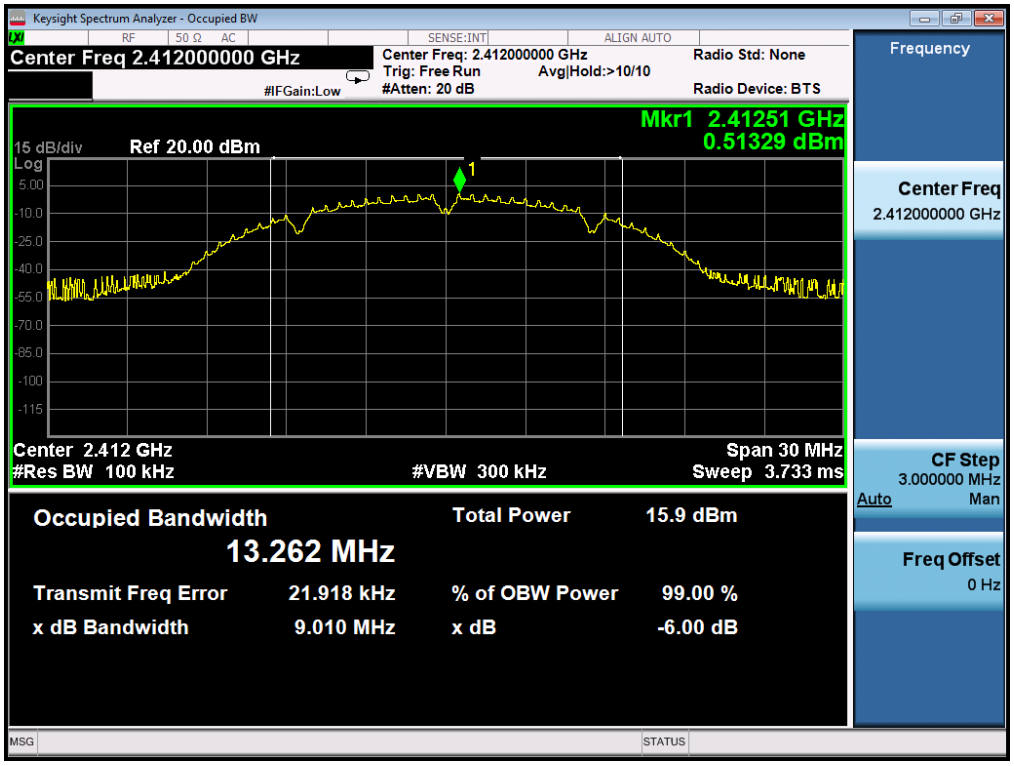
| **LIMITS AND MEASUREMENT RESULT** | | | |
|---|---|---|---|
| **Applicable Limits** | **Applicable Limits** | | |
| | **Test Data (MHz)** | | **Criteria** |
| >500KHZ | Low Channel | 17.58 | PASS |
| | Middle Channel | 17.54 | PASS |
| | High Channel | 17.57 | PASS |

| | |
|---|---|
| **TEST ITEM** | 6DB BANDWIDTH |
| **TEST MODE** | 802.11n 40 with data rate 135 |

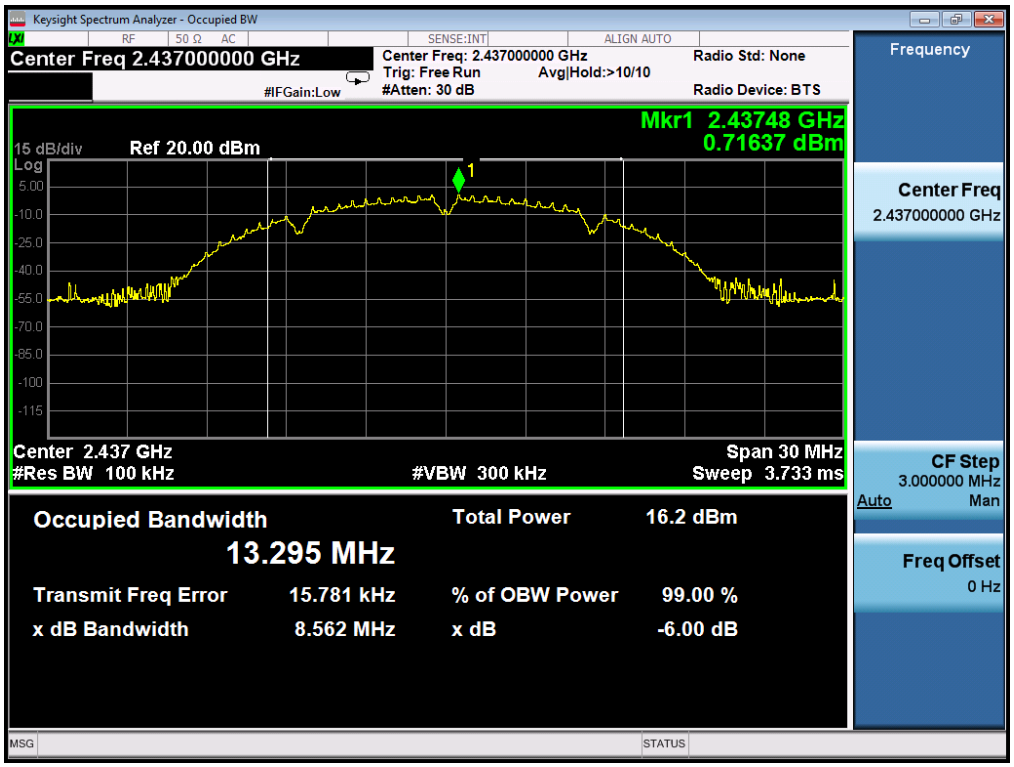
| **LIMITS AND MEASUREMENT RESULT** | | | |
|---|---|---|---|
| **Applicable Limits** | **Applicable Limits** | | |
| | **Test Data (MHz)** | | **Criteria** |
| >500KHZ | Low Channel | 35.72 | PASS |
| | Middle Channel | 35.69 | PASS |
| | High Channel | 36.76 | PASS |

## 802.11b TEST RESULT

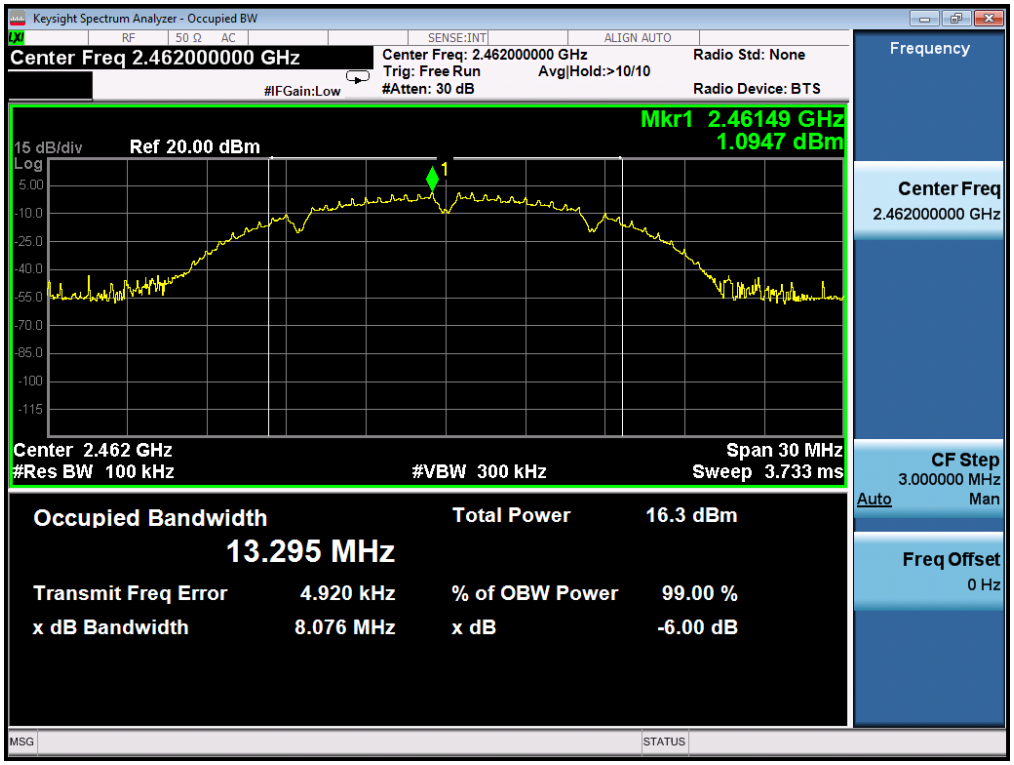
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL




TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

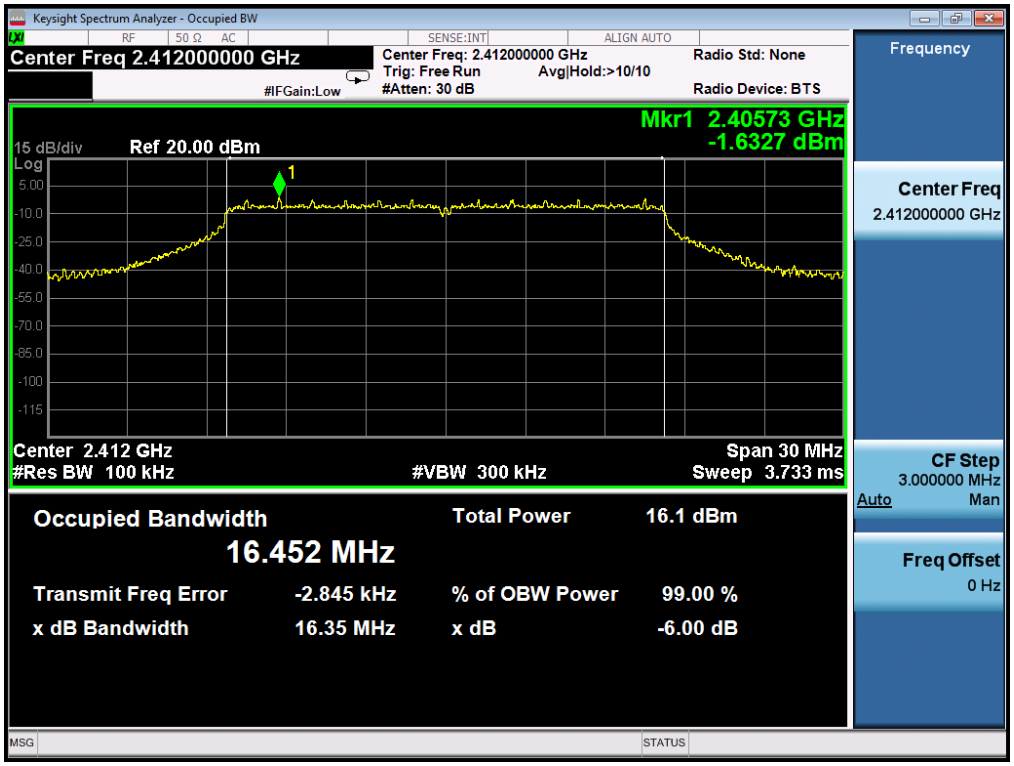


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

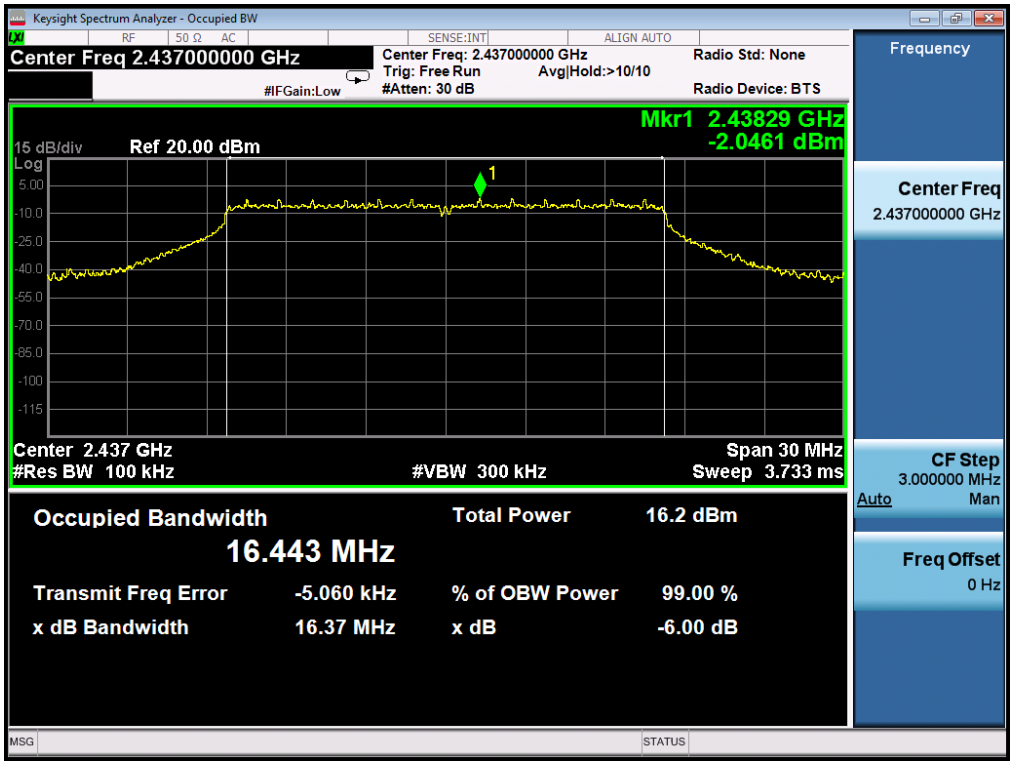



**802.11g TEST RESULT**

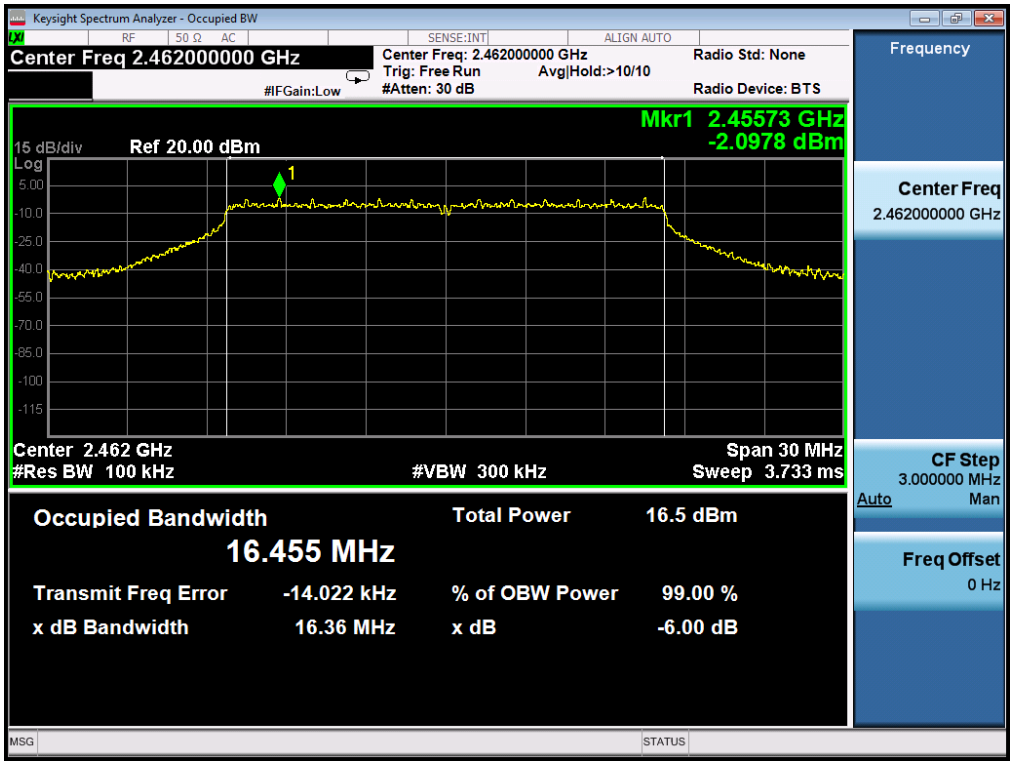
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

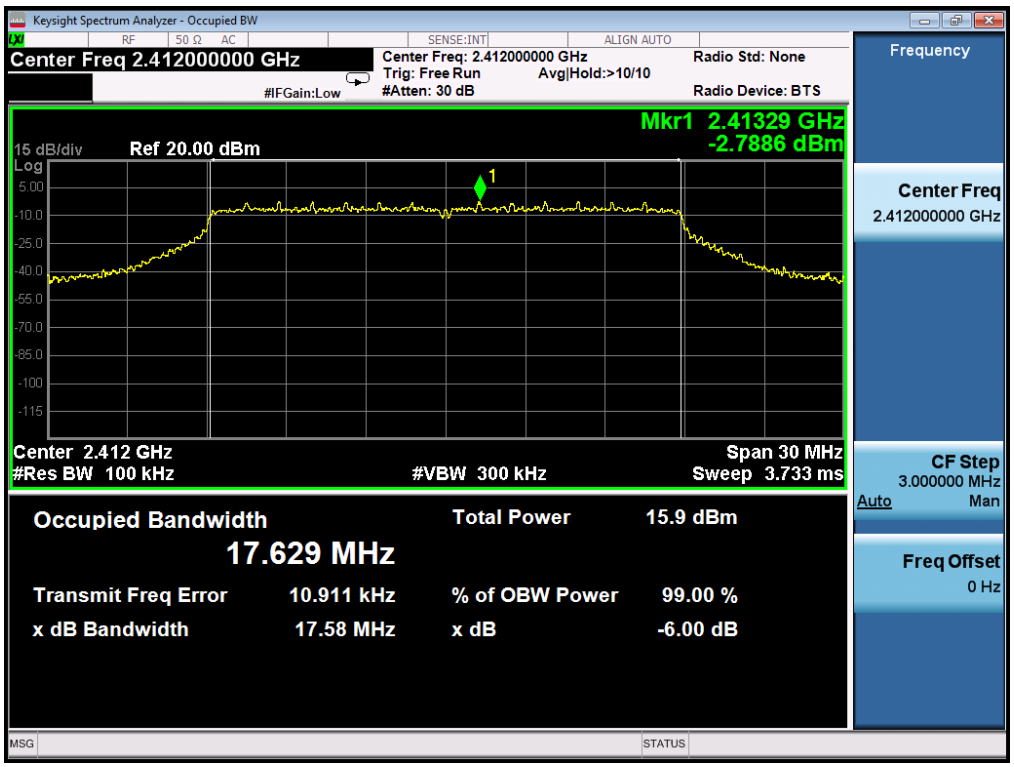



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

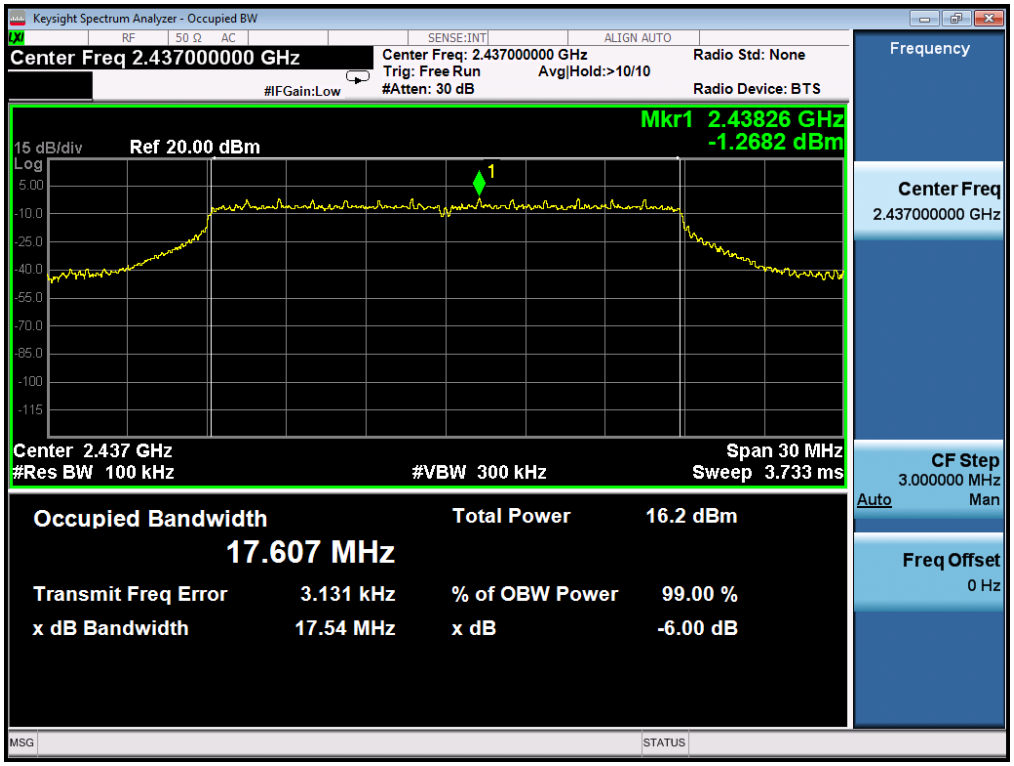


## 802.11n (20) TEST RESULT

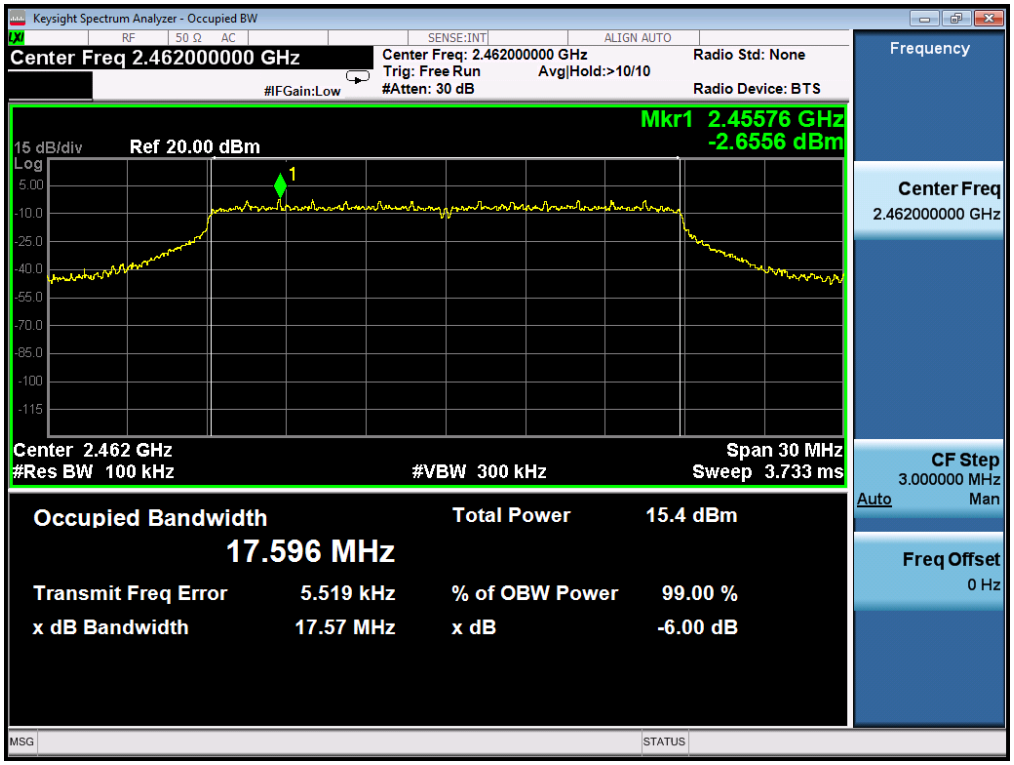
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL




TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

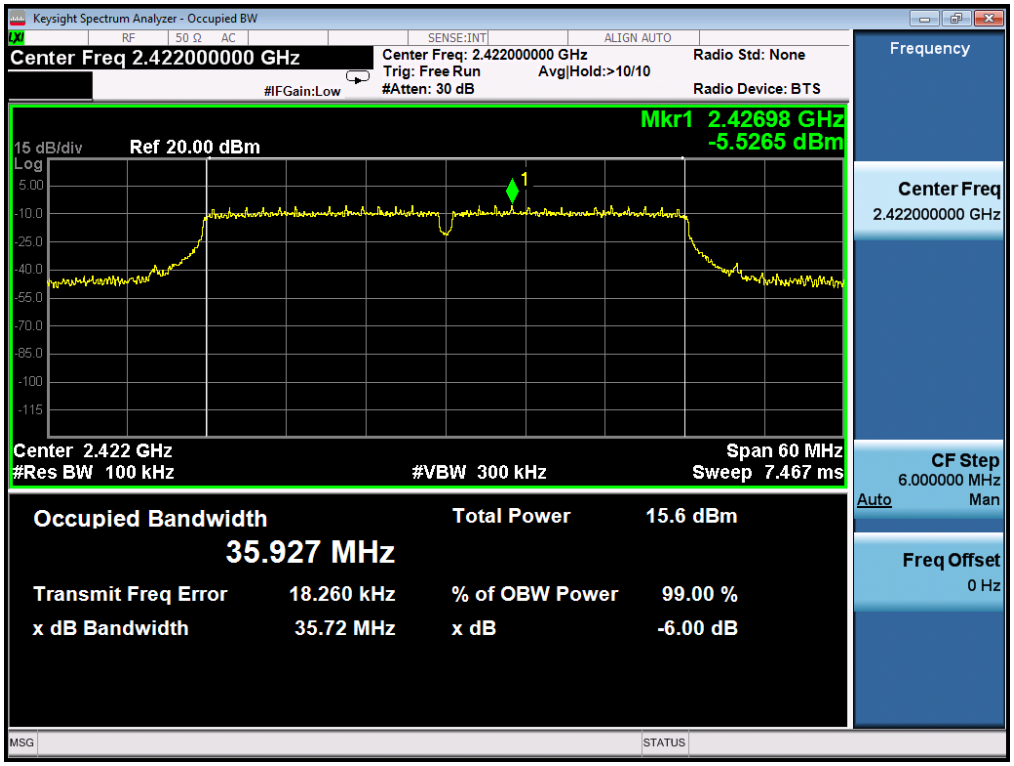


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

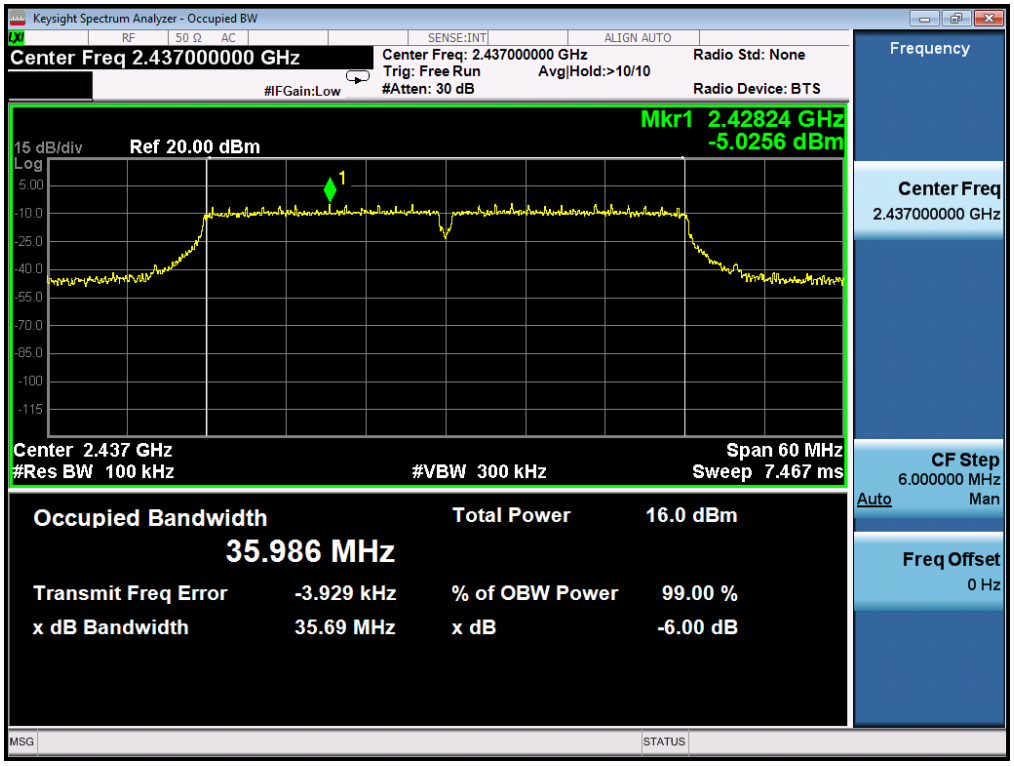



**802.11n (40) TEST RESULT**

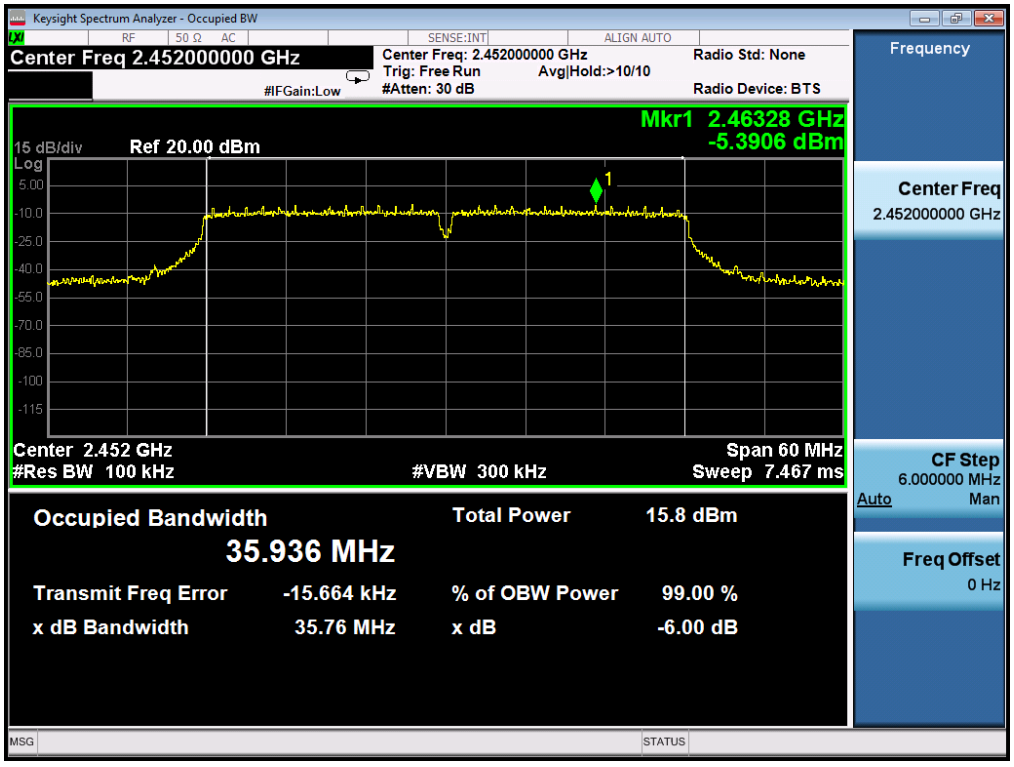
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL




TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



# 9. CONDUCTED SPURIOUS EMISSION

## 9.1. MEASUREMENT PROCEDURE

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

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

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

The same as described in section 8.2.

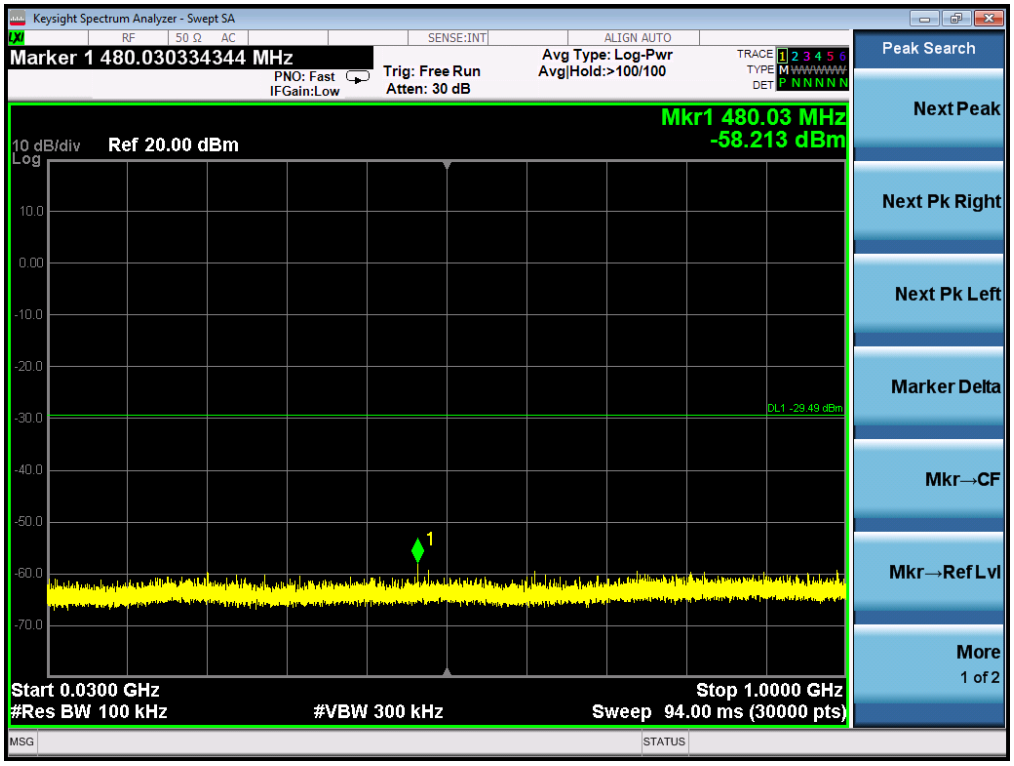
## 9.3. MEASUREMENT EQUIPMENT USEDJN

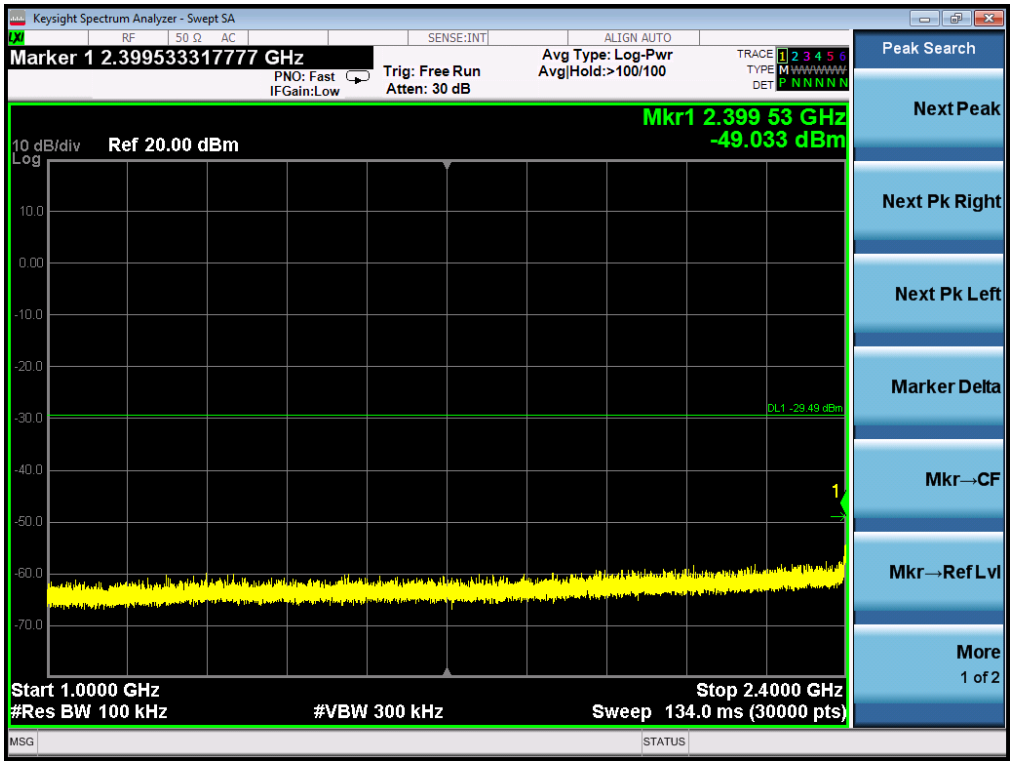
The same as described in section 6.

## 9.4. LIMITS AND MEASUREMENT RESULT

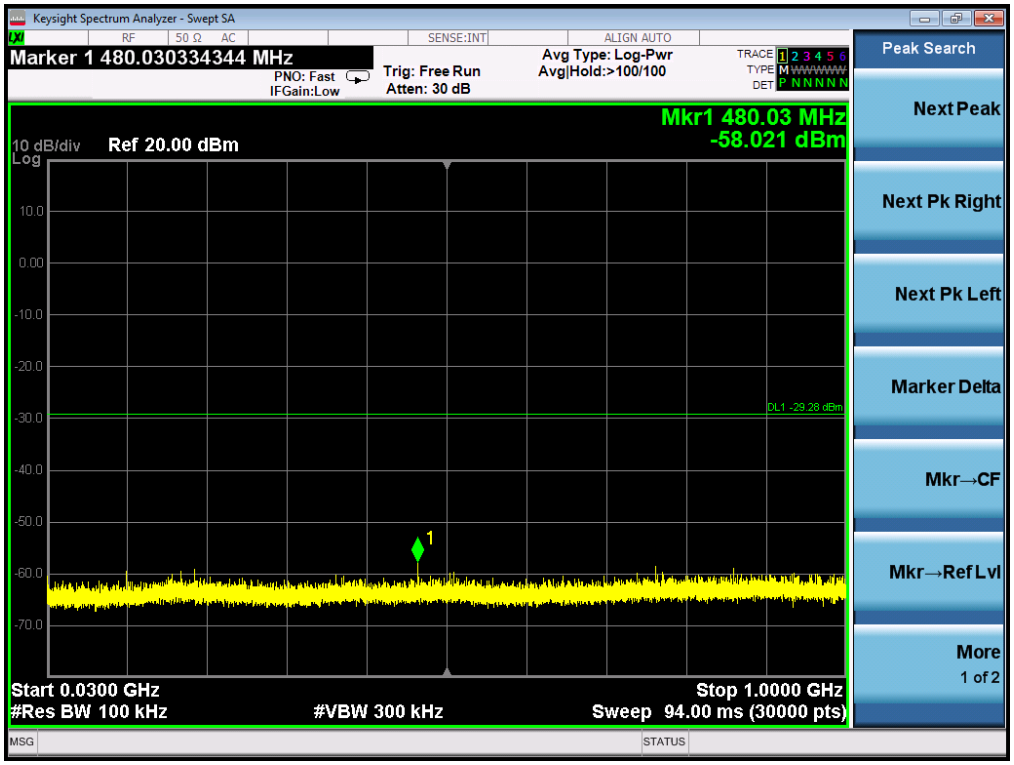
| LIMITS AND MEASUREMENT RESULT | | |
|---|---|---|
| **Applicable Limits** | **Measurement Result** | |
| | **Test Data** | **Criteria** |
| In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by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

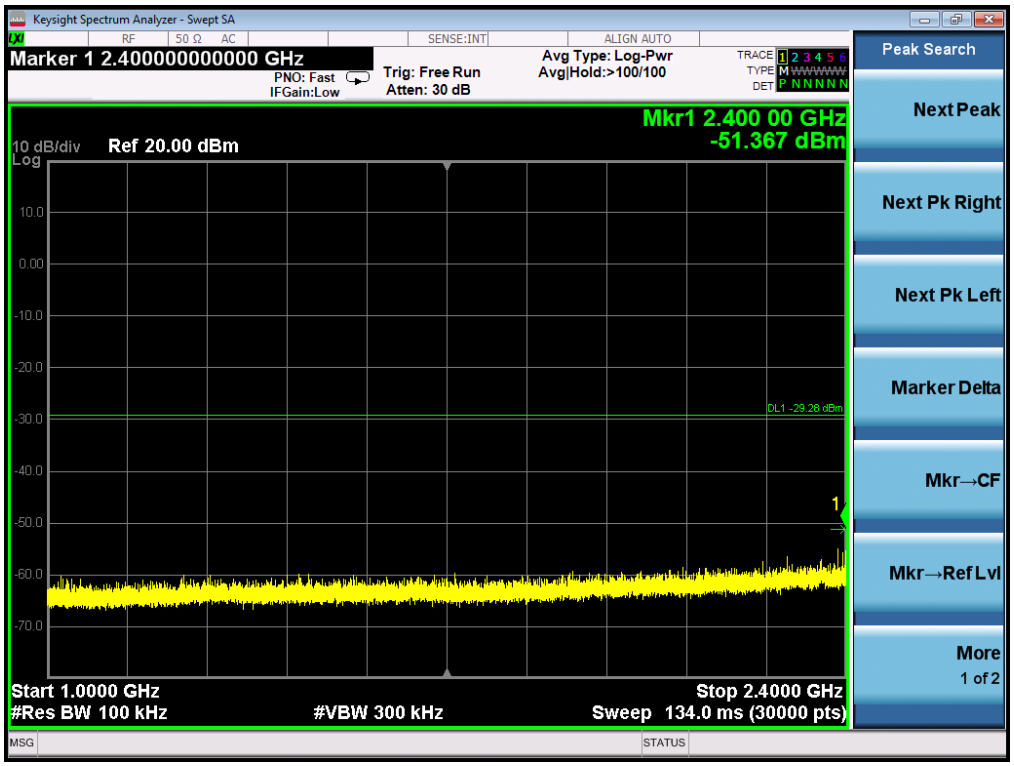
TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF 802.11b FOR MODULATION IN LOW CHANNEL



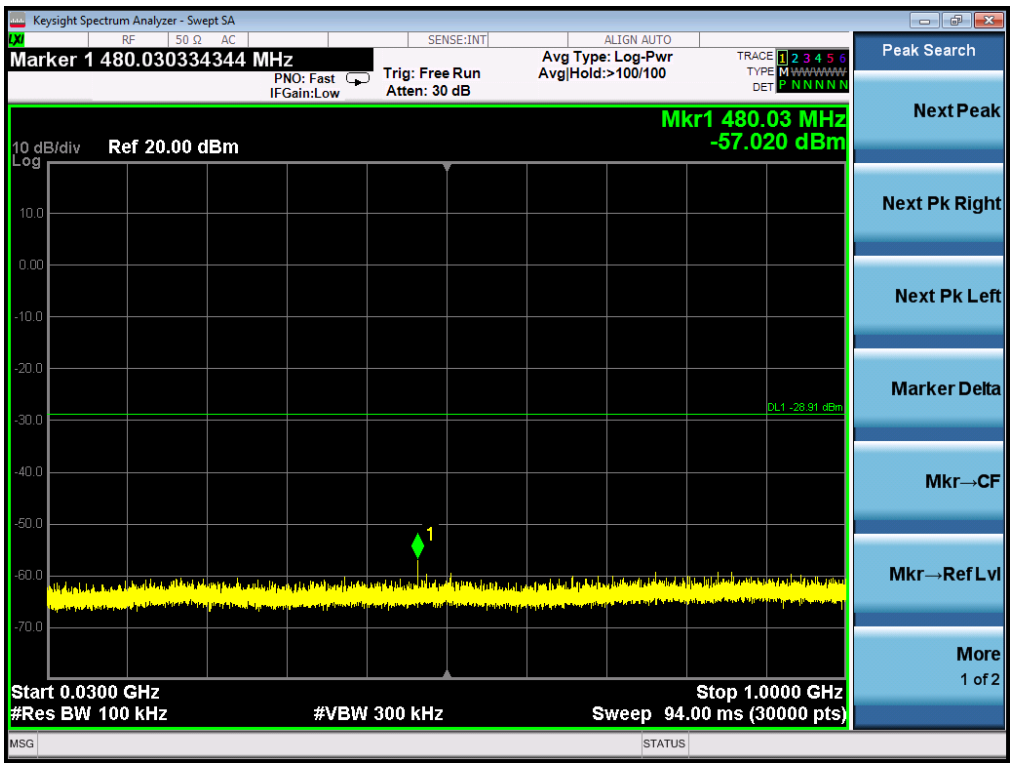
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF 802.11b FOR MODULATION IN MIDDLE CHANNEL

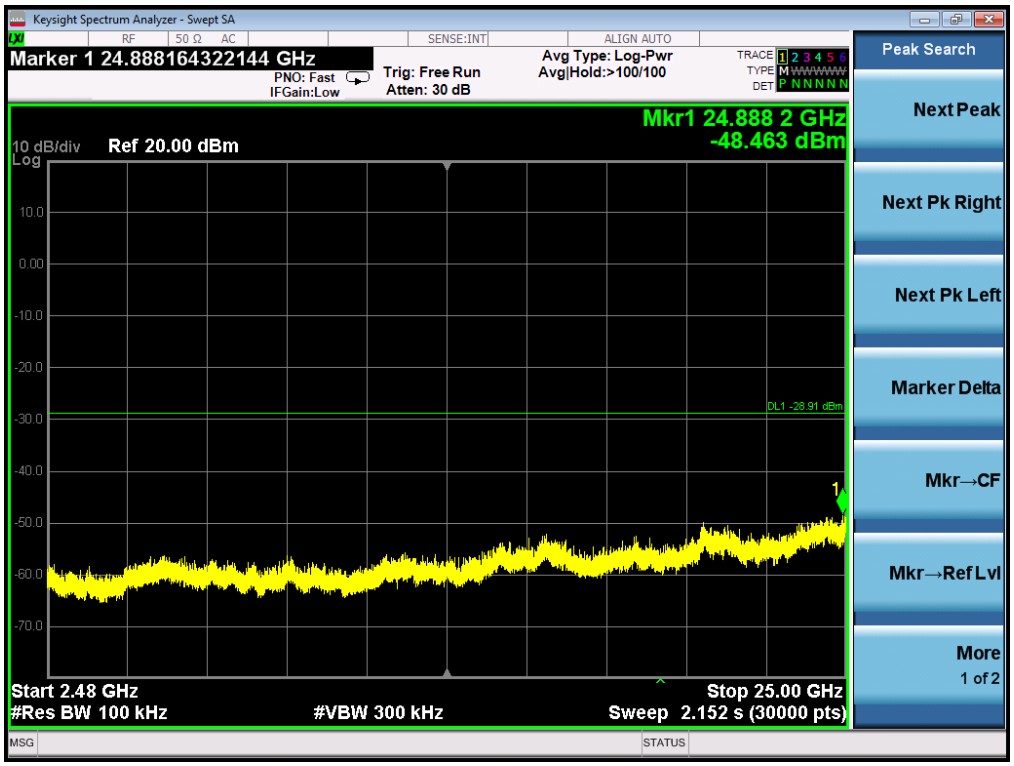



Keysight Spectrum Analyzer - Swept SA
Marker 1 2.400000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 2.400 00 GHz
-51.367 dBm
10 dB/div
Log
Ref 20.00 dBm
DL1 -29.28 dBm
Start 1.0000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.4000 GHz
Sweep 134.0 ms (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

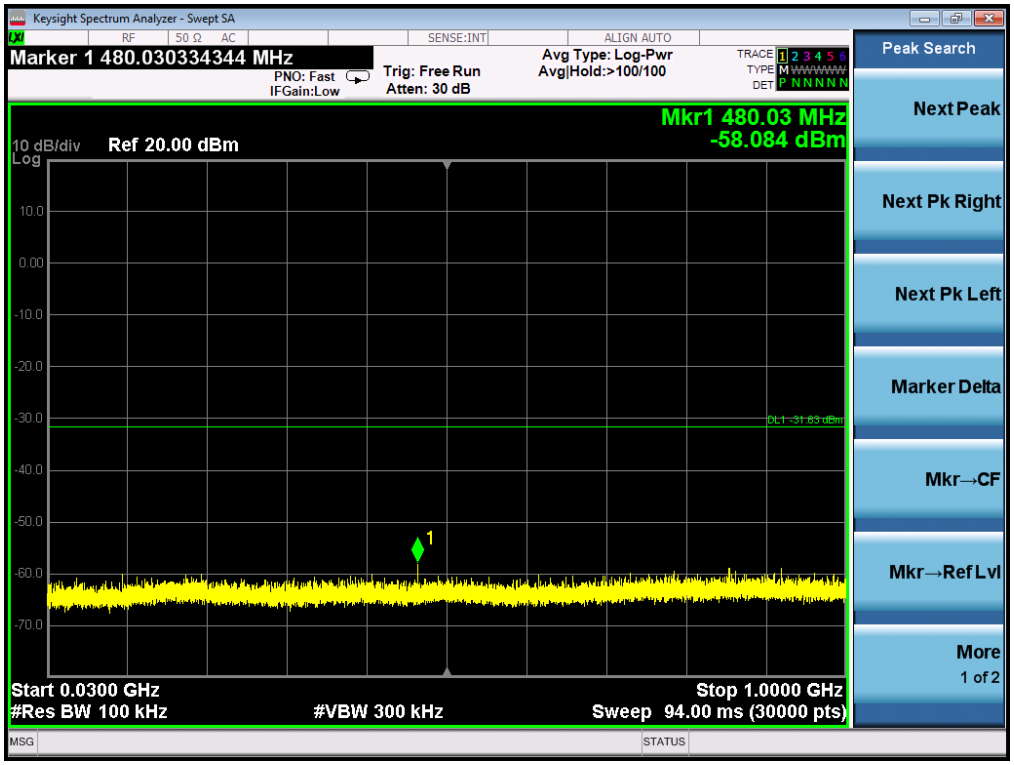
Keysight Spectrum Analyzer - Swept SA
Marker 1 24.470844611487 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 24.470 8 GHz
-47.839 dBm
10 dB/div
Log
Ref 20.00 dBm
DL1 -29.28 dBm
Start 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.152 s (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

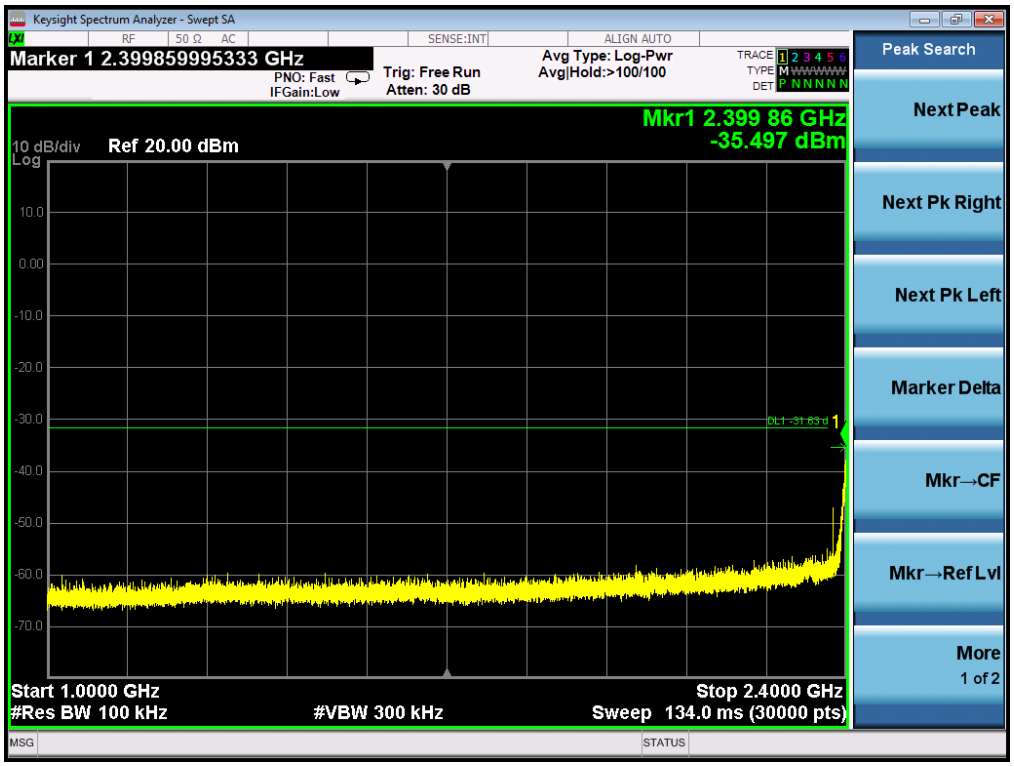
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE
OF 802.11b FOR MODULATION IN HIGH CHANNEL





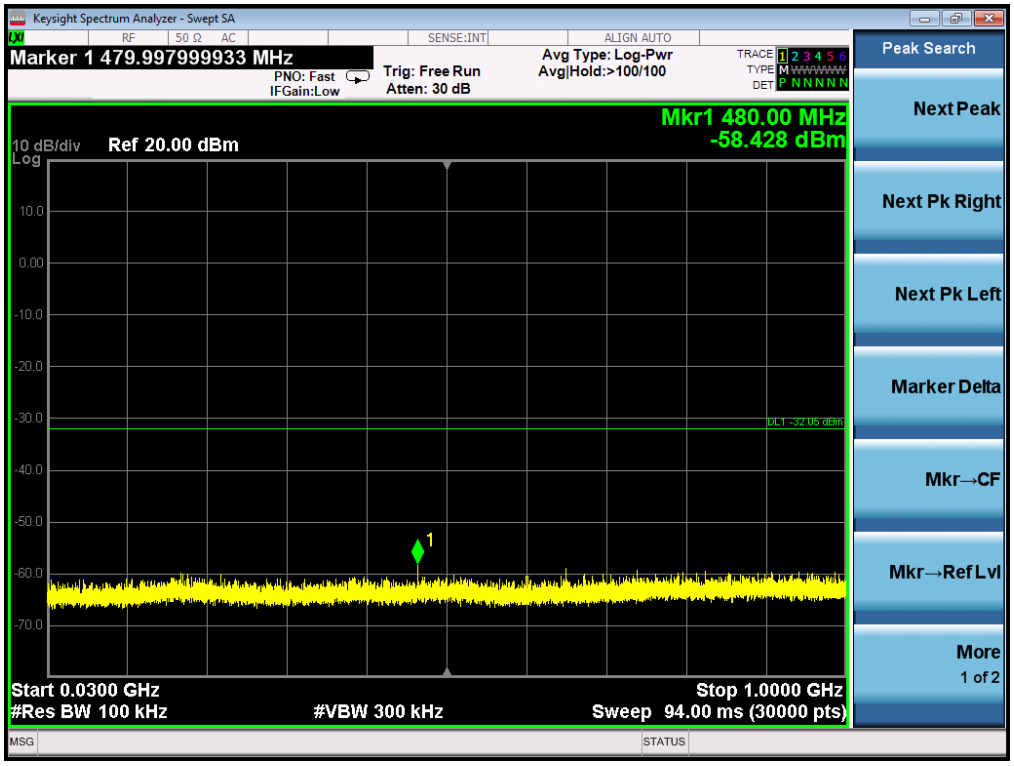

TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF 802.11g FOR MODULATION IN LOW CHANNEL

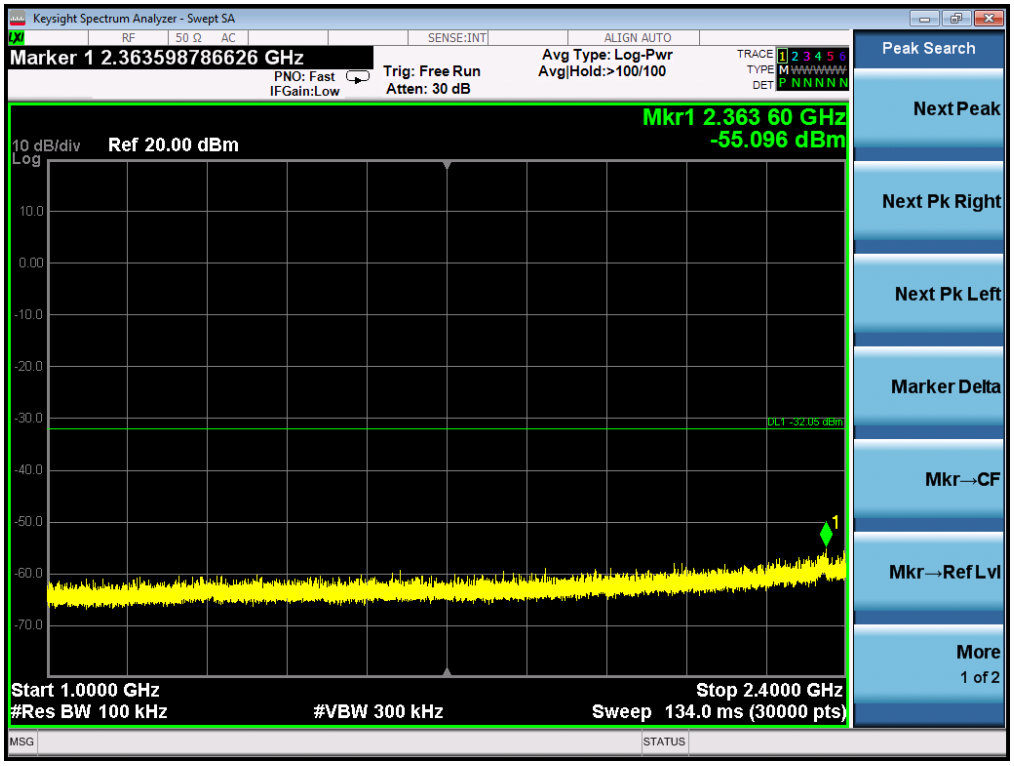



Keysight Spectrum Analyzer - Swept SA
Marker 1 2.399859995333 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 2.399 86 GHz
-35.497 dBm
10 dB/div
Log
Ref 20.00 dBm
Start 1.0000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.4000 GHz
Sweep 134.0 ms (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

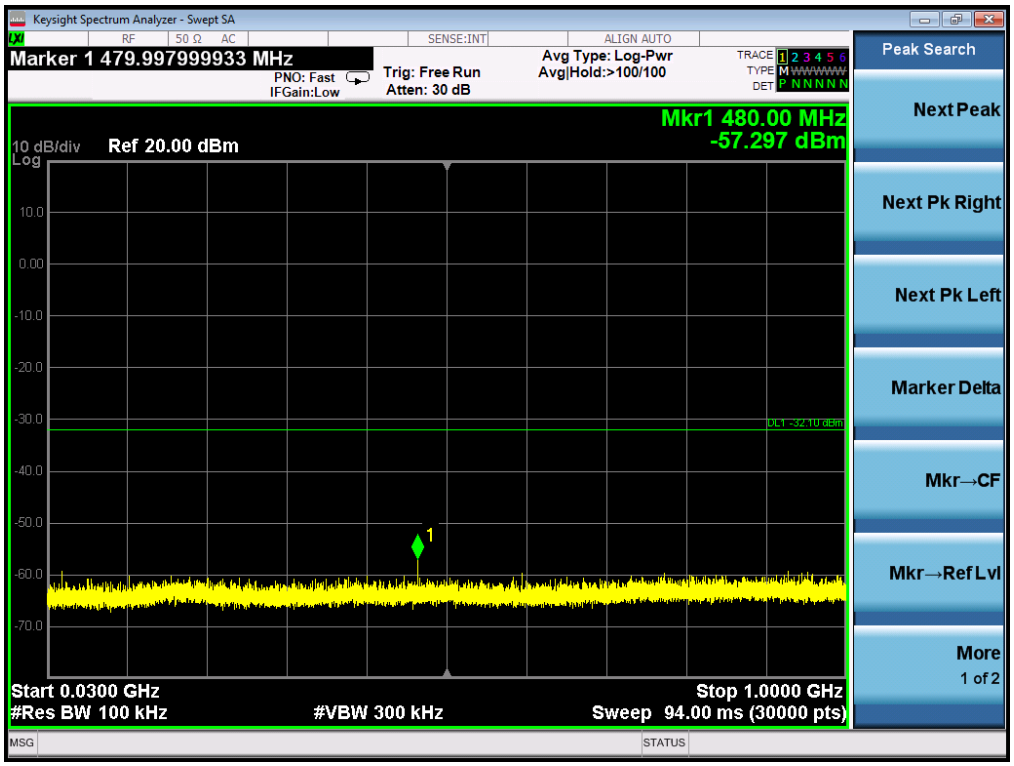
Keysight Spectrum Analyzer - Swept SA
Marker 1 24.978233324444 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 24.978 2 GHz
-48.747 dBm
10 dB/div
Log
Ref 20.00 dBm
Start 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.152 s (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

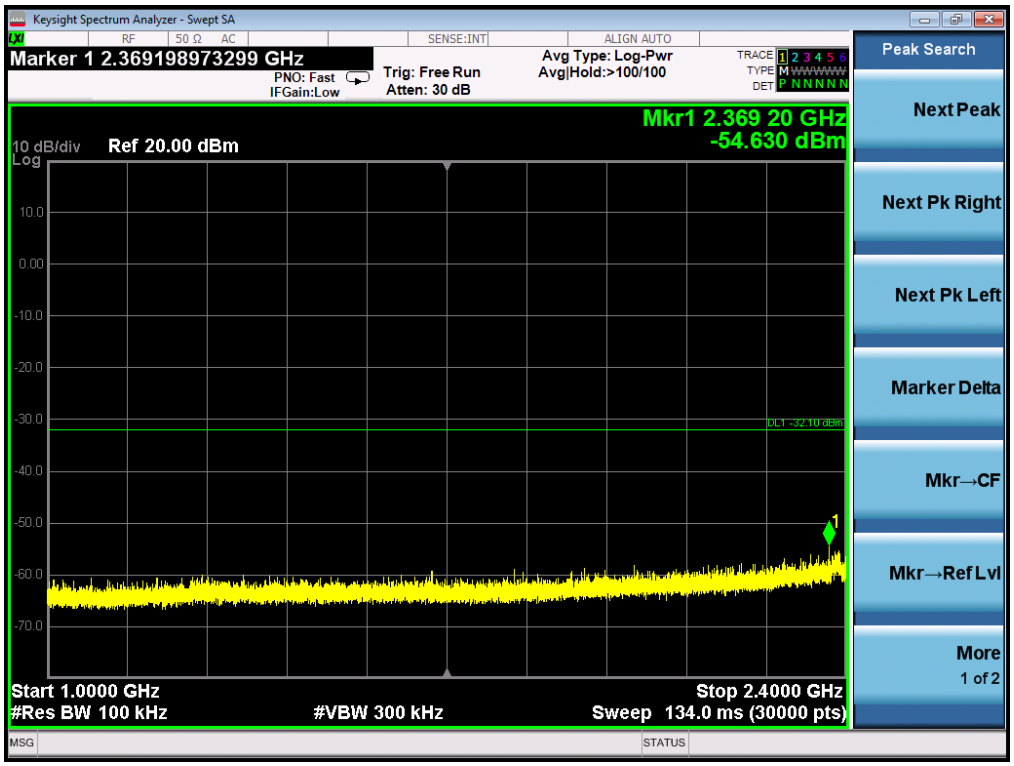
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE
OF 802.11g FOR MODULATION IN MIDDLE CHANNEL



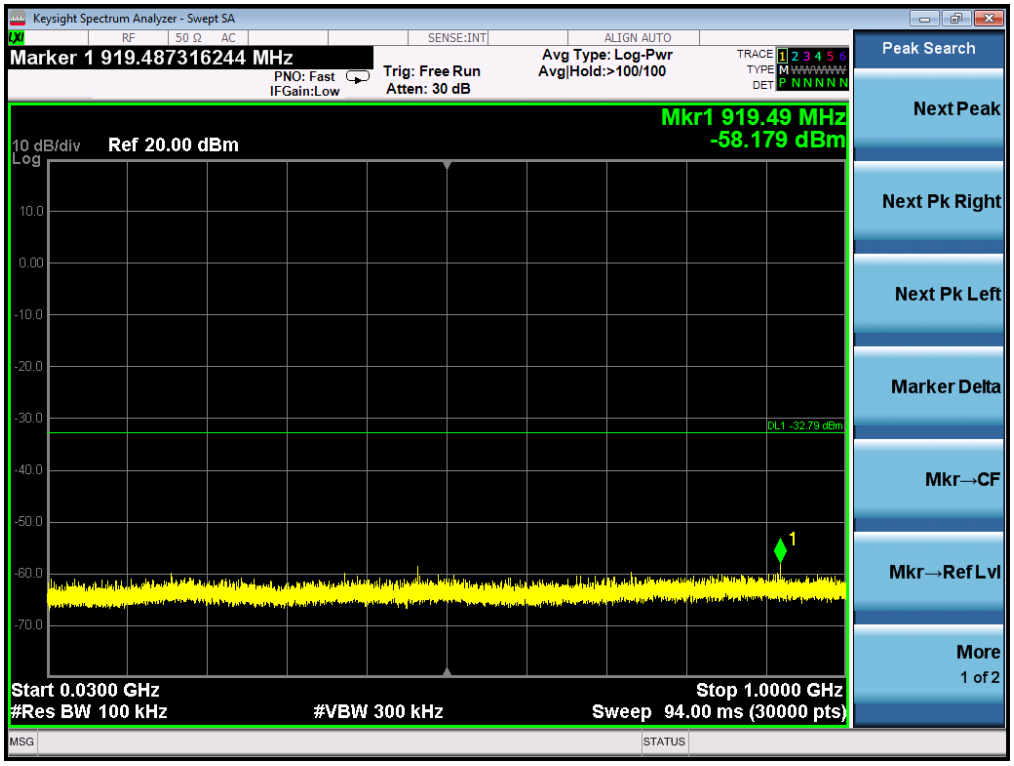
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF 802.11g FOR MODULATION IN HIGH CHANNEL

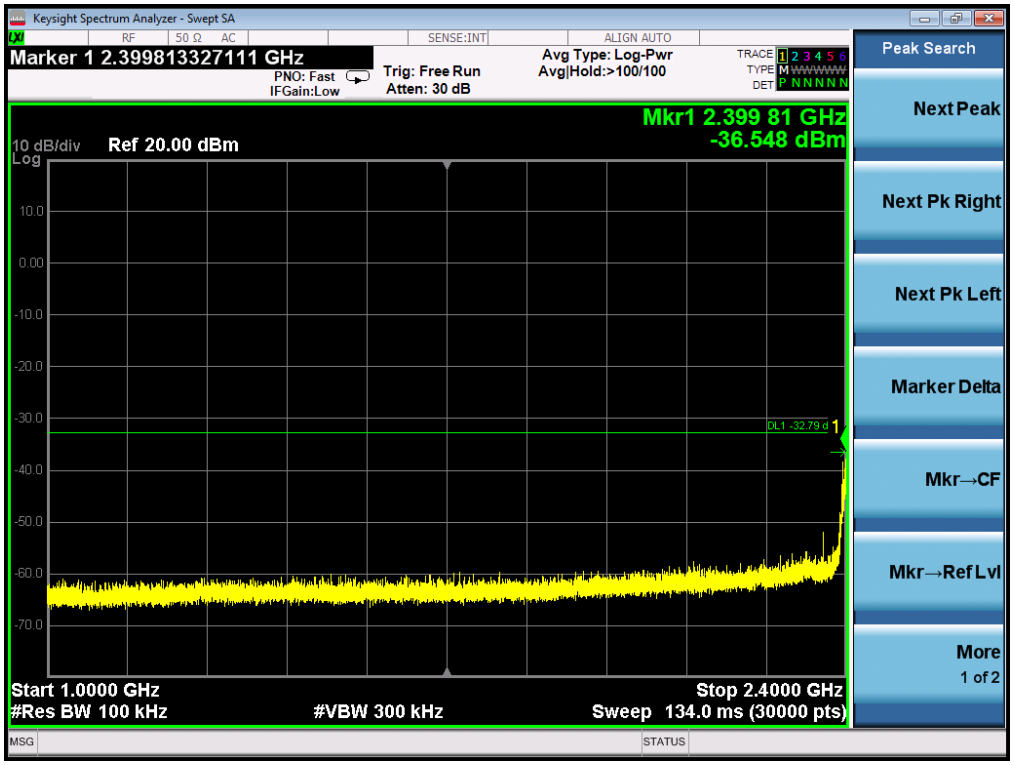



Keysight Spectrum Analyzer - Swept SA
Marker 1 2.369198973299 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 2.369 20 GHz
-54.630 dBm
10 dB/div
Log
Ref 20.00 dBm
Start 1.0000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.4000 GHz
Sweep 134.0 ms (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

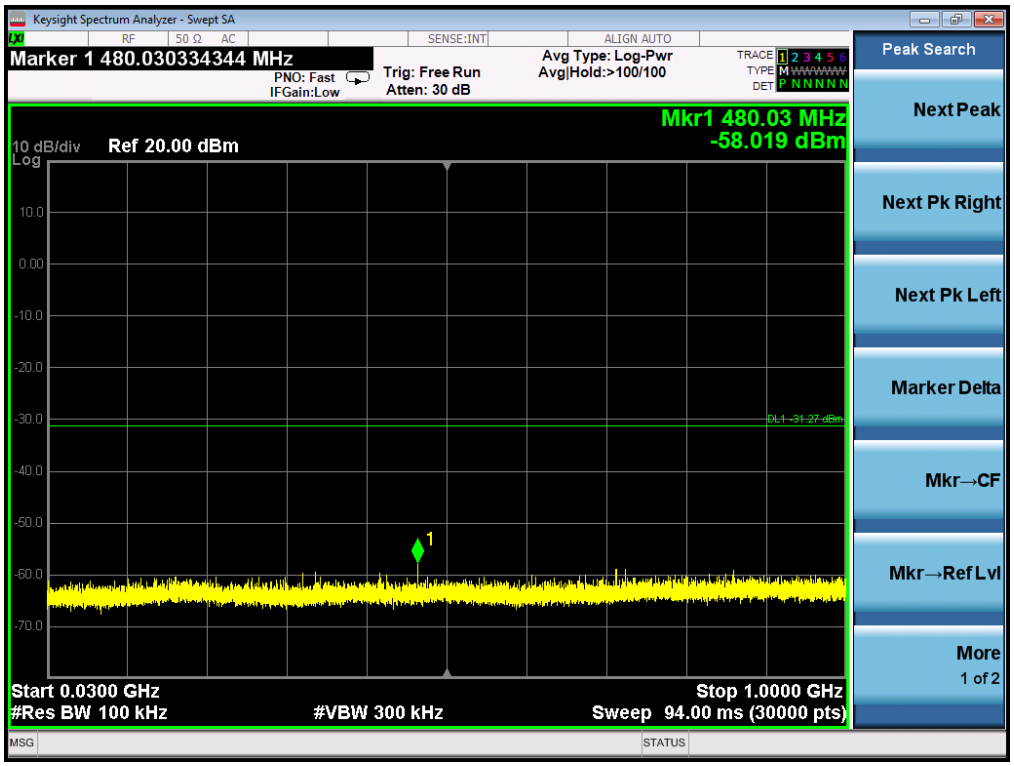
Keysight Spectrum Analyzer - Swept SA
Marker 1 24.544400963365 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 24.544 4 GHz
-48.015 dBm
10 dB/div
Log
Ref 20.00 dBm
Start 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.152 s (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

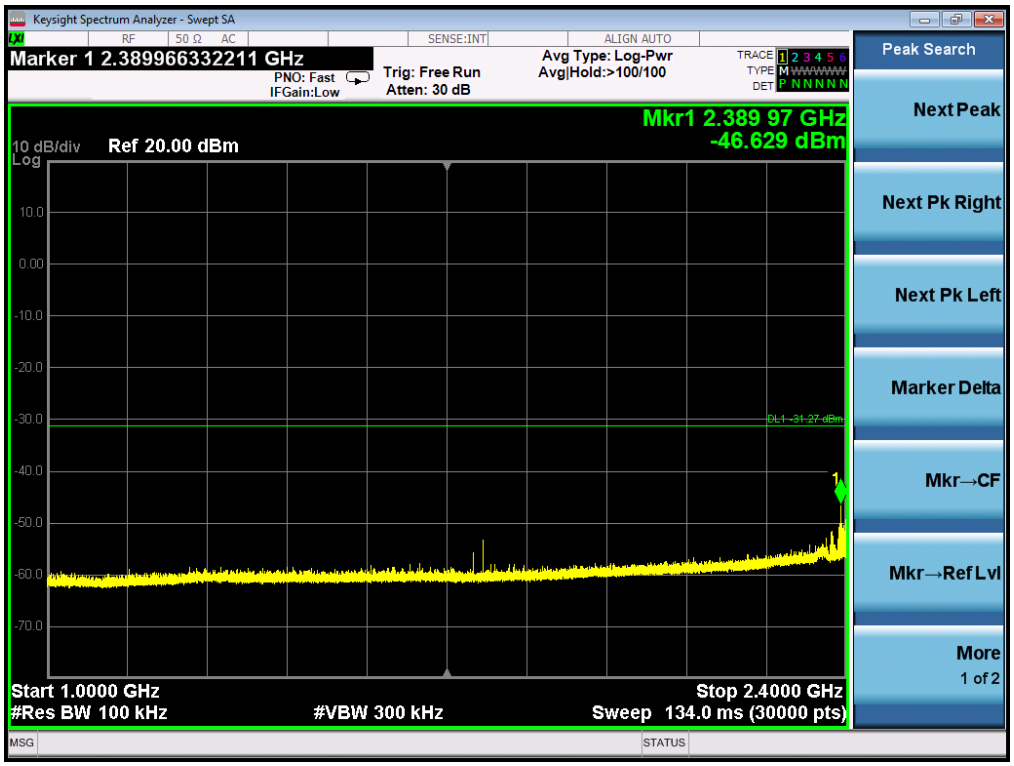
TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF 802.11n20 FOR MODULATION IN LOW CHANNEL



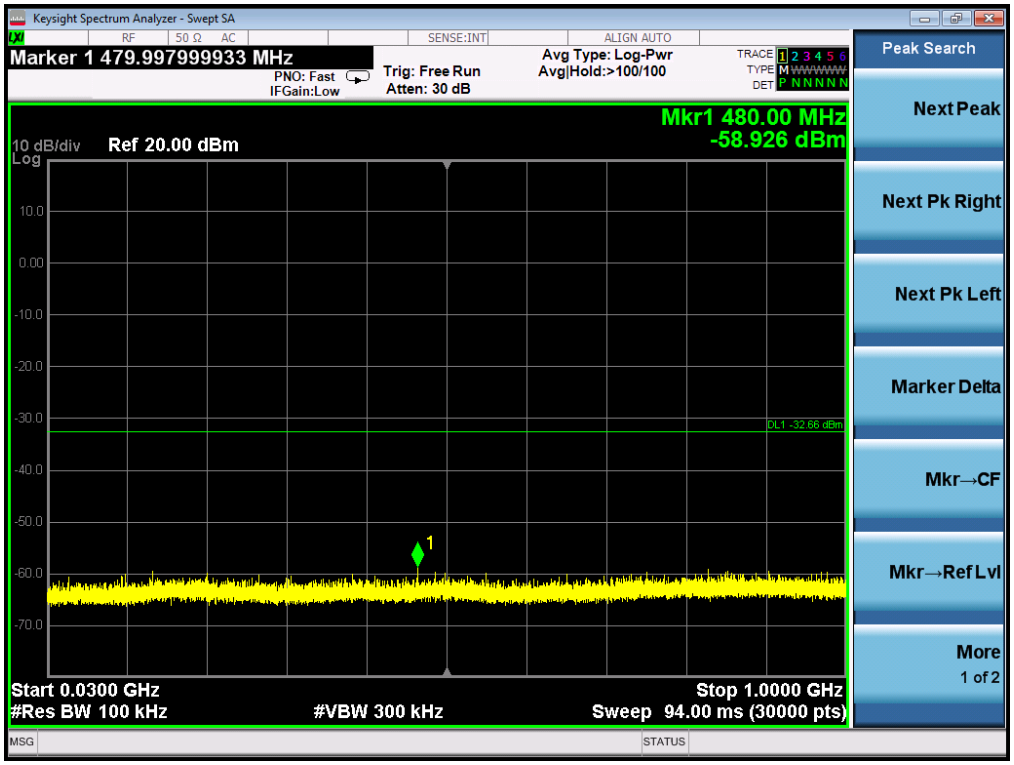
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF 802.11n20 FOR MODULATION IN MIDDLE CHANNEL

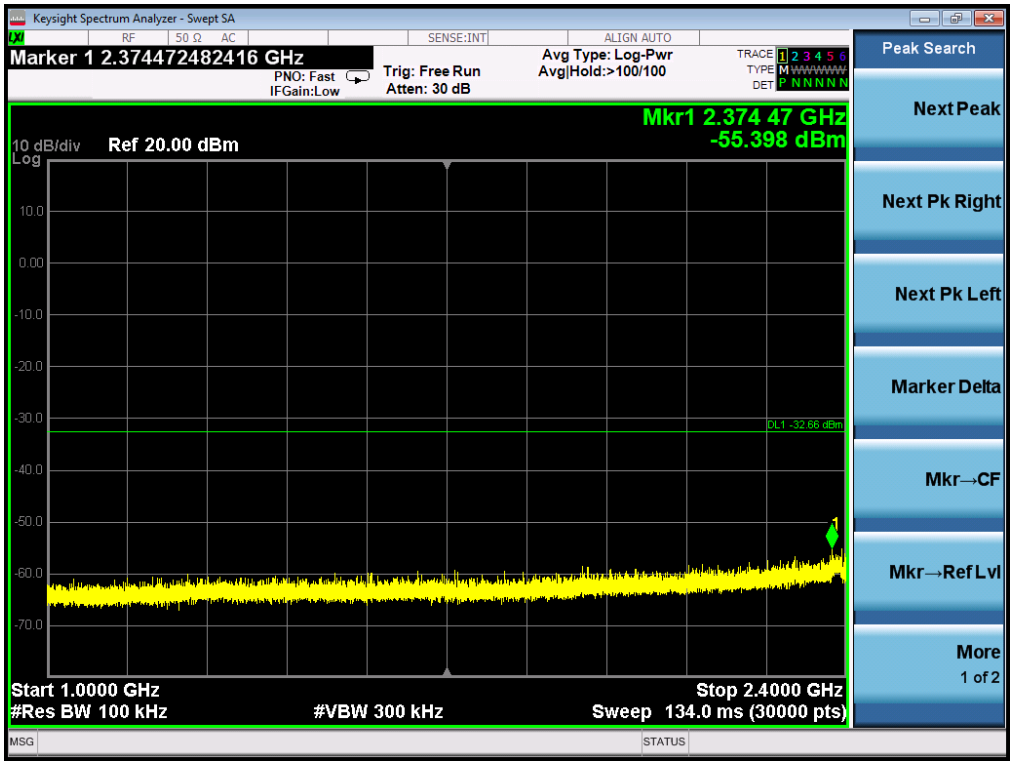



Keysight Spectrum Analyzer - Swept SA
Marker 1 2.389966332211 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 2.389 97 GHz
-46.629 dBm
10 dB/div
Log
Ref 20.00 dBm
Start 1.0000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.4000 GHz
Sweep 134.0 ms (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

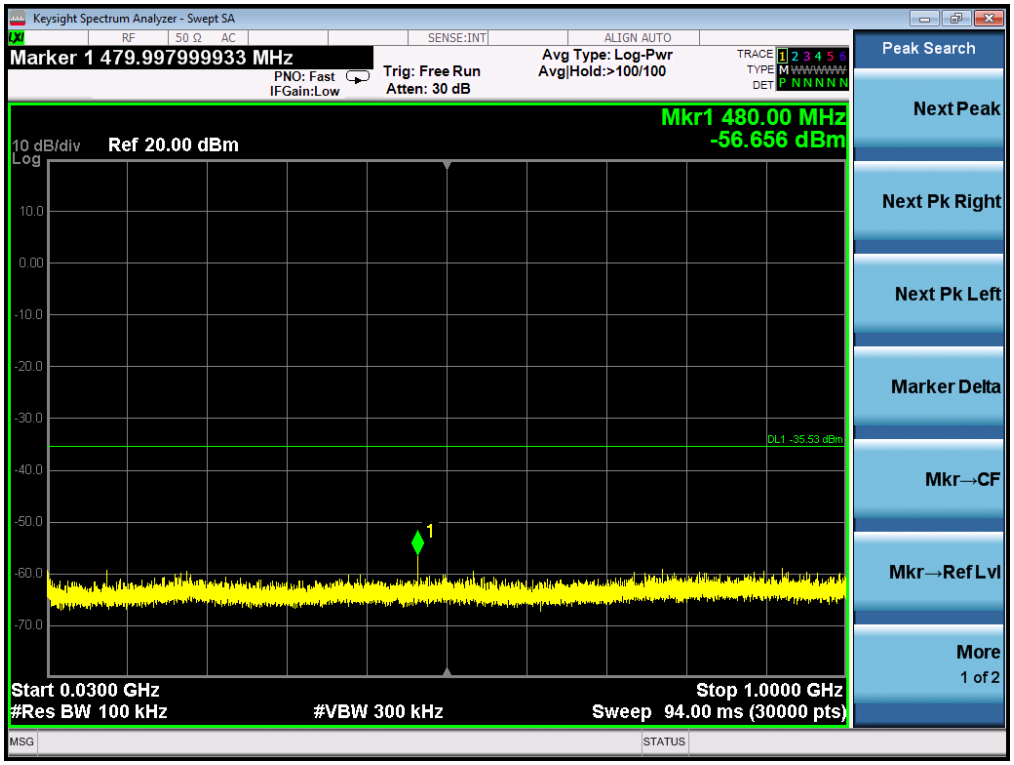
Keysight Spectrum Analyzer - Swept SA
Marker 1 24.994745974866 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 24.994 7 GHz
-46.542 dBm
10 dB/div
Log
Ref 20.00 dBm
Start 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.152 s (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

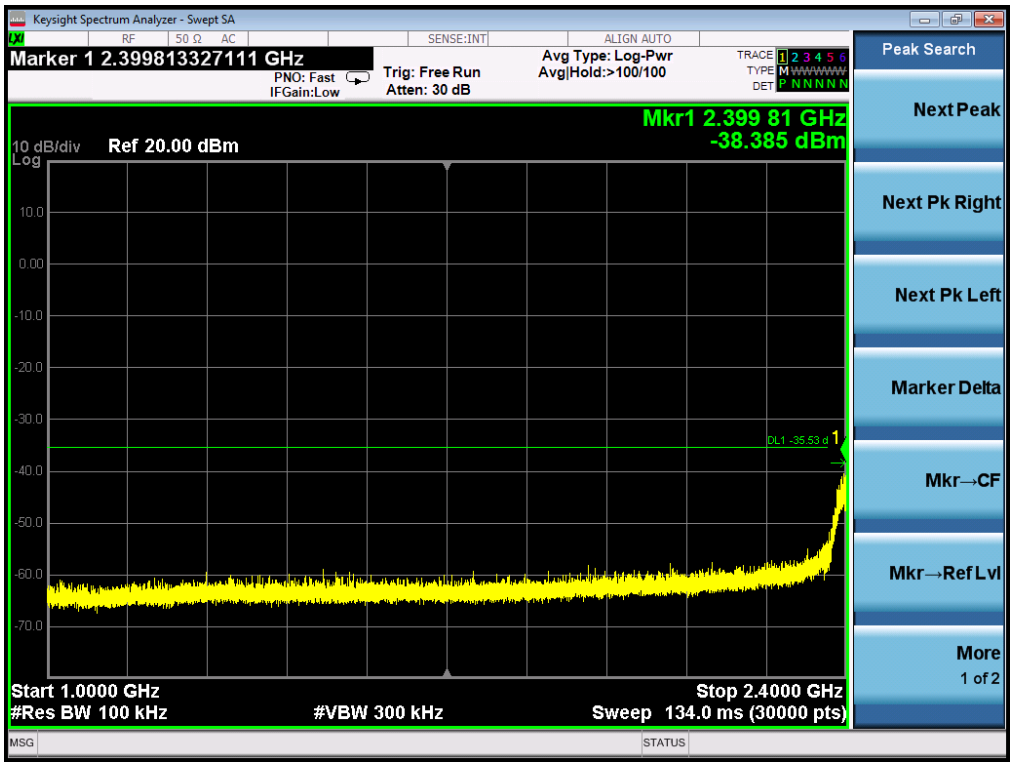
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE
OF 802.11n20 FOR MODULATION IN HIGH CHANNEL

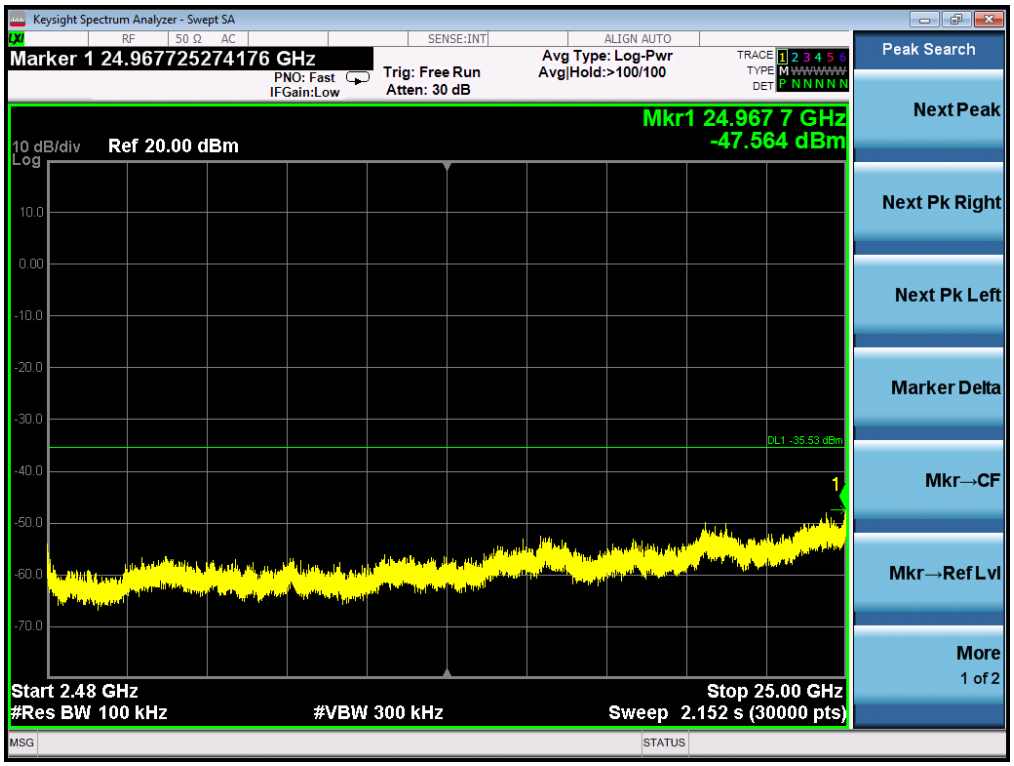


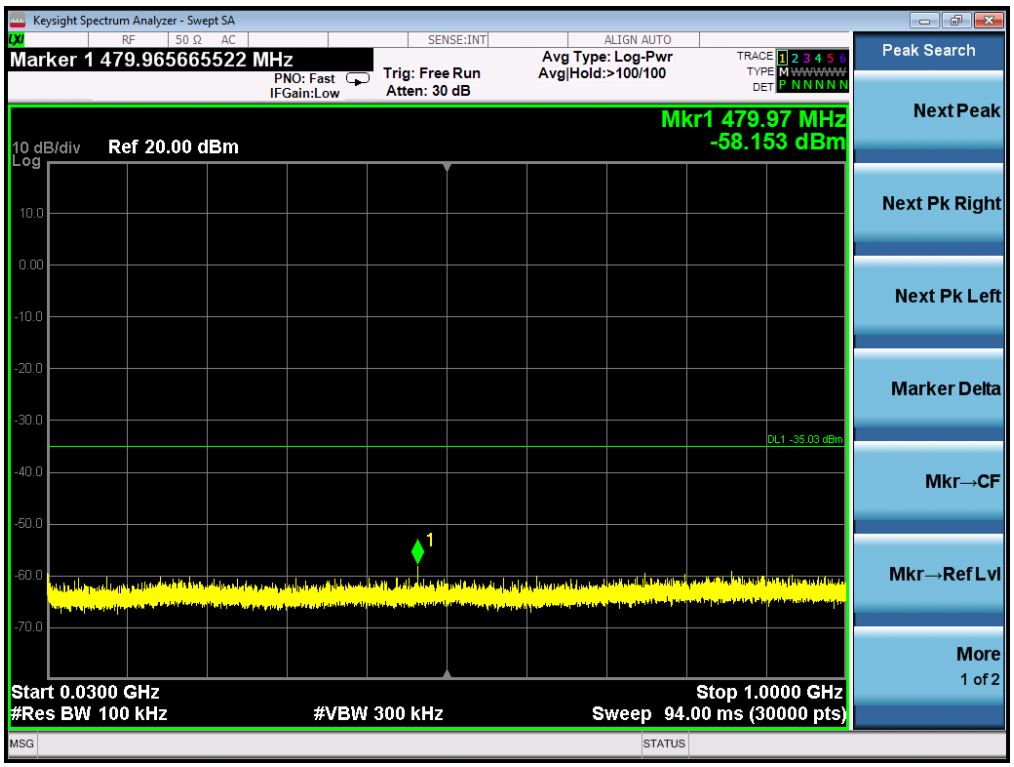
TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF 802.11n40 FOR MODULATION IN LOW CHANNEL

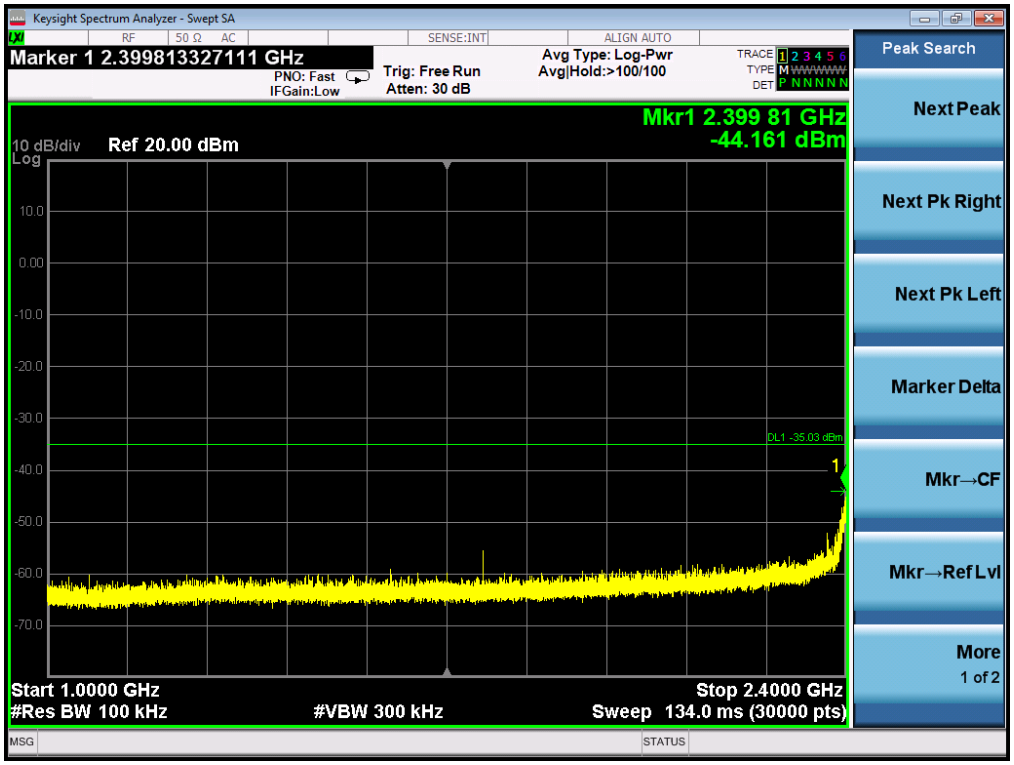


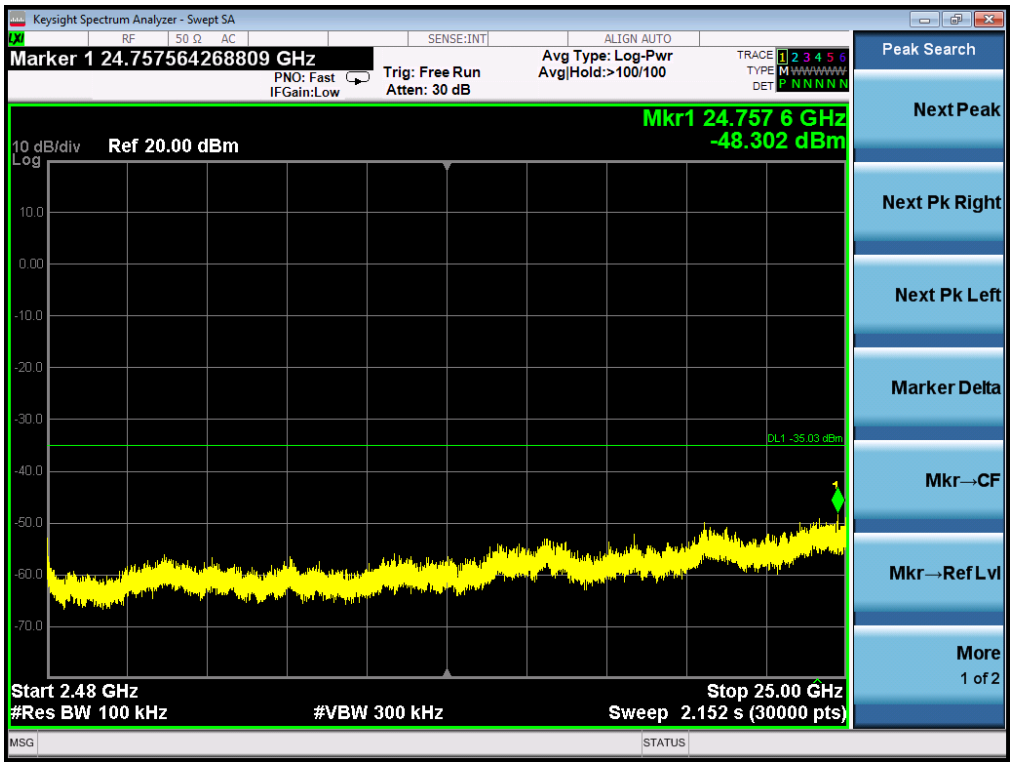

Keysight Spectrum Analyzer - Swept SA
Marker 1 2.399813327111 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 2.399 81 GHz
-38.385 dBm
10 dB/div
Log
Ref 20.00 dBm
Start 1.0000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.4000 GHz
Sweep 134.0 ms (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 24.967725274176 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 24.967 7 GHz
-47.564 dBm
10 dB/div
Log
Ref 20.00 dBm
Start 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.152 s (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

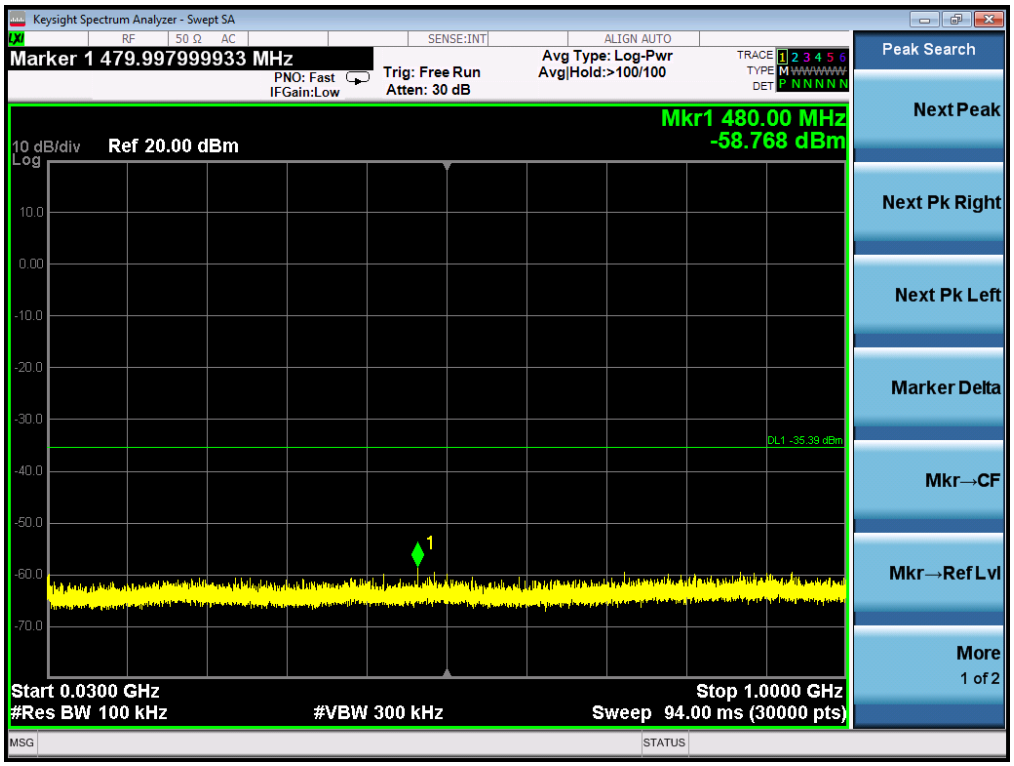
TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE
OF 802.11n40 FOR MODULATION IN MIDDLE CHANNEL

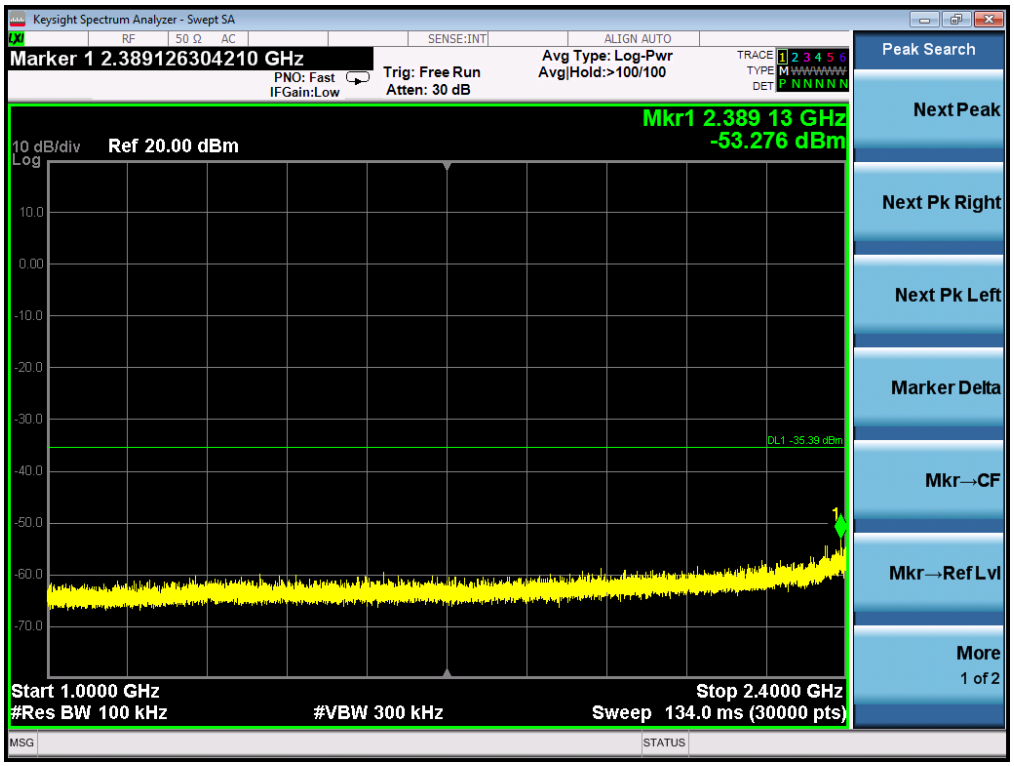





TEST PLOT OF OUT OF BAND EMISSIONS THE WORST CASE OF 802.11n40 FOR MODULATION IN HIGH CHANNEL




Keysight Spectrum Analyzer - Swept SA
Marker 1 2.389126304210 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 2.389 13 GHz
-53.276 dBm
10 dB/div
Log
Ref 20.00 dBm
DL1 -35.39 dBm
Start 1.0000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.4000 GHz
Sweep 134.0 ms (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Keysight Spectrum Analyzer - Swept SA
Marker 1 23.956700723357 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 23.956 7 GHz
-47.917 dBm
10 dB/div
Log
Ref 20.00 dBm
DL1 -35.39 dBm
Start 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.152 s (30000 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

# 10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

## 10.1 MEASUREMENT PROCEDURE

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

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

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

Refer To Section 8.2.

## 10.3 MEASUREMENT EQUIPMENT USED

Refer To Section 6.

## 10.4 LIMITS AND MEASUREMENT RESULT

| **TEST ITEM** | POWER SPECTRAL DENSITY |
|---|---|
| **TEST MODE** | 802.11b with data rate 1 |

| **Channel No.** | **Power density (dBm/20kHz)** | **Limit (dBm/3kHz)** | **Result** |
|---|---|---|---|
| Low Channel | -3.923 | 8 | Pass |
| Middle Channel | -3.494 | 8 | Pass |
| High Channel | -3.813 | 8 | Pass |

| **TEST ITEM** | POWER SPECTRAL DENSITY |
|---|---|
| **TEST MODE** | 802.11g with data rate 6 |

| **Channel No.** | **Power density (dBm/20kHz)** | **Limit (dBm/3kHz)** | **Result** |
|---|---|---|---|
| Low Channel | -6.886 | 8 | Pass |
| Middle Channel | -6.714 | 8 | Pass |
| High Channel | -7.798 | 8 | Pass |

| TEST ITEM | POWER SPECTRAL DENSITY |
|---|---|
| TEST MODE | 802.11n 20 with data rate 6.5 |

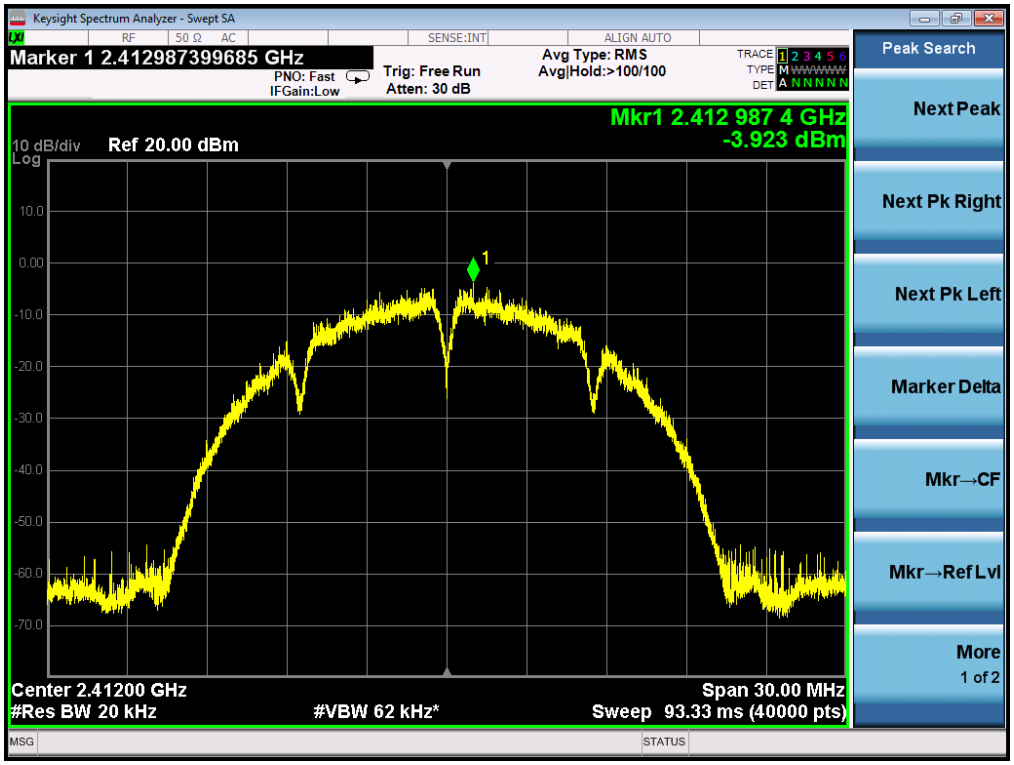
| Channel No. | Power density (dBm/20kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|
| Low Channel | -7.274 | 8 | Pass |
| Middle Channel | -7.537 | 8 | Pass |
| High Channel | -7.015 | 8 | Pass |

| TEST ITEM | POWER SPECTRAL DENSITY |
|---|---|
| TEST MODE | 802.11n 40 with data rate 13.5 |

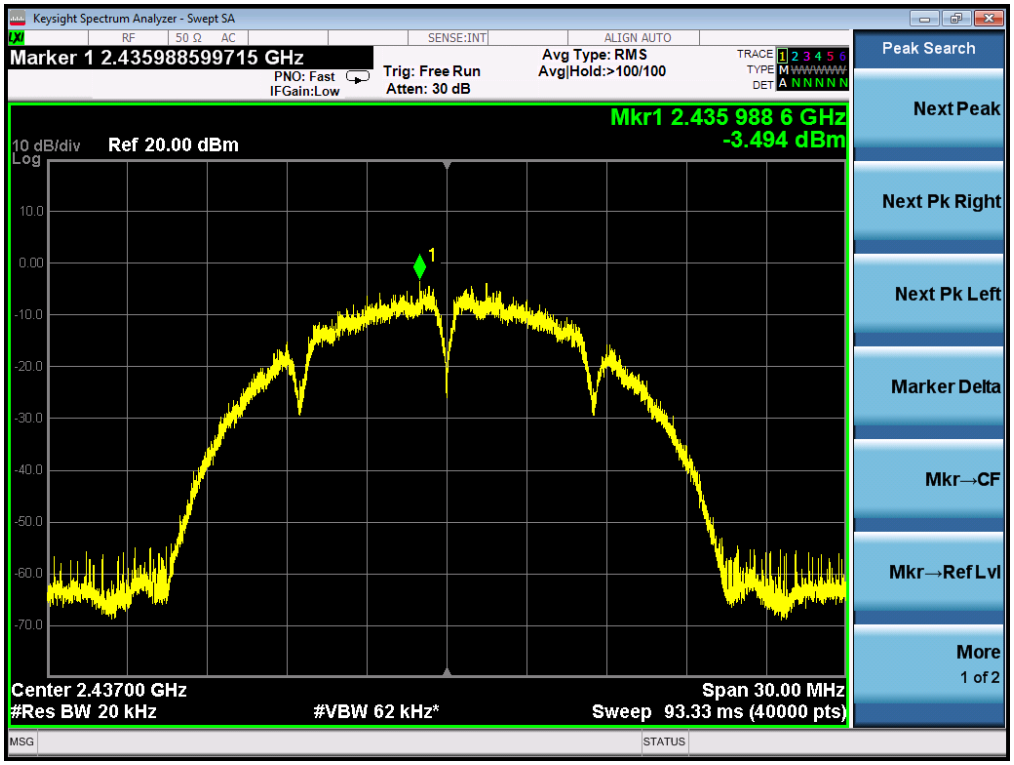
| Channel No. | Power density (dBm/20kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|
| Low Channel | -9.971 | 8 | Pass |
| Middle Channel | -9.847 | 8 | Pass |
| High Channel | -9.886 | 8 | Pass |

## 802.11b TEST RESULT

TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



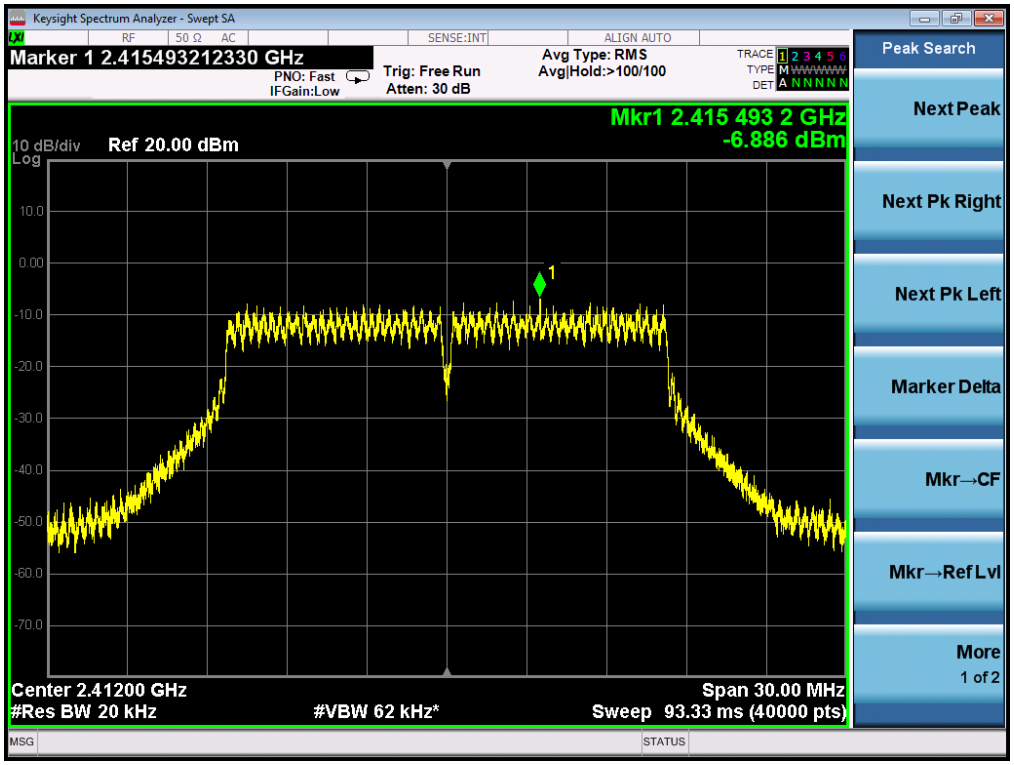

TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



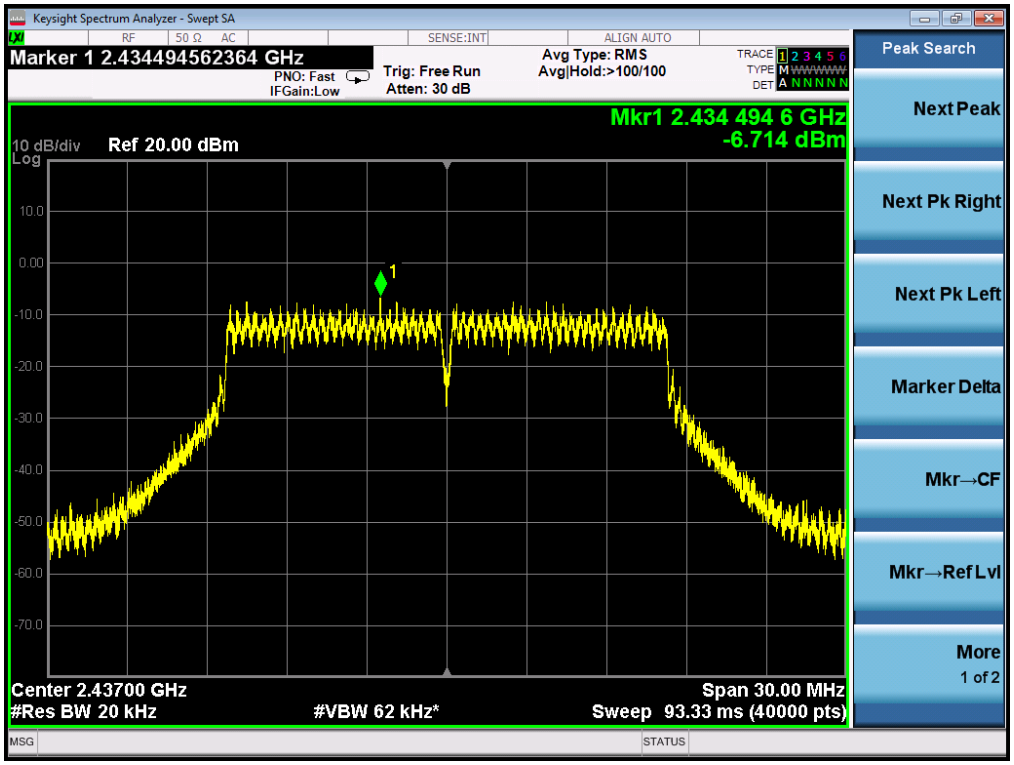
TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL

**802.11g TEST RESULT**

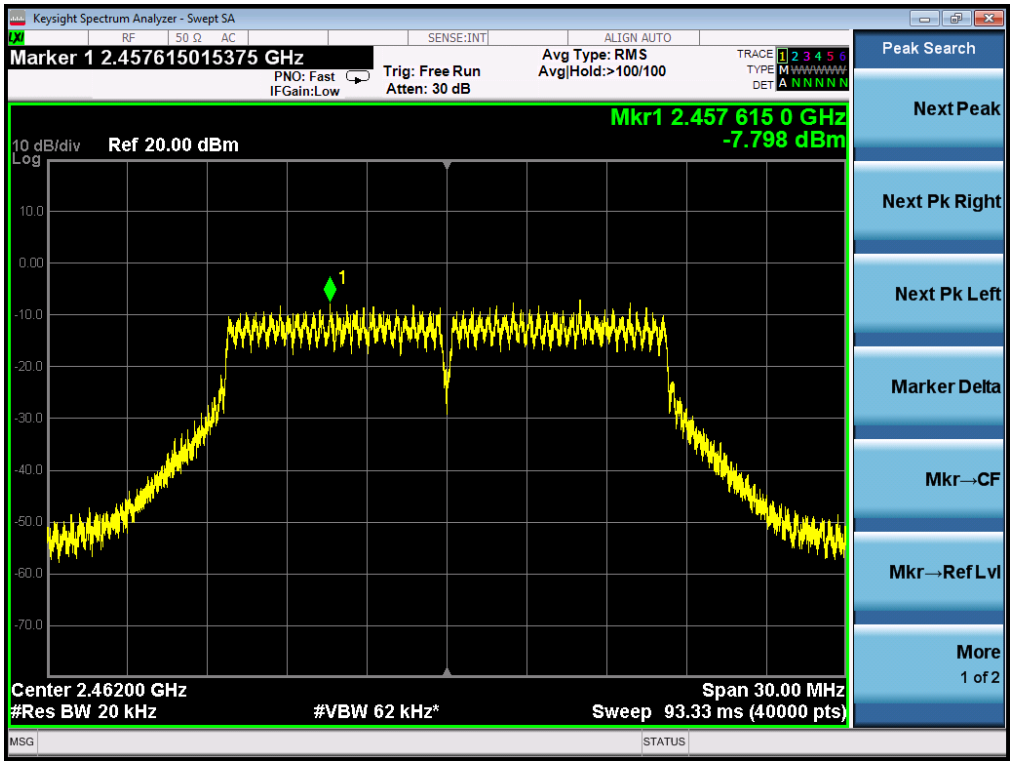
TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL

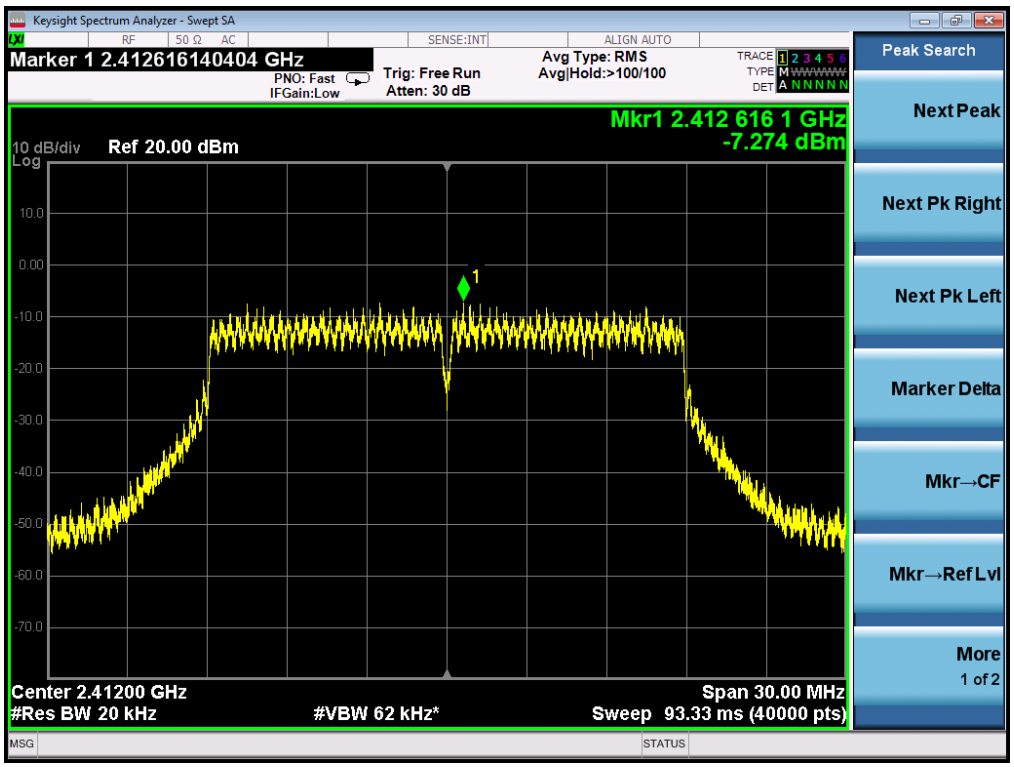



TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL

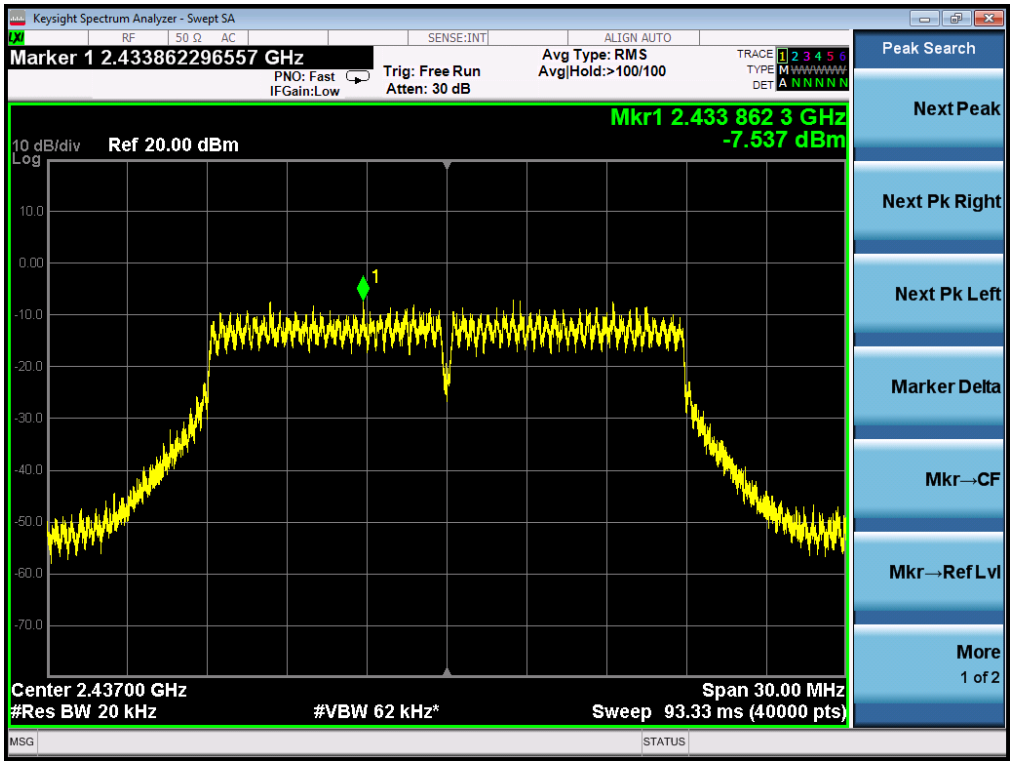


## 802.11n 20 TEST RESULT

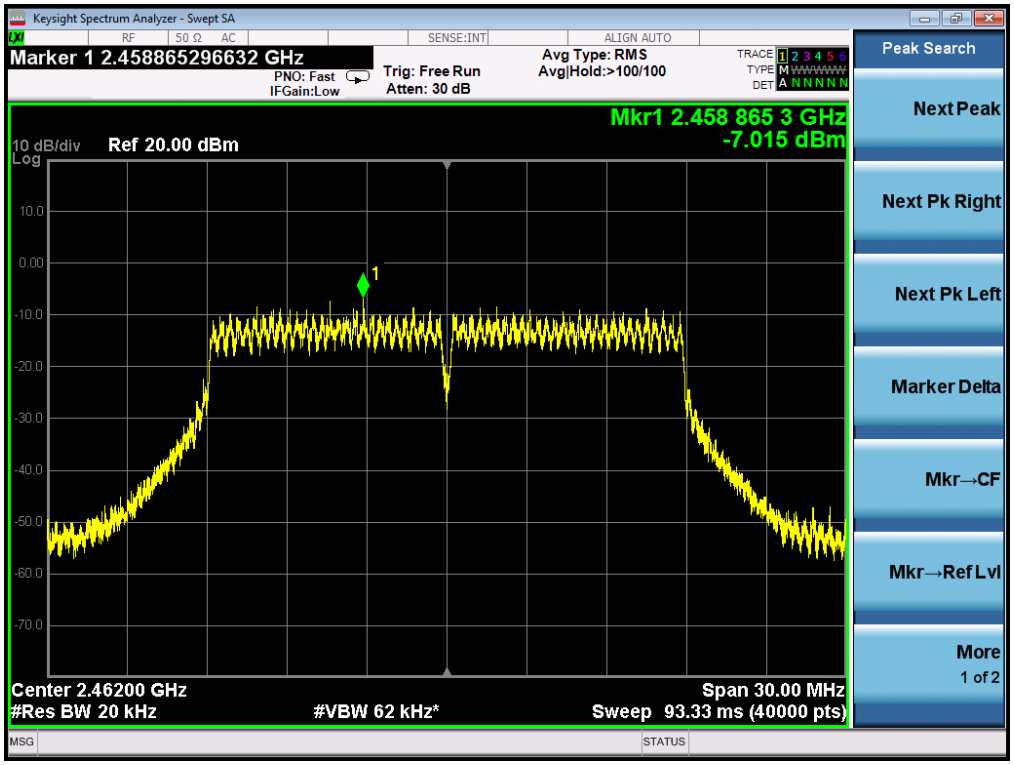
TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL




TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL

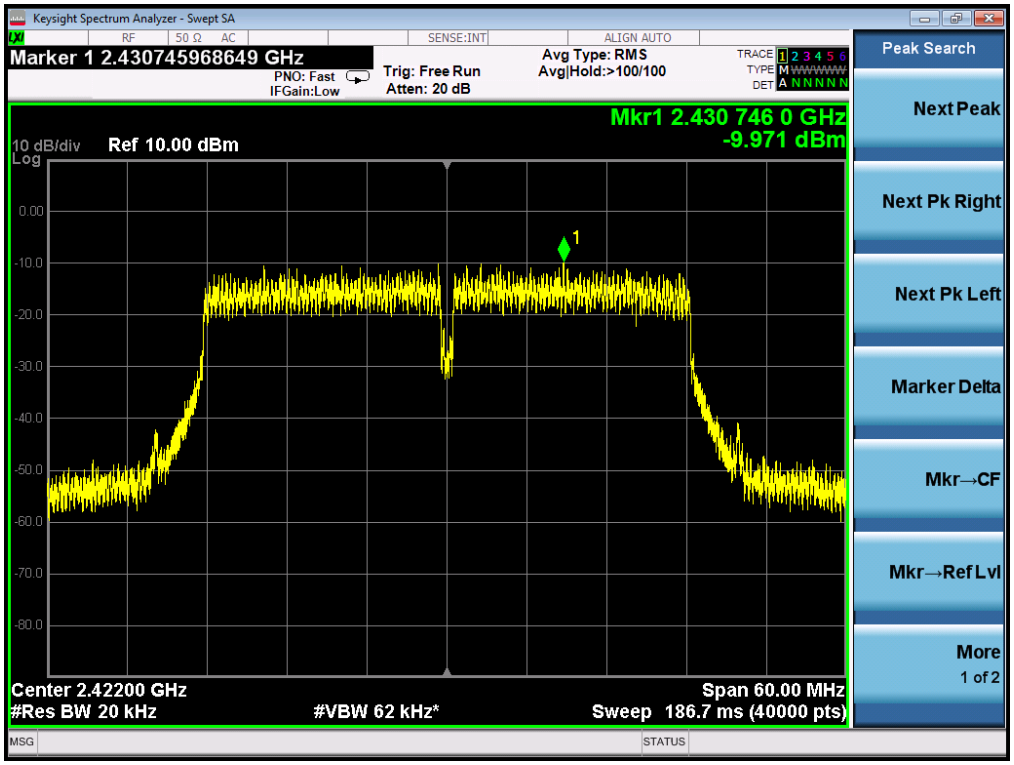


TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL

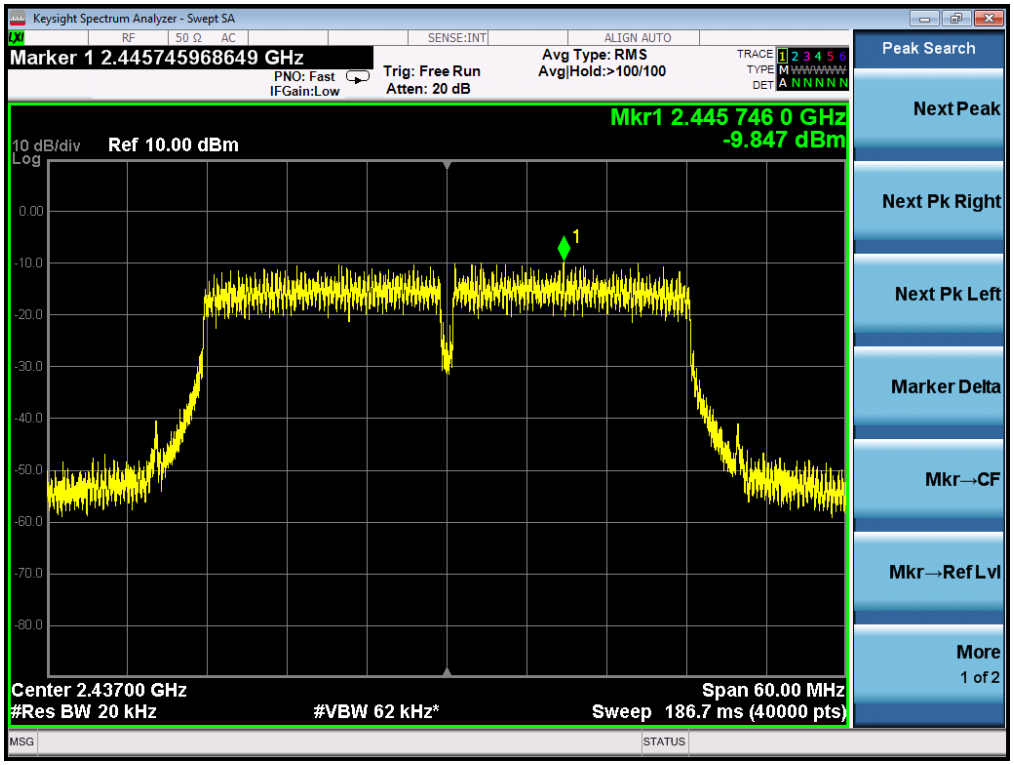



**802.11n 40 TEST RESULT**

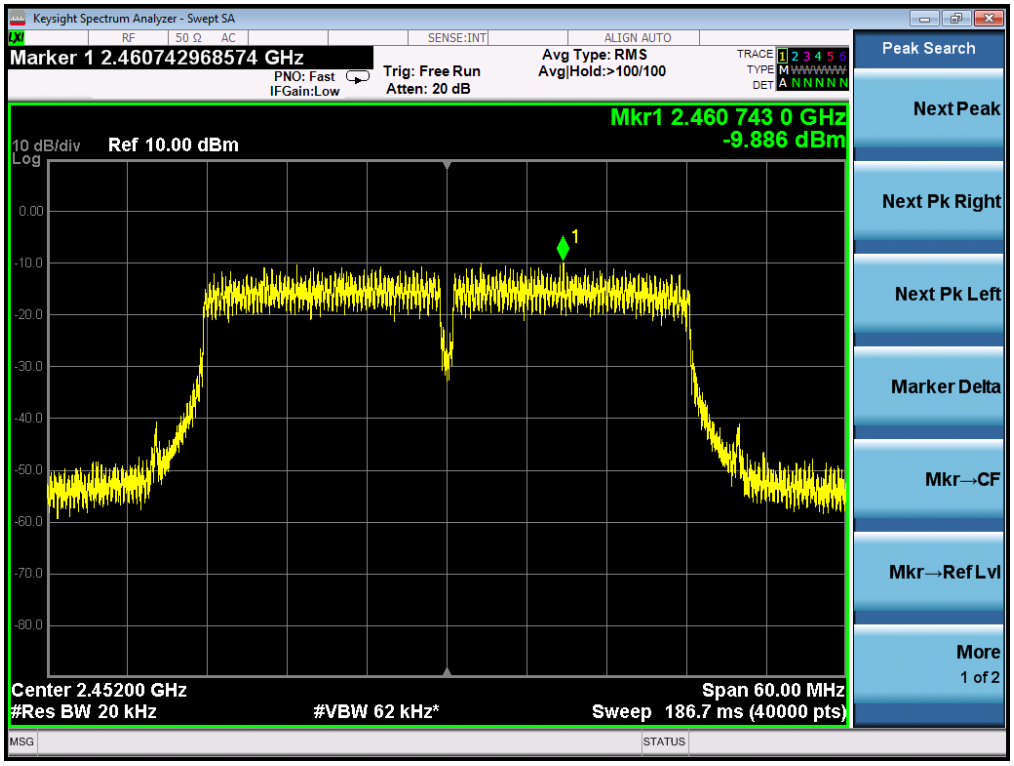
TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL




TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



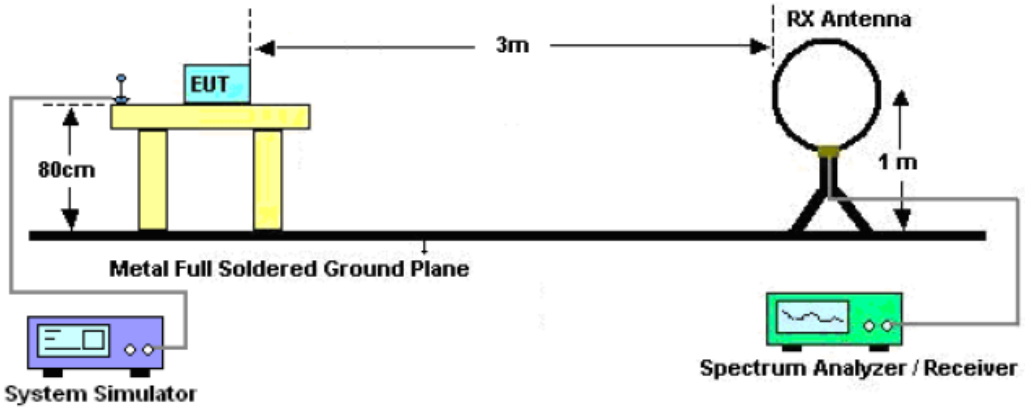
# 11. RADIATED EMISSION

## 11.1. MEASUREMENT PROCEDURE

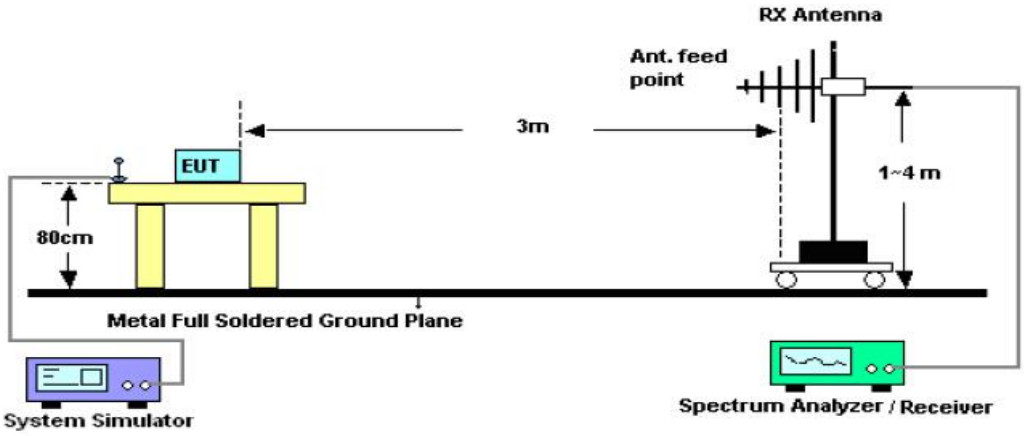
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated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

## 11.2. TEST SETUP

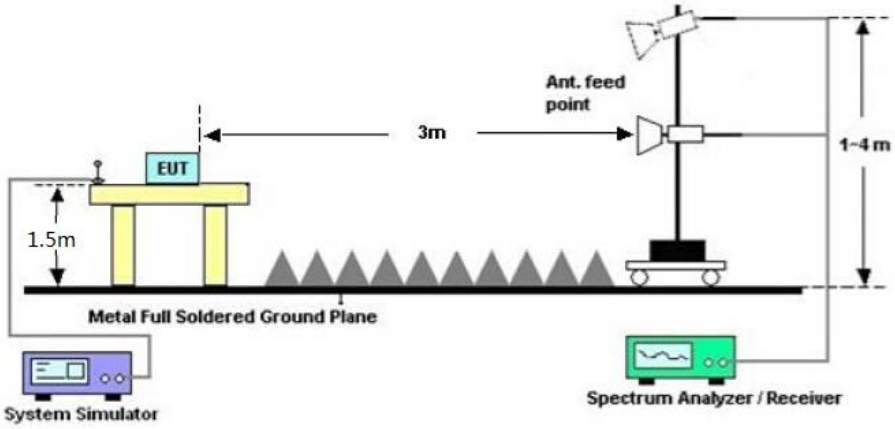
Radiated Emission Test-Setup Frequency Below 30MHz




RADIATED EMISSION TEST SETUP 30MHz-1000MHz




RADIATED EMISSION TEST SETUP ABOVE 1000MHz



## 11.3. LIMITS AND MEASUREMENT RESULT

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

| Frequencies (MHz) | Field Strength (micorvolts/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 |

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

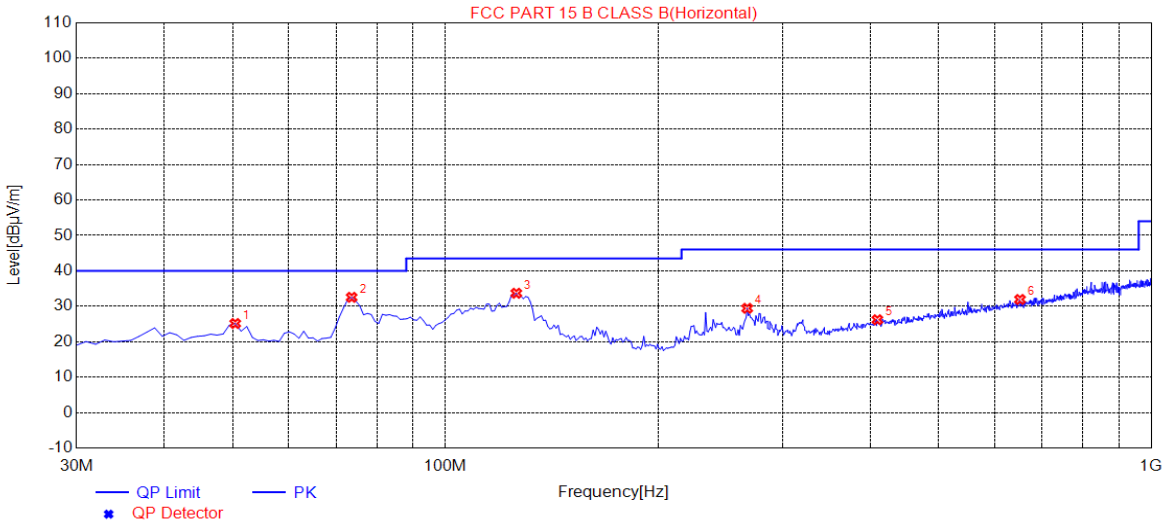
## 11.4. TEST RESULT

**RADIATED EMISSION BELOW 30MHZ**

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

## RADIATED EMISSION BELOW 1GHZ

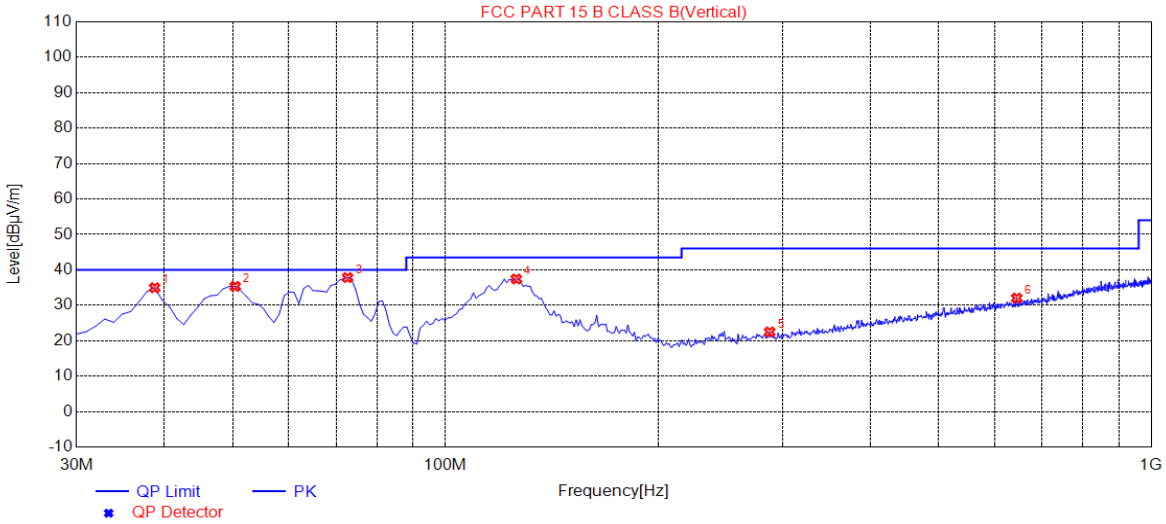
| | | | |
|---|---|---|---|
| **EUT** | Tablet pc | **Model Name** | BTAB-7Q2 |
| **Temperature** | 25˚C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | 802.11b with date rate 1 2412MHZ | **Antenna** | Horizontal |




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

**RESULT: PASS**

| | | | |
|---|---|---|---|
| **EUT** | Tablet pc | **Model Name** | BTAB-7Q2 |
| **Temperature** | 25˚C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | 802.11b with date rate 1 2412MHZ | **Antenna** | Vertical |




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

**RESULT: PASS**

**Note:** 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The “Factor” value can be calculated automatically by software of measurement system.

3. All test modes had been pre-tested. The 802.11b at low channel is the worst case and recorded in the report.

**RADIATED EMISSION ABOVE 1GHZ**

| | | | |
|---|---|---|---|
| **EUT** | Tablet pc | **Model Name** | BTAB-7Q2 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | 802.11b with date rate 1 2412MHZ | **Antenna** | Horizontal |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4824.077 | 44.65 | 0.08 | 44.73 | 74 | -29.27 | peak |
| 4824.100 | 39.02 | 0.08 | 39.1 | 54 | -14.9 | AVG |
| 7236.095 | 42.26 | 2.21 | 44.47 | 74 | -29.53 | peak |
| 7236.030 | 36.47 | 2.21 | 38.68 | 54 | -15.32 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|---|---|---|---|
| **EUT** | Tablet pc | **Model Name** | BTAB-7Q2 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | 802.11b with date rate 1 2412MHZ | **Antenna** | Vertical |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4824.114 | 43.96 | 0.08 | 44.04 | 74 | -29.96 | peak |
| 4824.098 | 39.34 | 0.08 | 39.42 | 54 | -14.58 | AVG |
| 7236.077 | 42.43 | 2.21 | 44.64 | 74 | -29.36 | peak |
| 7236.047 | 37.84 | 2.21 | 40.05 | 54 | -13.95 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|---|---|---|---|
| **EUT** | Tablet pc | **Model Name** | BTAB-7Q2 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | 802.11b with date rate 1 2437MHZ | **Antenna** | Horizontal |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4874.074 | 47.25 | 0.14 | 47.39 | 74 | -26.61 | peak |
| 4874.067 | 42.36 | 0.14 | 42.5 | 54 | -11.5 | AVG |
| 7311.098 | 41.38 | 2.36 | 43.74 | 74 | -30.26 | peak |
| 7311.090 | 37.64 | 2.36 | 40 | 54 | -14 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|---|---|---|---|
| **EUT** | Tablet pc | **Model Name** | BTAB-7Q2 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | 802.11b with date rate 1 2437MHZ | **Antenna** | Vertical |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4874.114 | 46.34 | 0.14 | 46.48 | 74 | -27.52 | peak |
| 4874.111 | 40.29 | 0.14 | 40.43 | 54 | -13.57 | AVG |
| 7311.061 | 43.06 | 2.36 | 45.42 | 74 | -28.58 | peak |
| 7311.103 | 39.27 | 2.36 | 41.63 | 54 | -12.37 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|---|---|---|---|
| **EUT** | Tablet pc | **Model Name** | BTAB-7Q2 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | 802.11b with date rate 1 2462MHZ | **Antenna** | Horizontal |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4924.030 | 43.11 | 0.22 | 43.33 | 74 | -30.67 | peak |
| 4924.082 | 40.32 | 0.22 | 40.54 | 54 | -13.46 | AVG |
| 7386.032 | 40.85 | 2.64 | 43.49 | 74 | -30.51 | peak |
| 7386.106 | 36.69 | 2.64 | 39.33 | 54 | -14.67 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|---|---|---|---|
| **EUT** | Tablet pc | **Model Name** | BTAB-7Q2 |
| **Temperature** | 25°C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | 802.11b with date rate 1 2462MHZ | **Antenna** | Vertical |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 4924.067 | 44.22 | 0.22 | 44.44 | 74 | -29.56 | peak |
| 4924.082 | 39.37 | 0.22 | 39.59 | 54 | -14.41 | AVG |
| 7386.067 | 38.45 | 2.64 | 41.09 | 74 | -32.91 | peak |
| 7386.063 | 37.59 | 2.64 | 40.23 | 54 | -13.77 | AVG |
| | | | | | | |
| | | | | | | |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

**RESULT: PASS**

**Note:**

Other emissions from 1G to 25 GHz are considered as ambient noise. No recording in the test report.

Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

The “Factor” value can be calculated automatically by software of measurement system.

All test modes had been pre-tested. The 802.11b mode is the worst case and recorded in the report.

# 12. BAND EDGE EMISSION

## 12.1. MEASUREMENT PROCEDURE

Radiated restricted band edge measurements

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting

## 12.2. TEST SET-UP

same as 11.2

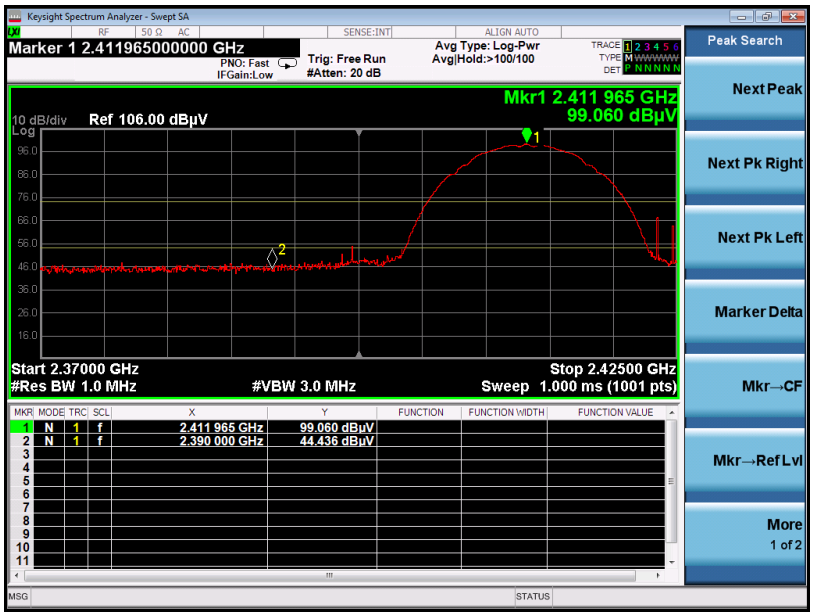
**Note**:

1. Factor=Antenna Factor + Cable loss - Amplifier gain. Field Strength=Factor + Reading level
2. The factor had been edited in the “Input Correction” of the Spectrum Analyzer. So the Amplitude of test plots is equal to Reading level plus the Factor in dB. Use the A dB(μV) to represent the Amplitude. Use the F dB(μV/m) to represent the Field Strength. So A=F.

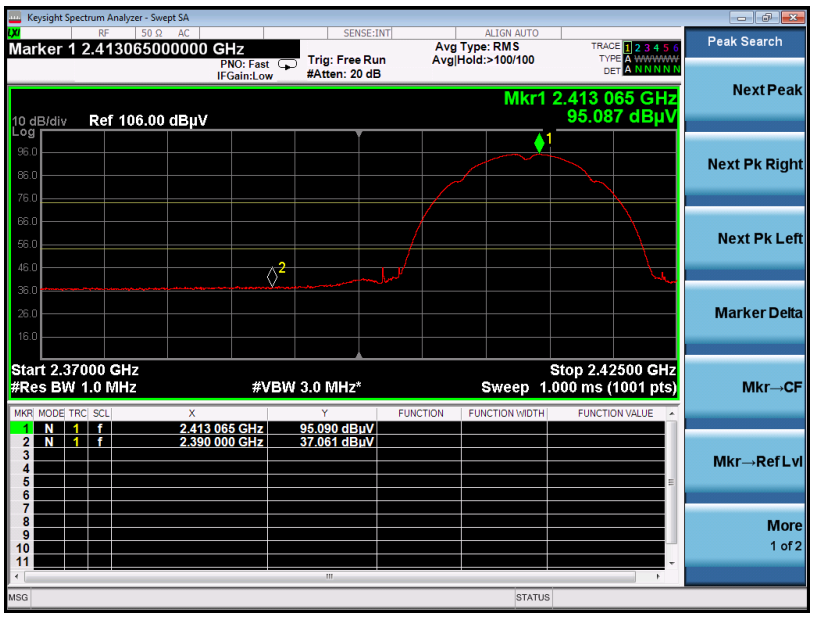
## 12.3. TEST RESULT

| | | | |
|---|---|---|---|
| **EUT** | Tablet pc | **Model Name** | BTAB-7Q2 |
| **Temperature** | 25˚C | **Relative Humidity** | 55.4% |
| **Pressure** | 960hPa | **Test Voltage** | Normal Voltage |
| **Test Mode** | 802.11b with data rate 1<br>2412MHZ | **Antenna** | Horizontal |

PK




AV




**RESULT: PASS**