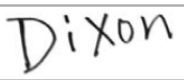
# FCC PART 15 SUBPART C TEST REPORT

## FCC PART 15.247

| | | |
|---|---|---|
| **Report Reference No.....:** | **MWR160100405** | |
| **FCC ID.....:** | **RQQHLT-E50UTM** | |
| Compiled by ( position+printed name+signature)..: | File administrators Martin Ao |  |
| Supervised by ( position+printed name+signature)..: | Test Engineer Yuchao Wang |  |
| Approved by ( position+printed name+signature)..: | Manager Dixon Hao |  |
| Date of issue.....: | Jan. 24, 2016 | |
| **Representative Laboratory Name** .: | **Maxwell International Co., Ltd.** | |
| Address .....: | Room 509, Hongfa center building, Baoan District, Shenzhen, Guangdong, China | |
| **Testing Laboratory Name** .....: | **Shenzhen CTL Testing Technology Co., Ltd.** | |
| Address .....: | Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055 | |
| **Applicant's name**.....: | **HYUNDAI CORPORATION** | |
| Address .....: | 140-2, Kye-dong, Chongro-ku, Seoul, South Korea | |
| **Test specification** .....**:** | | |
| Standard .....: | **FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz** | |
| TRF Originator.....: | Maxwell International Co., Ltd. | |



| | |
|---|---|
| **Test item description .....:** | Mobile Phone |
| Trade Mark .....: | HYUNDAI |
| **Manufacturer**.....: | **Shenzhen Rainbow Time Technology Co.,Ltd** |
| Model/Type reference.....: | E545 |
| Listed Models .....: | / |
| Modulation Type .....: | DSSS(CCK,DQPSK,DBPSK),OFDM(64QAM,16QAM,QPSK, BPSK) |
| Operation Frequency.....: | From 2412MHz to 2462MHz |
| Rating .....: | DC 3.80V |
| Hardware version .....: | 14900_MM1_V03 |
| Software version .....: | HYUNDAI_E545_V5.1.1_20160122 |
| Result.....: | **PASS** |

# T E S T R E P O R T

| Test Report No. : | MWR160100405 | Jan. 24, 2016<br>Date of issue |
|---|---|---|

| | | |
|---|---|---|
| Equipment under Test | : | Mobile Phone |
| Model /Type | : | E545 |
| Listed Models | : | / |
| **Applicant** | : | **HYUNDAI CORPORATION** |
| Address | : | 140-2, Kye-dong, Chongro-ku, Seoul, South Korea |
| **Manufacturer** | : | **Shenzhen Rainbow Time Technology Co.,Ltd** |
| Address | : | Room 905, ChangHong Technology Building, Science and Technology Park, Nanshan District, Shenzhen, China |

| **Test Result**: | **PASS** |
|---|---|

# Contents

# 1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10:2013: American National Standard for Testing Unlicensed Wireless Devices
KDB558074 D01 V03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

# 2 SUMMARY

## 2.1 General Remarks

| | | |
|---|---|---|
| Date of receipt of test sample | : | Jan. 01, 2016 |
| | | |
| | | |
| Testing commenced on | : | Jan. 12, 2016 |
| | | |
| | | |
| Testing concluded on | : | Jan. 24, 2016 |

## 2.2 Product Description

The **HYUNDAI CORPORATION**'s Model: E545 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

| | |
|---|---|
| Name of EUT | Mobile Phone |
| Model Number | E545 |
| Modilation Type | GMSK for GSM/GPRS, 8-PSK for EDGE,QPSK for UMTS |
| Antenna Type | Internal |
| UMTS Operation Frequency Band | Device supported UMTS FDD Band II/V |
| WLAN FCC Operation frequency | IEEE 802.11b:2412-2462MHz<br>IEEE 802.11g:2412-2462MHz<br>IEEE 802.11n HT20:2412-2462MHz<br>IEEE 802.11n HT40:2422-2452MHz |
| BT FCC Operation frequency | 2402MHz-2480MHz |
| HSDPA Release Version | Release 10 |
| HSUPA Release Version | Release 6 |
| DC-HSUPA Release Version | Not Supported |
| WCDMA Release Version | R99 |
| WLAN FCC Modulation Type | IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)<br>IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)<br>IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)<br>IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK) |
| BT Modulation Type | GFSK,8DPSK,π/4DQPSK(BT 3.0+EDR) |
| Hardware version | 14900_MM1_V03 |
| Software version | HYUNDAI_E545_V5.1.1_20160122 |
| Android version | Android 4.4.2 |
| GPS function | Supported |
| WLAN | Supported 802.11b/802.11g/802.11n |
| Bluetooth | Supported BT 4.0/BT 3.0+EDR |
| GSM/EDGE/GPRS | Supported GSM/GPRS/EDGE |
| GSM/EDGE/GPRS Power Class | GSM850:Power Class 4/ PCS1900:Power Class 1 |
| GSM/EDGE/GPRS Operation Frequency | GSM850 :824.2MHz-848.8MHz/PCS1900:1850.2MHz-1909.8MHz |
| GSM/EDGE/GPRS Operation Frequency Band | GSM850/PCS1900/GPRS850/GPRS1900/EDGE850/EDGE1900 |
| GSM Release Version | R99 |
| GPRS/EDGE Multislot Class | GPRS/EDGE: Multi-slot Class 12 |
| Extreme temp. Tolerance | -30°C to +50°C |
| Extreme vol. Limits | 3.40VDC to 4.20VDC (nominal: 3.80VDC) |
| GPRS operation mode | Class B |

## 2.3 Equipment Under Test

### Power supply system utilised

| | | | | | |
|---|---|---|---|---|---|
| Power supply voltage | : | ○ | 120V / 60 Hz | ○ | 115V / 60Hz |
| | | ○ | 12 V DC | ○ | 24 V DC |
| | | ● | Other (specified in blank below) | | |

DC 3.80V

## 2.4 Description of the test mode

IEEE 802.11b/g/n: The product support Third channels but only use Eleventh channels in USA.

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---|---|---|---|
| **1** | **2412** | 8 | 2447 |
| 2 | 2417 | 9 | 2452 |
| 3 | 2422 | 10 | 2457 |
| 4 | 2427 | **11** | **2462** |
| 5 | 2432 | | |
| **6** | **2437** | | |
| 7 | 2442 | | |

## 2.5 Short description of the Equipment under Test (EUT)

### 2.5.1 General Description

E545 is subscriber equipment in the WCDMA/GSM system. The HSPA/UMTS frequency band is Band I,Band II , Band Vand Band VIII; The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only Band II and Band V and GSM850 and PCS1900 bands test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and SIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

### 2.5.2 Test Modes

| Test Case | Test Conditions | |
|---|---|---|
| | Configuration | Description |
| DTS (6 dB) Bandwidth | Measurement Method | FCC KDB 558074 §8.2 Option 2 |
| | Test Environment | NTNV |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H<br>11n HT40_L, 11n HT40_M, 11n HT40_H |
| Maximum Peak Conducted Output Power | Measurement Method | FCC KDB 558074§9.1.2 |
| | Test Environment | NTNV |
| | Test Setup | Test Setup 1 |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H<br>11n HT40_L, 11n HT40_M, 11n HT40_H |
| Maximum Power Spectral Density Level | Measurement Method | FCC KDB 558074 §10.2 (peak PSD). |
| | Test Environment | NTNV |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H |

| | | |
|---|---|---|
| | | 11n HT40_L, 11n HT40_M, 11n HT40_H |
| Unwanted Emissions into Non-Restricted Frequency Bands | Measurement Method | FCC KDB 558074§11.0. |
| | Test Environment | NTNV |
| | Test Setup | Test Setup 1 |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H<br>11n HT40_L, 11n HT40_M, 11n HT40_H |
| Unwanted Emissions into Restricted Frequency Bands (Conducted) | Measurement Method | FCC KDB 558074§12.2, Conducted (antenna-port). |
| | Test Environment | NTNV |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H<br>11n HT40_L, 11n HT40_M, 11n HT40_H |
| Unwanted Emissions into Restricted | Measurement Method | FCC KDB 558074§12.1,Radiated(cabinet/case emissions with Impedance matching for antenna-port). |
| | Test Environment | NTNV |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H<br>11n HT40_L, 11n HT40_M, 11n HT40_H |

| Test Case | Test Conditions | |
|---|---|---|
| | Configuration | Description |
| AC Power Line Conducted Emissions | Measurement Method | AC mains conducted. |
| | Test Environment | NTNV |
| | EUT Configuration | 11g_M (Worst Conf.). |

Note: 1. For Radiated Emissions, By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

2. Typical working modes for each IEEE 802.11mode are selected to perform tests. The manufacturer provide special test software to control TX duty cycle >98% for TX test; recorded worst case at difference data rate as follows:

| Test Mode | Test Modes Description |
|---|---|
| 11b | IEEE 802.11b with data rate of 1 Mbps using SISO mode. |
| 11g | IEEE 802.11g with data rate of 6 Mbps using SISO mode. |
| 11n HT20 | IEEE 802.11n with data date of MCS0 and bandwidth of 20MHz using SISO mode. |
| 11n HT40 | IEEE 802.11n with data date of MCS7 and bandwidth of 40MHz using SISO mode. |

## 2.6 EUT operation mode

| Test Mode | RF Ch. | TX Freq. [MHz] | RX Freq. [MHz] | Ch. BW [MHz] |
|---|---|---|---|---|
| 11b | L | Ch No. 1 / 2412MHz | --- | 20 |
| | M | Ch No. 6 / 2437 MHz | --- | 20 |
| | H | Ch No. 11/ 2462MHz | --- | 20 |
| 11g | L | Ch No. 1 / 2412MHz | --- | 20 |
| | M | Ch No. 6 / 2437 MHz | --- | 20 |
| | H | Ch No. 11/ 2462MHz | --- | 20 |
| 11n HT20 | L | Ch No. 1 / 2412MHz | --- | 20 |
| | M | Ch No. 6 / 2437 MHz | --- | 20 |
| | H | Ch No. 11/ 2462MHz | --- | 20 |
| 11n HT40 | L | Ch No. 3/ 2422MHz | --- | 40 |
| | M | Ch No. 6 / 2437 MHz | --- | 40 |
| | H | Ch No. 9/ 2452 MHz | --- | 40 |

## 2.7 EUT configuration

**The following peripheral devices and interface cables were connected during the measurement:**

● - supplied by the manufacturer

○ - supplied by the lab

| | | | |
|---|---|---|---|
| ○ | Power Cable | Length (m) : | / |
| | | Shield : | / |
| | | Detachable : | / |
| ○ | Multimeter | Manufacturer : | / |
| | | Model No. : | / |

## 2.8 Internal Identification of AE used during the test

| AE ID* | Description |
|---|---|
| AE1 | Charger |

AE1
Model: 811B
INPUT: AC100-240V~ 50/60Hz 0.15A
OUTPUT: DC 5.0V 1500mA

*AE ID: is used to identify the test sample in the lab internally.

## 2.9 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: FCC ID: RQQHLT-E50UTM** filing to comply with FCC Part 15.247 Rules

## 2.10 Modifications

No modifications were implemented to meet testing criteria.

## 2.11 Test Environments

NOTE: The values used in the test report maybe stringent than the declared.

| Environment Parameter | Selected Values During Tests | | |
|---|---|---|---|
| NTNV | Temperature | Voltage | Relative Humidity |
| | Ambient | 3.8VDC | Ambient |

1. The frequency bands used in this EUT are listed as follows:

| Frequency Band(MHz) | 2400-2483.5 | 5150-5350 | 5470-5725 | 5725-5850 |
|---|---|---|---|---|
| 802.11b | √ | — | — | — |
| 802.11g | √ | — | — | — |
| 802.11n HT20 | √ | — | — | — |
| 802.11n HT40 | √ | — | — | — |

2. The EUT incorporates a SISO function,Physically,the EUT provides one completed transmitter and one completed receiver.

| Modulation Mode | TX Function |
|---|---|
| 802.11b | 1TX |
| 802.11g | 1TX |
| 802.11n HT20 | 1TX |
| 802.11n HT40 | 1TX |

# 3 TEST ENVIRONMENT

## 3.1 Address of the test laboratory

**Shenzhen CTL Testing Technology Co., Ltd.**
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4, CISPR 22/EN 55022 and CISPR16-4-1 SVSWR requirements.

## 3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

### IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

### FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December 19, 2013.

## 3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature: | 15-35 ° C |
| Humidity: | 30-60 % |
| Atmospheric pressure: | 950-1050mbar |

## 3.4 Test Description

| Test Item | FCC Part No. | Requirements | Verdict |
|---|---|---|---|
| DTS (6 dB) Bandwidth | 15.247(a)(2) | ≥ 500 kHz. | PASS |
| Maximum Peak Conducted Output Power | 15.247(b)(3) | For directional gain:< 30dBm – (G[dBi] –6 [dB]),peak; Otherwise :< 30dBm, peak. | PASS |
| Maximum Power Spectral Density Level | 15.247(e) | For directional gain :< 8dBm/3 kHz – (G[dBi] –6[dB]), peak. Otherwise :< 8dBm/3 kHz, peak. | PASS |
| Band Edges Compliance | 15.247(d) | < -20dBr/100 kHz if total peak power ≤power limit. | PASS |
| Unwanted Emissions into Non-Restricted Frequency Bands | 15.247(d) | < -20dBr/100 kHz if total peak power ≤power limit. | PASS |
| Unwanted Emissions into Restricted Frequency Bands (Conducted) | 15.247(d) 15.209 | < -20dBr/100 kHz if total peak power ≤power limit. | PASS |
| Unwanted Emissions into Restricted Frequency Bands (Radiated) | 15.247(d) 15.209 | FCC Part 15.209 field strength limit; | PASS |
| AC Power Line Conducted Emissions | 15.207 | FCC Part 15.207 conducted limit; | PASS |

Remark: The measurement uncertainty is not included in the test result.

## 3.5 Summary of measurement results

| Test Specification clause | Test case | Test Mode | Test Channel | Recorded In Report | | Pass | Fail | NA | NP | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| §15.247(b)(4) | Antenna gain | 802.11b | ☒ Lowest<br>☒ Middle<br>☒ Highest | 802.11b | ☒ Lowest<br>☒ Middle<br>☒ Highest | ☒ | ☐ | ☐ | ☐ | complies |
| §15.247(e) | Power spectral density | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Middle<br>☒ Highest | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Middle<br>☒ Highest | ☒ | ☐ | ☐ | ☐ | complies |
| §15.247(a)(1) | Spectrum bandwidth – 6 dB bandwidth | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Middle<br>☒ Highest | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Middle<br>☒ Highest | ☒<br>☒ | ☐ | ☐ | ☐ | complies |
| §15.247(b)(1) | Maximum output power | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Middle<br>☒ Highest | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Middle<br>☒ Highest | ☒<br>☒<br>☒ | ☐ | ☐ | ☐ | complies |
| §15.247(d) | Band edge compliance conducted | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Highest | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Highest | ☒<br>☒ | ☐ | ☐ | ☐ | complies |
| §15.205 | Band edge compliance radiated | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Highest | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Highest | ☒ | ☐ | ☐ | ☐ | complies |
| §15.247(d) | TX spurious emissions conducted | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Middle<br>☒ Highest | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Middle<br>☒ Highest | ☒<br>☒ | ☐ | ☐ | ☐ | complies |
| §15.247(d) | TX spurious emissions radiated | 802.11b<br>802.11g<br>802.11n HT20<br>802.11n HT40 | ☒ Lowest<br>☒ Middle<br>☒ Highest | 802.11b | ☒ Lowest<br>☒ Middle<br>☒ Highest | ☒ | ☐ | ☐ | ☐ | complies |
| §15.109 | RX spurious emissions radiated | -/- | -/- | -/- | -/- | ☒ | ☐ | ☐ | ☐ | complies |
| §15.209(a) | TX spurious Emissions radiated < 30 MHz | 802.11b | -/- | 802.11b | -/- | ☒ | ☐ | ☐ | ☐ | complies |
| §15.107(a) §15.207 | Conducted Emissions < 30 MHz | 802.11b | -/- | 802.11b | -/- | ☒ | ☐ | ☐ | ☐ | complies |

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

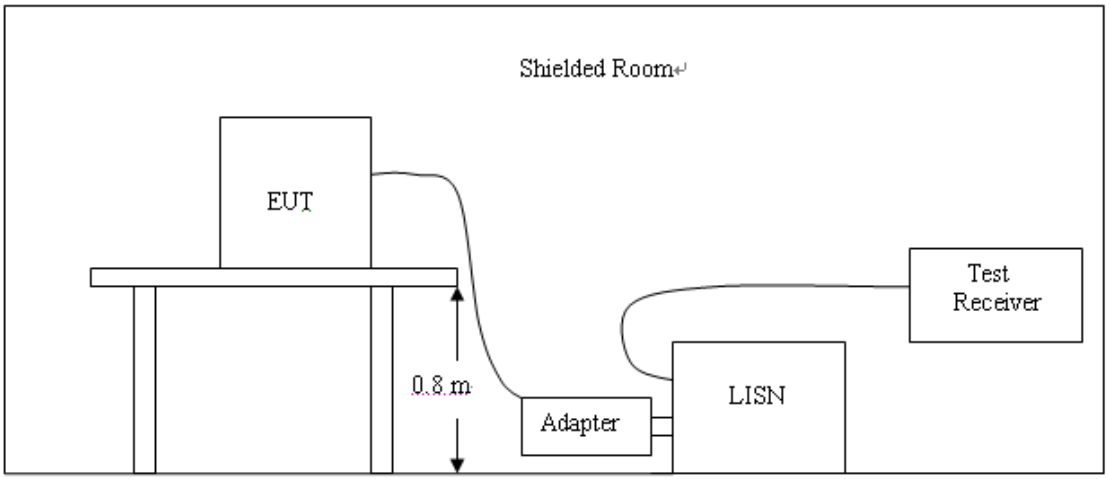
## 3.6 Equipments Used during the Test

| Test Equipment | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| LISN | R&S | ENV216 | 3560.6550.12 | 2015/06/02 | 2016/06/01 |
| LISN | R&S | ESH2-Z5 | 860014/010 | 2015/06/02 | 2016/06/01 |
| Bilog Antenna | Sunol Sciences Corp. | JB1 | A061713 | 2015/06/02 | 2016/06/01 |
| EMI Test Receiver | R&S | ESCI | 103710 | 2015/06/02 | 2016/06/01 |
| Spectrum Analyzer | Agilent | N9030A | MY49430428 | 2015/05/21 | 2016/05/20 |
| Controller | EM Electronics | Controller EM 1000 | N/A | 2015/05/21 | 2016/05/20 |
| Horn Antenna | Sunol Sciences Corp. | DRH-118 | A062013 | 2015/05/19 | 2016/05/18 |
| Active Loop Antenna | SCHWARZBECK | FMZB1519 | 1519-037 | 2015/05/19 | 2016/05/18 |
| Amplifier | Agilent | 8349B | 3008A02306 | 2015/05/19 | 2016/05/18 |
| Amplifier | Agilent | 8447D | 2944A10176 | 2015/05/19 | 2016/05/18 |
| Temperature/ Humidity Meter | Gangxing | CTH-608 | 02 | 2015/05/20 | 2016/05/19 |
| High-Pass Filter | K&L | 9SH10-2700/X12750-O/O | N/A | 2015/05/20 | 2016/05/19 |
| High-Pass Filter | K&L | 41H10-1375/U12750-O/O | N/A | 2015/05/20 | 2016/05/19 |
| Coaxial Cables | HUBER+SUHNER | SUCOFLEX 104PEA-10M | 10m | 2015/06/02 | 2016/06/01 |
| Coaxial Cables | HUBER+SUHNER | SUCOFLEX 104PEA-3M | 3m | 2015/06/02 | 2016/06/01 |
| Coaxial Cables | HUBER+SUHNER | SUCOFLEX 104PEA-3M | 3m | 2015/06/02 | 2016/06/01 |
| RF Cable | Megalon | RF-A303 | N/A | 2015/06/02 | 2016/06/01 |
| Power Sensor | R&S | NRP-Z4 | 823.3618.03 | 2015.06.02 | 2016.06.01 |
| Power Meter | R&S | NRVS | 1020.1809.02 | 2015.06.02 | 2016.06.01 |

# 4 TEST CONDITIONS AND RESULTS

## 4.1 AC Power Conducted Emission

**TEST CONFIGURATION**




**TEST PROCEDURE**

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2. Support equipment, if needed, was placed as per ANSI C63.10-2013
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4. The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

**AC Power Conducted Emission Limit**

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following:

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

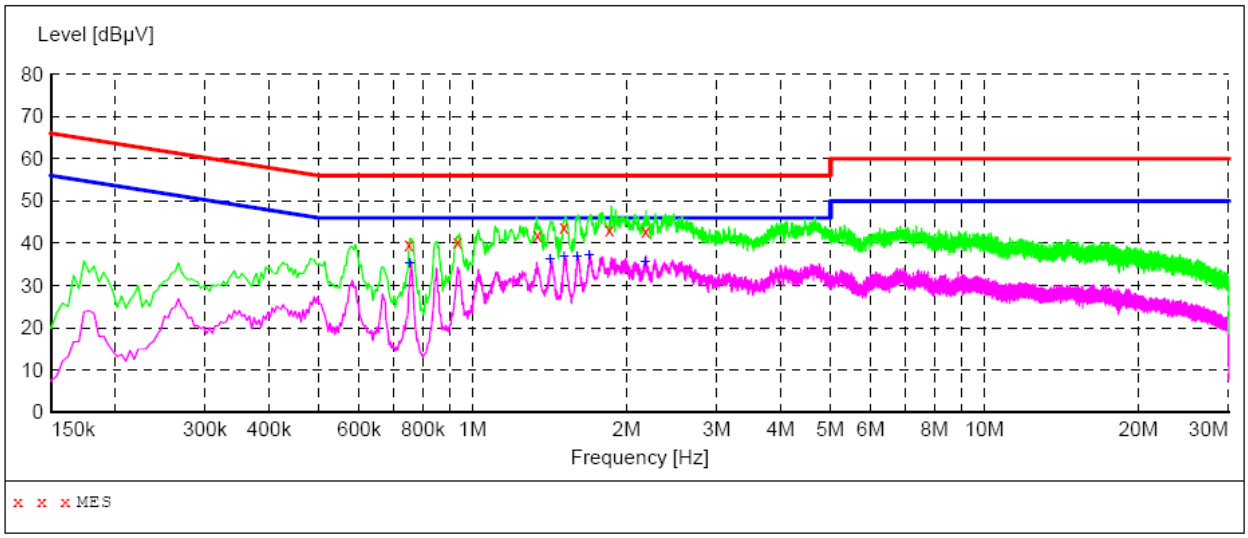
* Decreasing linearly with the logarithm of the frequency

**TEST RESULTS**

The AC Power Conducted Emission measurement is performed the each test mode (b/g/n) and channel (low/mid/high), the datum recorded below (802.11b mode, the middle channel) is the worst case for all the test modes and channels.

***L:***

***SCAN TABLE: "Voltage (9K-30M)FIN"***
Short Description: 150K-30M Voltage




***MEASUREMENT RESULT:***

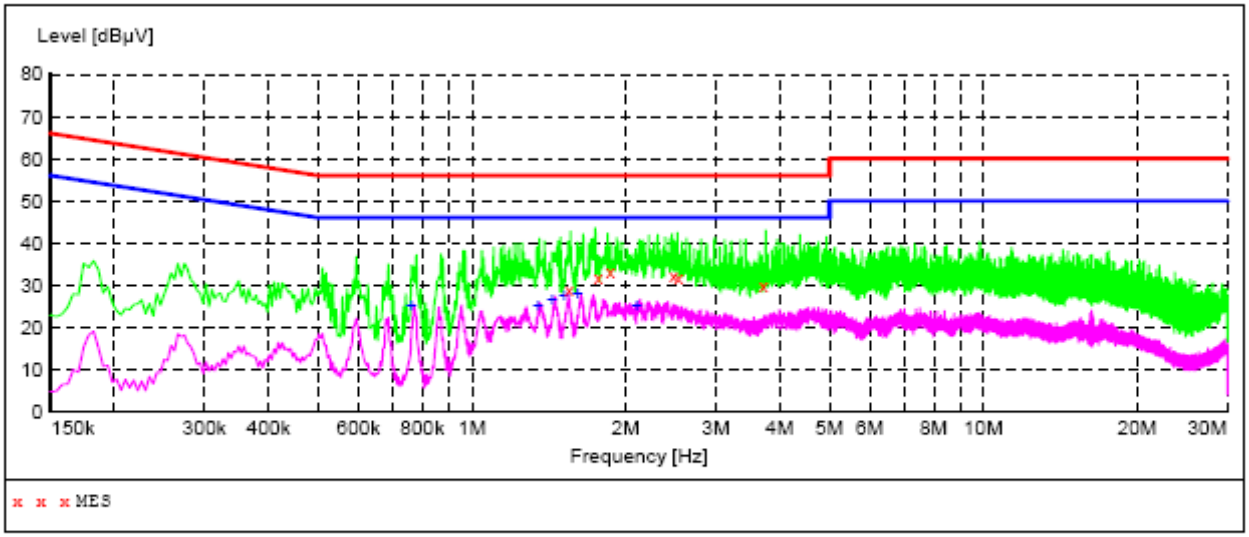
| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.750000 | 39.70 | 10.4 | 56 | 16.3 | QP | L1 | GND |
| 0.934000 | 40.40 | 10.5 | 56 | 15.6 | QP | L1 | GND |
| 1.338000 | 41.80 | 10.5 | 56 | 14.2 | QP | L1 | GND |
| 1.506000 | 43.80 | 10.5 | 56 | 12.2 | QP | L1 | GND |
| 1.850000 | 43.30 | 10.5 | 56 | 12.7 | QP | L1 | GND |
| 2.178000 | 42.80 | 10.5 | 56 | 13.2 | QP | L1 | GND |

***MEASUREMENT RESULT:***

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.754000 | 35.10 | 10.4 | 46 | 10.9 | AV | L1 | GND |
| 1.418000 | 36.10 | 10.5 | 46 | 9.9 | AV | L1 | GND |
| 1.510000 | 36.70 | 10.5 | 46 | 9.3 | AV | L1 | GND |
| 1.602000 | 36.90 | 10.5 | 46 | 9.1 | AV | L1 | GND |
| 1.690000 | 37.20 | 10.5 | 46 | 8.8 | AV | L1 | GND |
| 2.174000 | 35.50 | 10.5 | 46 | 10.5 | AV | L1 | GND |

***N:***

*SCAN TABLE: "Voltage (9K-30M)FIN"*
Short Description: 150K-30M Voltage




***MEASUREMENT RESULT:***

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 1.550000 | 29.10 | 10.5 | 56 | 26.9 | QP | N | GND |
| 1.766000 | 31.90 | 10.5 | 56 | 24.1 | QP | N | GND |
| 1.866000 | 33.10 | 10.5 | 56 | 22.9 | QP | N | GND |
| 2.478000 | 32.20 | 10.5 | 56 | 23.8 | QP | N | GND |
| 2.534000 | 31.80 | 10.5 | 56 | 24.2 | QP | N | GND |
| 3.714000 | 29.80 | 10.5 | 56 | 26.2 | QP | N | GND |

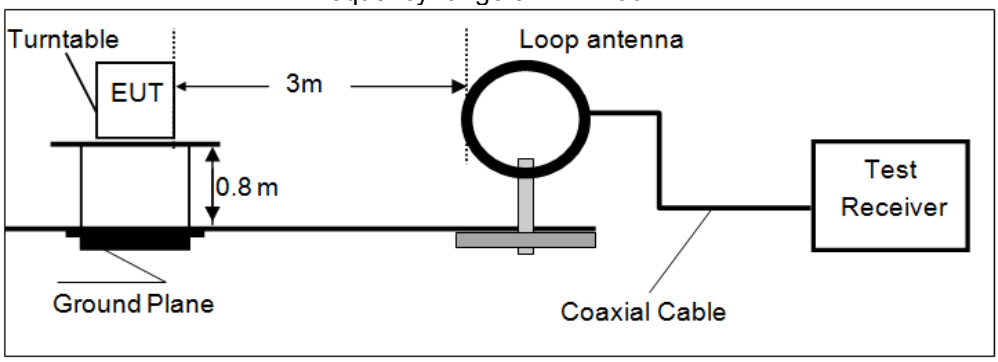
***MEASUREMENT RESULT:***

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.762000 | 25.30 | 10.4 | 46 | 20.7 | AV | N | GND |
| 1.346000 | 25.20 | 10.5 | 46 | 20.8 | AV | N | GND |
| 1.434000 | 26.60 | 10.5 | 46 | 19.4 | AV | N | GND |
| 1.514000 | 27.60 | 10.5 | 46 | 18.4 | AV | N | GND |
| 1.610000 | 28.00 | 10.5 | 46 | 18.0 | AV | N | GND |
| 2.102000 | 25.30 | 10.5 | 46 | 20.7 | AV | N | GND |

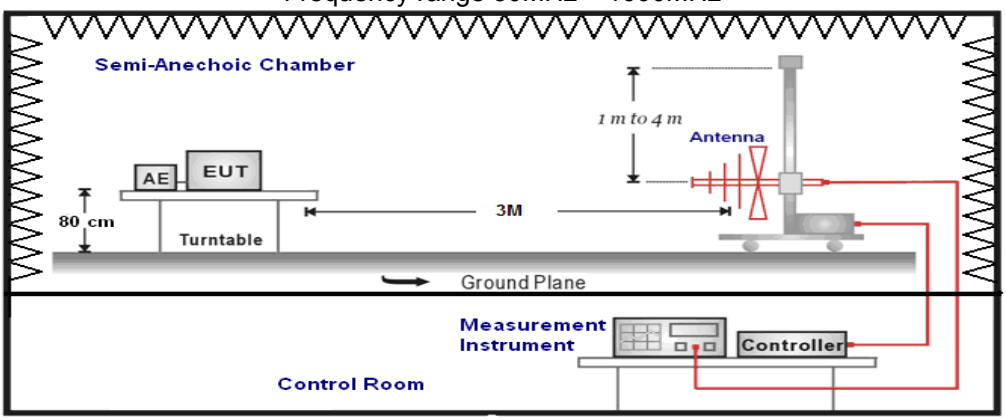
## 4.2 Radiated Emission and Band Edge

**TEST CONFIGURATION**

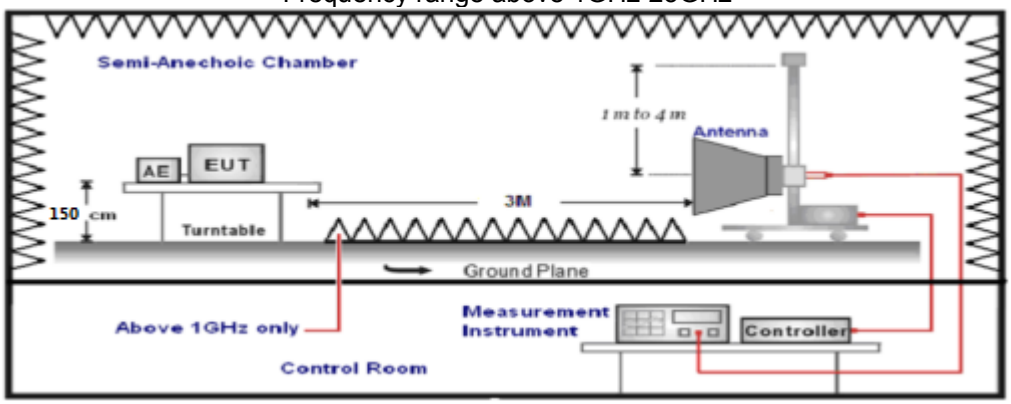
Frequency range 9 KHz – 30MHz




Frequency range 30MHz – 1000MHz




Frequency range above 1GHz-25GHz




**TEST PROCEDURE**

1. The EUT was placed on a turn table which is 0.8m above ground plane for below 1GHz and 1.50m above ground plane for above 1GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 32.768 KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9 KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type | Test Distance |
|---|---|---|
| 9KHz-30MHz | Active Loop Antenna | 3 |
| 30MHz-1GHz | Ultra-Broadband Antenna | 3 |
| 1GHz-18GHz | Double Ridged Horn Antenna | 3 |

| | | |
|---|---|---|
| 18GHz-25GHz | Horn Anternna | 1 |

7. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting | Detector |
|---|---|---|
| 9KHz-150KHz | RBW=200Hz/VBW=3KHz,Sweep time=Auto | QP |
| 150KHz-30MHz | RBW=9KHz/VBW=100KHz,Sweep time=Auto | QP |
| 30MHz-1GHz | RBW=120KHz/VBW=1000KHz,Sweep time=Auto | QP |
| 1GHz-40GHz | Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto | Peak |
| | Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto | Peak |

More procudre as follows;

**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 1.0 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 QP 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 4 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.

**Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

**FS = RA + AF + CL - AG**

| | |
|---|---|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | AG = Amplifier Gain |
| AF = Antenna Factor | |

For example

| Frequency (MHz) | FS (dBμV/m) | RA (dBμV/m) | AF (dB) | CL (dB) | AG (dB) | Transd (dB) |
|---|---|---|---|---|---|---|
| 300.00 | 40 | 58.1 | 12.2 | 1.6 | 31.90 | -18.1 |

Transd=AF +CL-AG

**RADIATION LIMIT**

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.
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)

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 0.009-0.49 | 300 | 20log(2400/F(KHz))+80 | 2400/F(KHz) |
| 0.49-1.705 | 30 | 20log(24000/F(KHz))+40 | 24000/F(KHz) |
| 1.705-30 | 30 | 20log(30)+40 | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

**TEST RESULTS**

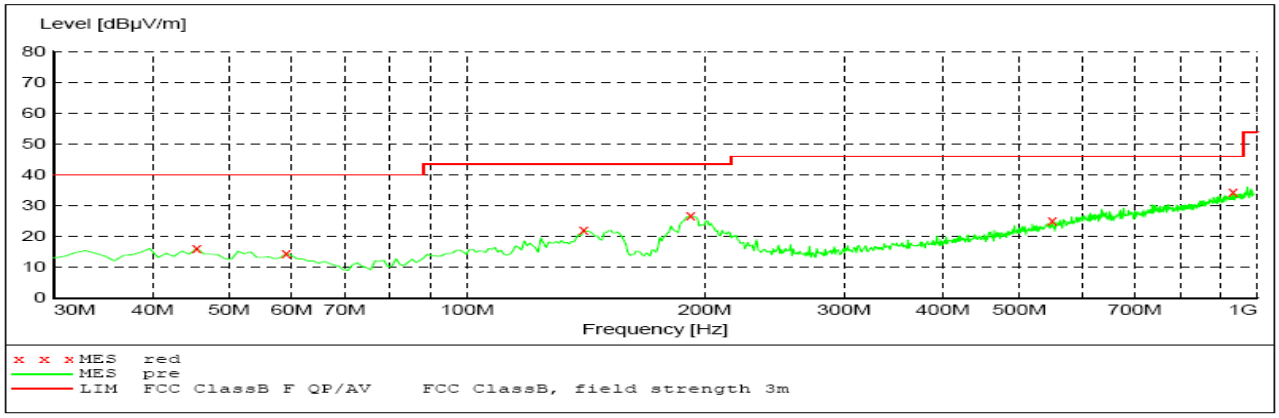
Remark:
1. The radiated measurement are performed the each test mode (b/g/n) and channel (low/mid/high), the datum recorded below (802.11b mode, the middle channel) is the worst case for all the test mode and channel.
2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.
3. HORN ANTENNA for the radiation emission test above 1G.
4. We tested both battery powered and powered by adapter charging mode at three orientate ons, recorded worst case at powered by adapter charging mode.
5. "---" means not recorded as emission levels lower than limit.
6. Margin= Limit - Level

***For 9KHz to 30MHz***

| Frequency (MHz) | Corrected Reading (dBμV/m)@3m | FCC Limit (dBμV/m) @3m | Margin (dB) | Detector | Result |
|---|---|---|---|---|---|
| 11.41 | 46.69 | 69.54 | 22.85 | QP | PASS |
| 22.36 | 43.87 | 69.54 | 25.67 | QP | PASS |

***For 30MHz to 1000MHz***

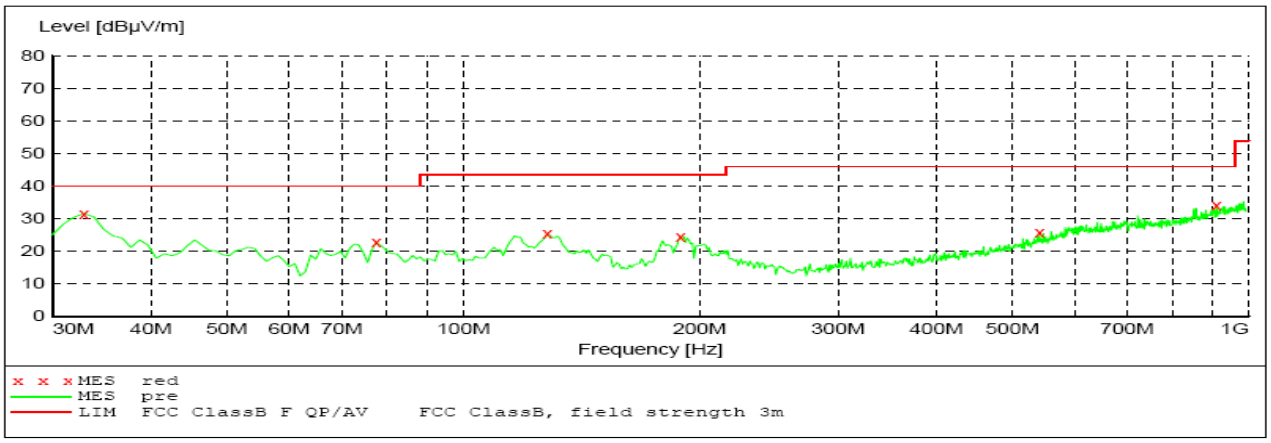
| *Polarization* | *Horizontal* |
|---|---|




***MEASUREMENT RESULT:***

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Det. | Height cm | Azimuth deg | Polarization |
|---|---|---|---|---|---|---|---|---|
| 45.520000 | 16.20 | -15.0 | 40.0 | 23.8 | PK | 100.0 | 141.00 | HORIZONTAL |
| 59.100000 | 14.50 | -15.6 | 40.0 | 25.5 | PK | 300.0 | 29.00 | HORIZONTAL |
| 140.580000 | 22.10 | -18.5 | 43.5 | 21.4 | PK | 300.0 | 5.00 | HORIZONTAL |
| 191.990000 | 26.80 | -14.7 | 43.5 | 16.7 | PK | 300.0 | 202.00 | HORIZONTAL |
| 550.890000 | 25.10 | -5.4 | 46.0 | 20.9 | PK | 300.0 | 229.00 | HORIZONTAL |
| 933.070000 | 34.20 | 3.2 | 46.0 | 11.8 | PK | 300.0 | 134.00 | HORIZONTAL |

| *Polarization* | *Vertical* |
|---|---|




***MEASUREMENT RESULT:***

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Det. | Height cm | Azimuth deg | Polarization |
|---|---|---|---|---|---|---|---|---|
| 32.910000 | 31.50 | -16.3 | 40.0 | 8.5 | PK | 100.0 | 143.00 | VERTICAL |
| 77.530000 | 22.80 | -19.6 | 40.0 | 17.2 | PK | 100.0 | 119.00 | VERTICAL |
| 127.970000 | 25.30 | -17.6 | 43.5 | 18.2 | PK | 100.0 | 181.00 | VERTICAL |
| 189.080000 | 24.50 | -14.9 | 43.5 | 19.0 | PK | 100.0 | 287.00 | VERTICAL |
| 542.160000 | 25.60 | -5.6 | 46.0 | 20.4 | PK | 100.0 | 260.00 | VERTICAL |
| 909.790000 | 34.10 | 2.7 | 46.0 | 11.9 | PK | 100.0 | 276.00 | VERTICAL |

***For 1GHz to 25GHz***

*Note:We tested 11b,11g,11n HT20,11n HT40 and rcorded the worst case at the 11b Mode.*

***802.11b Mode (above 1GHz)***

| Frequency(MHz): | | | | 2412 | | Polarity: | | | HORIZONTAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | 2402.00 | 105.55 | PK | -- | -- | 72.15 | 28.78 | 4.61 | 0 | 33.4 |
| 1 | 2402.00 | 95.91 | AV | -- | -- | 62.51 | 28.78 | 4.61 | 0 | 33.4 |
| 2 | 2390.00 | 41.34 | PK | 74 | 32.66 | 8.02 | 28.72 | 4.6 | 0 | 33.32 |
| 2 | 2390.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 3 | 2400.00 | 45.36 | PK | 74 | 28.64 | 11.97 | 28.78 | 4.61 | 0 | 33.39 |
| 3 | 2400.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 4 | 4824.00 | 64.6 | PK | 74 | 9.4 | 60.05 | 33.52 | 6.92 | 35.89 | 4.55 |
| 4 | 4824.00 | 50.02 | AV | 54 | 3.98 | 45.47 | 33.52 | 6.92 | 35.89 | 4.55 |
| 5 | 5175.50 | 50.38 | PK | 74 | 23.62 | 43.06 | 34.49 | 7.13 | 34.29 | 7.32 |
| 5 | 5175.50 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 6 | 7236.00 | 49.41 | PK | 74 | 24.59 | 38.14 | 37.1 | 9.19 | 35.02 | 11.27 |
| 6 | 7236.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |

| Frequency(MHz): | | | | 2412 | | Polarity: | | | VERTICAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | 2402.00 | 105.94 | PK | -- | -- | 72.54 | 28.78 | 4.61 | 0 | 33.4 |
| 1 | 2402.00 | 96.45 | AV | -- | -- | 63.05 | 28.78 | 4.61 | 0 | 33.4 |
| 2 | 2390.00 | 42.38 | PK | 74 | 31.62 | 9.06 | 28.72 | 4.6 | 0 | 33.32 |
| 2 | 2390.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 3 | 2400.00 | 46.1 | PK | 74 | 27.9 | 12.71 | 28.78 | 4.61 | 0 | 33.39 |
| 3 | 2400.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 4 | 4824.00 | 65.9 | PK | 74 | 8.1 | 61.35 | 33.52 | 6.92 | 35.89 | 4.55 |
| 4 | 4824.00 | 50.31 | AV | 54 | 3.69 | 45.76 | 33.52 | 6.92 | 35.89 | 4.55 |
| 5 | 5233.50 | 50.63 | PK | 74 | 23.37 | 43.21 | 34.57 | 7.16 | 34.31 | 7.42 |
| 5 | 5233.50 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 6 | 7236.00 | 49.53 | PK | 74 | 24.47 | 38.26 | 37.1 | 9.19 | 35.02 | 11.27 |
| 6 | 7236.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

| Frequency(MHz): | | 2437 | | | | Polarity: | | | HORIZONTAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | 2437.00 | 106.06 | PK | -- | -- | 72.56 | 28.85 | 4.65 | 0 | 33.5 |
| 1 | 2437.00 | 96.65 | AV | -- | -- | 63.15 | 28.85 | 4.65 | 0 | 33.5 |
| 2 | 3158.75 | 47.64 | PK | 74 | 26.36 | 46.45 | 31.14 | 5.43 | 35.38 | 1.19 |
| 2 | 3158.75 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 3 | 4874.00 | 65.02 | PK | 74 | 8.98 | 58.68 | 33.59 | 6.95 | 34.2 | 6.34 |
| 3 | 4874.00 | 50.31 | AV | 54 | 3.69 | 43.97 | 33.59 | 6.95 | 34.2 | 6.34 |
| 4 | 5250.75 | 42.32 | PK | 74 | 31.68 | 34.65 | 34.59 | 7.17 | 34.09 | 7.67 |
| 4 | 5250.75 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 5 | 7311.00 | 51.33 | PK | 74 | 22.67 | 39.67 | 37.44 | 9.22 | 35 | 11.66 |
| 5 | 7311.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |

| Frequency(MHz): | | 2437 | | | | Polarity: | | | VERTICAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | 2437.00 | 105.24 | PK | -- | -- | 71.74 | 28.85 | 4.65 | 0 | 33.5 |
| 1 | 2437.00 | 96.15 | AV | -- | -- | 62.65 | 28.85 | 4.65 | 0 | 33.5 |
| 2 | 3678.50 | 50.77 | PK | 74 | 23.23 | 47.25 | 32.51 | 6.03 | 35.02 | 3.52 |
| 2 | 3678.50 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 3 | 4874.00 | 67.9 | PK | 74 | 6.1 | 61.56 | 33.59 | 6.95 | 34.2 | 6.34 |
| 3 | 4874.00 | 51.08 | AV | 54 | 2.92 | 44.74 | 33.59 | 6.95 | 34.2 | 6.34 |
| 4 | 5005.15 | 43.56 | PK | 74 | 30.44 | 36.76 | 34 | 7.03 | 34.23 | 6.8 |
| 4 | 5005.15 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 5 | 7311.00 | 52.31 | PK | 74 | 21.69 | 40.65 | 37.44 | 9.22 | 35 | 11.66 |
| 5 | 7311.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

| Frequency(MHz): | | | | 2462 | | Polarity: | | | HORIZONTAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | 2480.00 | 105.27 | PK | -- | -- | 71.65 | 28.92 | 4.7 | 0 | 33.62 |
| 1 | 2480.00 | 95.47 | AV | -- | -- | 61.85 | 28.92 | 4.7 | 0 | 33.62 |
| 2 | 2483.50 | 53.55 | PK | 74 | 20.45 | 19.92 | 28.93 | 4.7 | 0 | 33.63 |
| 2 | 2483.50 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 3 | 2500.00 | 44.74 | PK | 74 | 29.26 | 11.06 | 28.96 | 4.72 | 0 | 33.68 |
| 3 | 2500.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 4 | 4924.00 | 65.54 | PK | 74 | 8.46 | 60.76 | 33.71 | 6.98 | 35.91 | 4.78 |
| 4 | 4924.00 | 51.32 | AV | 54 | 2.68 | 46.54 | 33.71 | 6.98 | 35.91 | 4.78 |
| 5 | 5215.70 | 49.86 | PK | 74 | 24.14 | 42.46 | 34.56 | 7.15 | 34.31 | 7.4 |
| 5 | 5215.70 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 6 | 7386.00 | 50.6 | PK | 74 | 23.4 | 38.72 | 37.61 | 9.25 | 34.98 | 11.88 |
| 6 | 7386.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |

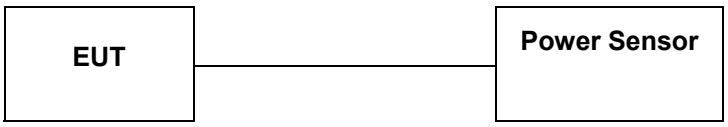
| Frequency(MHz): | | | | 2462 | | Polarity: | | | VERTICAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | 2480.00 | 105.27 | PK | -- | -- | 71.65 | 28.92 | 4.7 | 0 | 33.62 |
| 1 | 2480.00 | 95.49 | AV | -- | -- | 61.87 | 28.92 | 4.7 | 0 | 33.62 |
| 2 | 2483.50 | 55.11 | PK | 74 | 18.89 | 21.48 | 28.93 | 4.7 | 0 | 33.63 |
| 2 | 2483.50 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 3 | 2500.00 | 43.83 | PK | 74 | 30.17 | 10.15 | 28.96 | 4.72 | 0 | 33.68 |
| 3 | 2500.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 4 | 4924.00 | 65.57 | PK | 74 | 8.43 | 60.79 | 33.71 | 6.98 | 35.91 | 4.78 |
| 4 | 4924.00 | 50.24 | AV | 54 | 3.76 | 45.46 | 33.71 | 6.98 | 35.91 | 4.78 |
| 5 | 5155.75 | 48.85 | PK | 74 | 25.15 | 41.57 | 34.45 | 7.12 | 34.29 | 7.28 |
| 5 | 5155.75 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |
| 6 | 7386.00 | 51.52 | PK | 74 | 22.48 | 39.64 | 37.61 | 9.25 | 34.98 | 11.88 |
| 6 | 7386.00 | -- | AV | 54 | -- | -- | -- | -- | -- | -- |

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

## 4.3 Maximum Output Power

**TEST CONFIGURATION**




**TEST PROCEDURE**

According to KDB558074 D01 DTS Meas Guidance v03:
PKPM1 Peak power meter method: The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.
Maximum conducted (average) output power: As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.
1. The EUT is configured to transmit continuously, or to transmit with a constant duty factor.
2. At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
3. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
If the transmitter does not transmit continuously, measure the duty cycle (x) of the transmitter output signal as described in Section 6.0.
Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
Adjust the measurement in dBm by adding 10log (1/x), where x is the duty cycle to the measurement result.

**LIMIT**

The Maximum Peak Output Power Measurement is 30dBm.

**TEST RESULTS**

Remark: We measured output power at difference data rate for each mode and recorded worst case for each mode.

### 4.3.1 802.11b Test Mode

A. Test Verdict

| Channel | Frequency (MHz) | Measured Output Peak Power (dBm) | Limits (dBm) | Verdict |
|---|---|---|---|---|
| 1 | 2412 | 17.58 | 30 | PASS |
| 6 | 2437 | 18.09 | 30 | PASS |
| 11 | 2462 | 18.02 | 30 | PASS |

Note:
1. For 802.11b mode at finial test to get the worst-case emission at 1Mbps.
2. The test results including the cable lose.

### 4.3.2 802.11g Test Mode

A. Test Verdict

| Channel | Frequency (MHz) | Measured Output Peak Power (dBm) | Limits (dBm) | Verdict |
|---|---|---|---|---|
| 1 | 2412 | 17.68 | 30 | PASS |
| 6 | 2437 | 18.54 | 30 | PASS |
| 11 | 2462 | 18.05 | 30 | PASS |

Note:
1. For 802.11g mode at finial test to get the worst-case emission at 6Mbps.
2. The test results including the cable lose.

### 4.3.3 802.11n HT20 Test Mode

A. Test Verdict

| Channel | Frequency (MHz) | Measured Output Peak Power (dBm) | Limits (dBm) | Verdict |
|---|---|---|---|---|
| 1 | 2412 | 18.06 | 30 | PASS |
| 6 | 2437 | 18.85 | 30 | PASS |
| 11 | 2462 | 18.14 | 30 | PASS |

Note:
1. For 802.11n HT20 mode at finial test to get the worst-case emission at 6.5Mbps.
2. The test results including the cable lose.

### 4.3.4 802.11n HT40 Test Mode

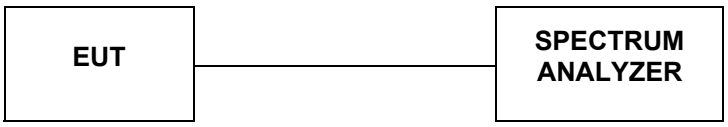
A. Test Verdict

| Channel | Frequency (MHz) | Measured Output Peak Power (dBm) | Limits (dBm) | Verdict |
|---|---|---|---|---|
| 1 | 2412 | 15.57 | 30 | PASS |
| 6 | 2437 | 16.89 | 30 | PASS |
| 11 | 2462 | 15.71 | 30 | PASS |

Note:
1. For 802.11n HT40 mode at finial test to get the worst-case emission at 13.5Mbps.
2. The test results including the cable lose.

## 4.4 Power Spectral Density

**TEST CONFIGURATION**




**TEST PROCEDURE**

According to KDB 558074 D01 V03 Method PKPSD (peak PSD) this procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

**LIMIT**

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.

**TEST RESULTS**

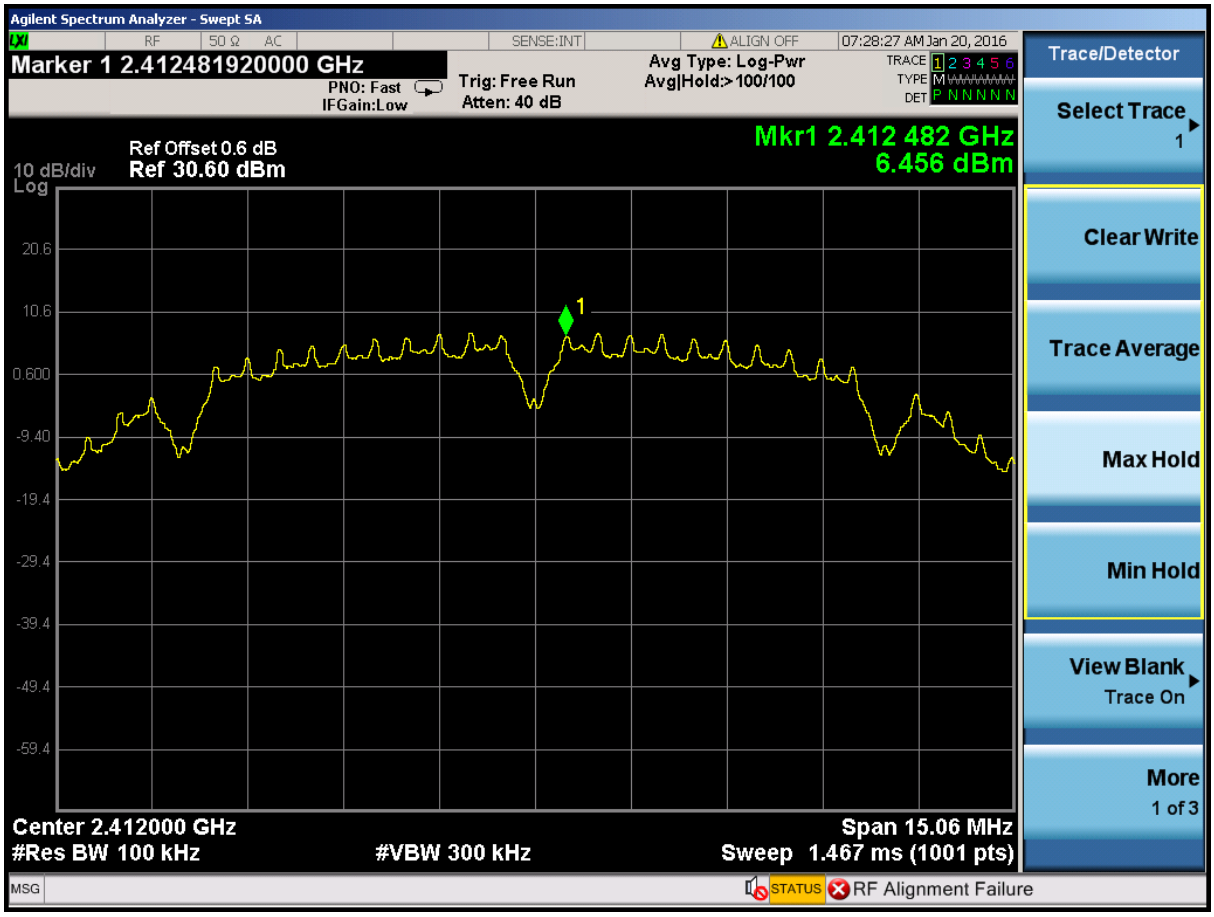
### 4.4.1 802.11b Test Mode

A. Test Verdict

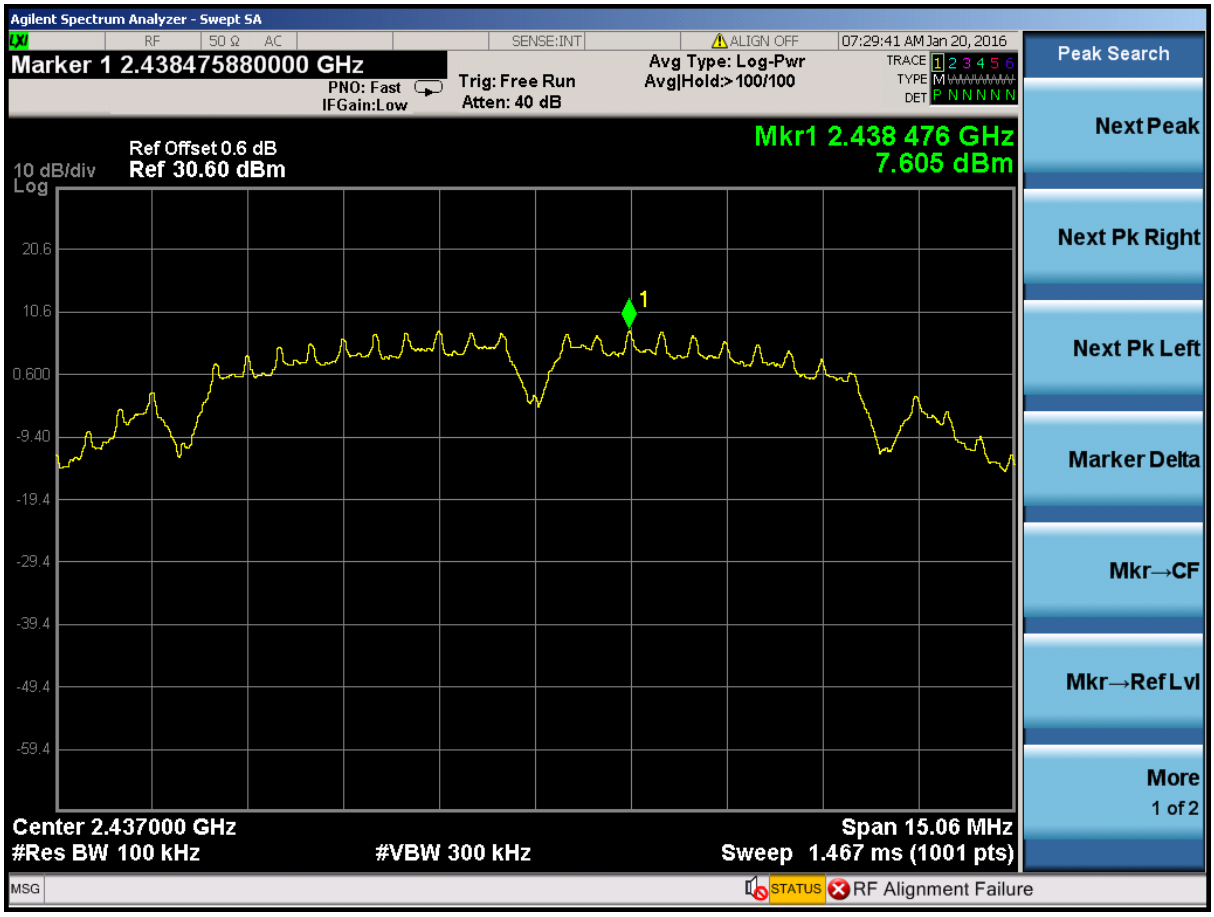
| Channel | Frequency (MHz) | Report PSD (dBm/100KHz) | Refer to Plot | Limits (dBm/3KHz) | Verdict |
|---|---|---|---|---|---|
| 1 | 2412 | 6.456 | Plot 4.4.1 A | 8 | PASS |
| 6 | 2437 | 7.605 | Plot 4.4.1 B | 8 | PASS |
| 11 | 2462 | 7.790 | Plot 4.4.1 C | 8 | PASS |

Note:
1. For 802.11b mode at finial test to get the worst-case emission at 1Mbps.
2. The test results including the cable lose.

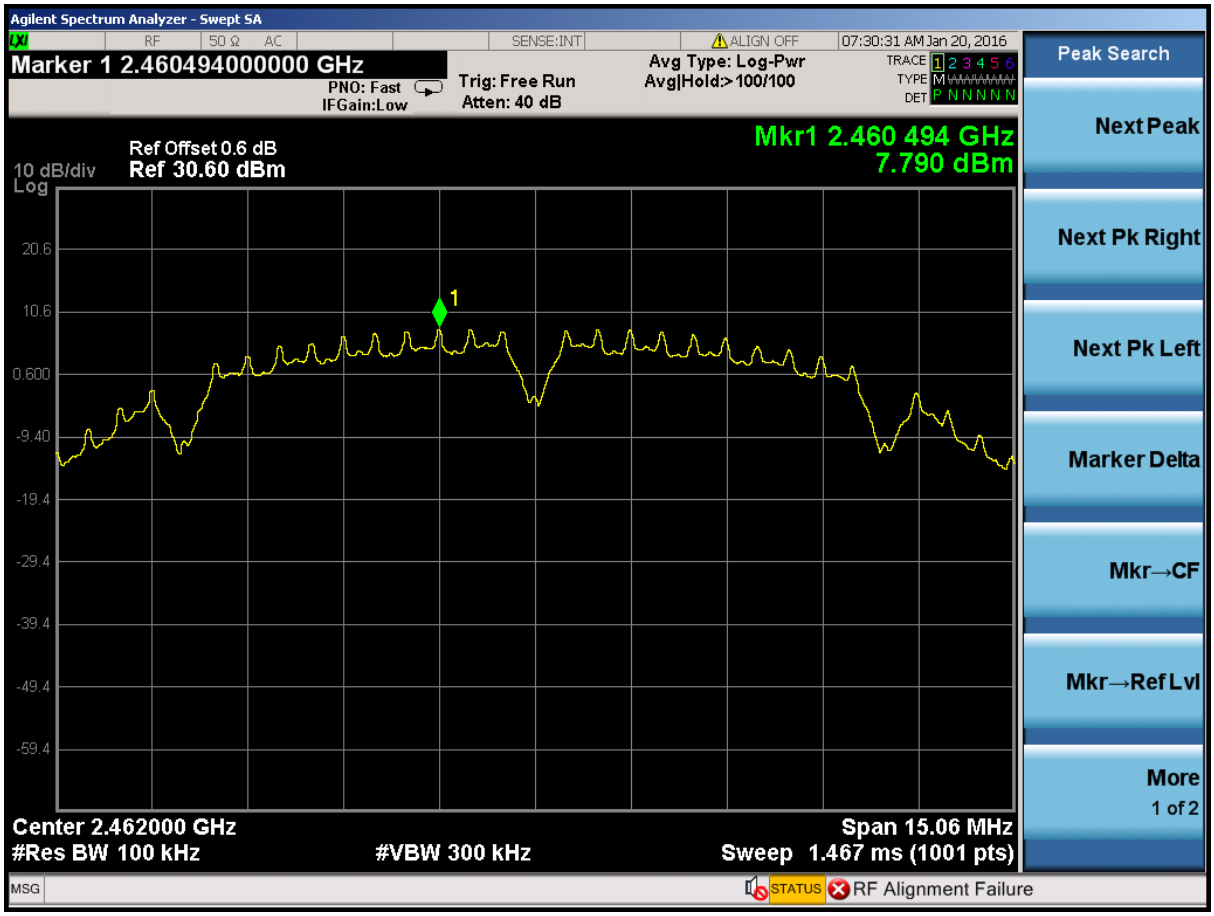
B. Test Plots




(Plot 4.4.1 A: Channel 1: 2412MHz @ 802.11b)




(Plot 4.4.1 B: Channel 6: 2437MHz @ 802.11b)




(Plot 4.4.1 C: Channel 11: 2462MHz @ 802.11b)

## 4.4.2 802.11g Test Mode

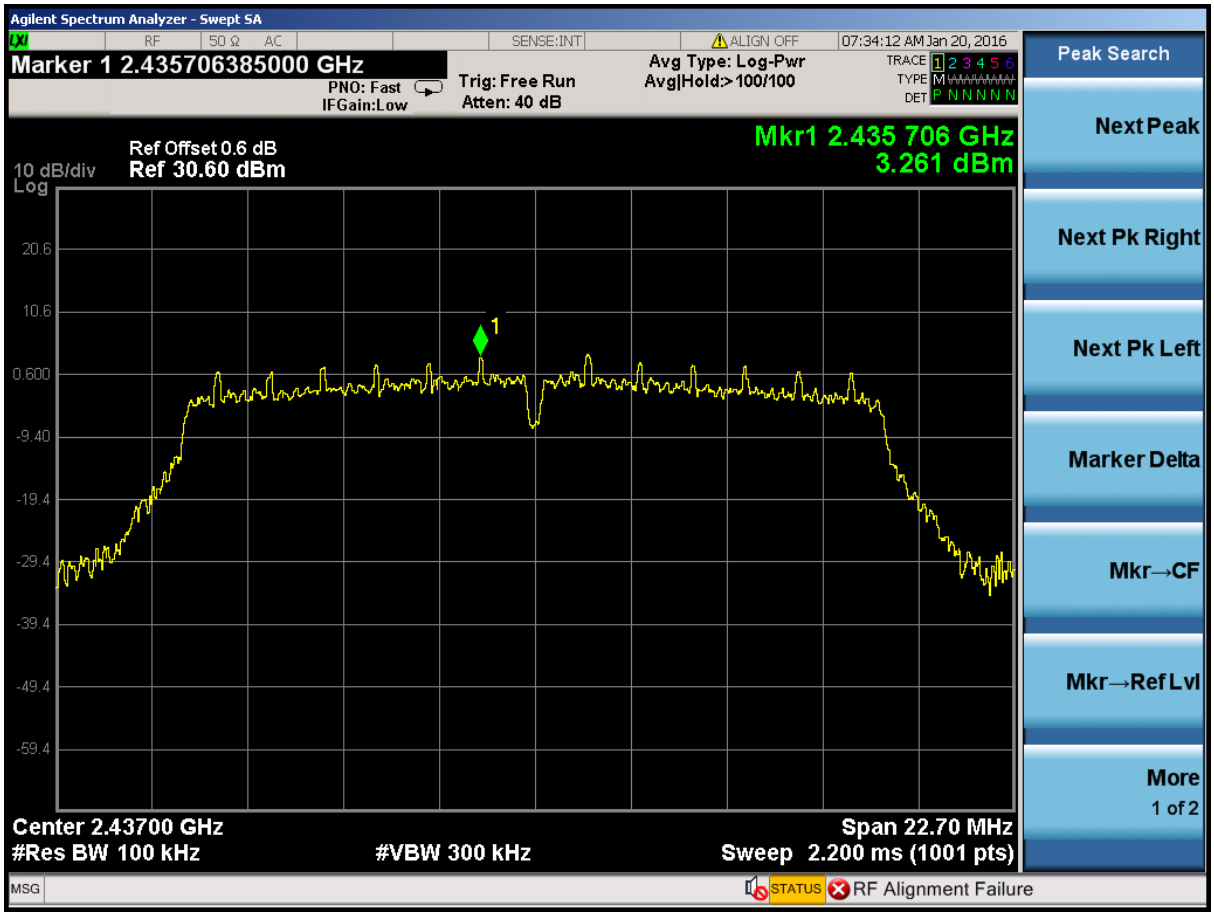
A. Test Verdict

| Channel | Frequency (MHz) | Report PSD (dBm/100KHz) | Refer to Plot | Limits (dBm/3KHz) | Verdict |
|---|---|---|---|---|---|
| 1 | 2412 | 1.832 | Plot 4.4.2 A | 8 | PASS |
| 6 | 2437 | 3.261 | Plot 4.4.2 B | 8 | PASS |
| 11 | 2462 | 2.782 | Plot 4.4.2 C | 8 | PASS |

Note:
1. For 802.11g mode at finial test to get the worst-case emission at 6Mbps.
2. The test results including the cable lose.

B. Test Plots


(Plot 4.4.2 A: Channel 1: 2412MHz @ 802.11g)




(Plot 4.4.2 B: Channel 6: 2437MHz @ 802.11g)


(Plot 4.4.2 C: Channel 11: 2462MHz @ 802.11g)

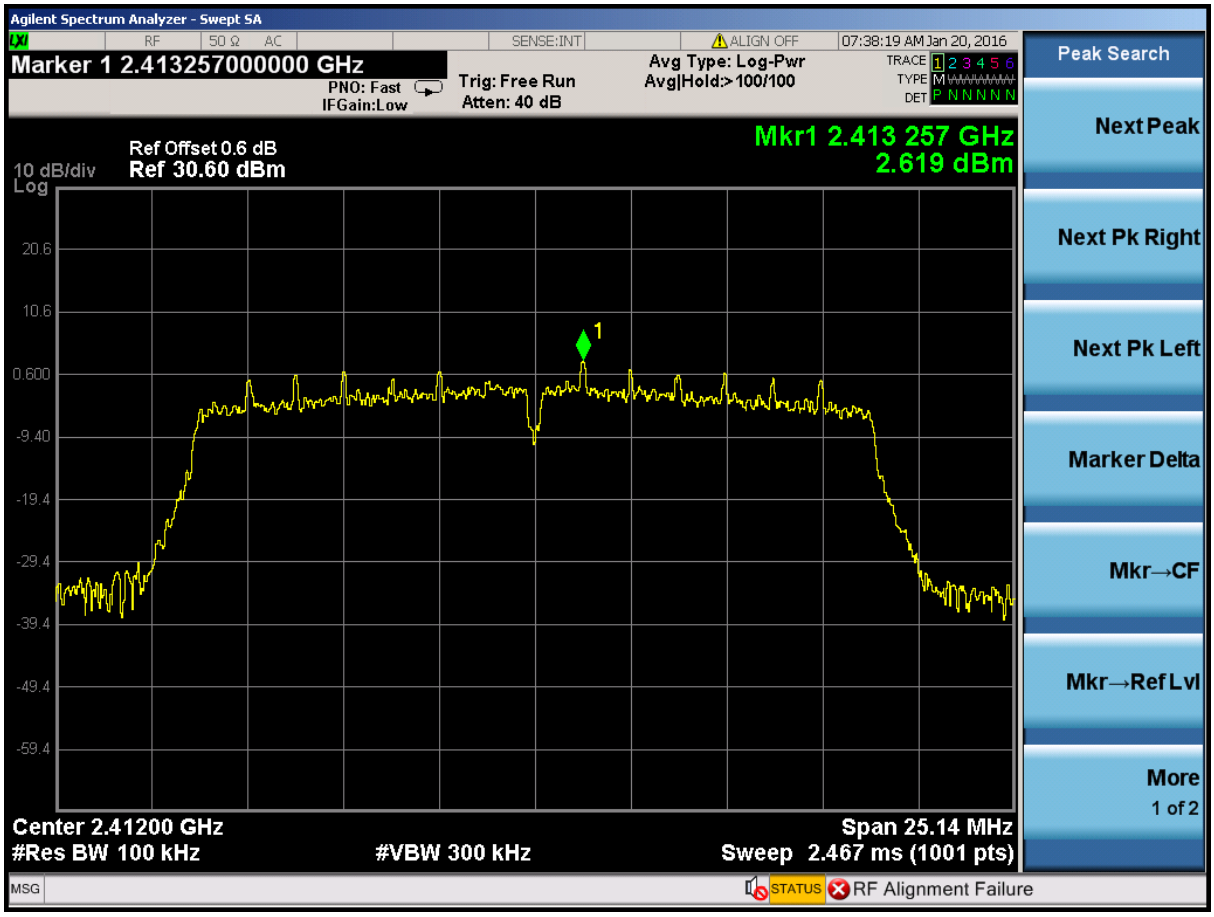
### 4.4.3 802.11n HT20 Test Mode

A. Test Verdict

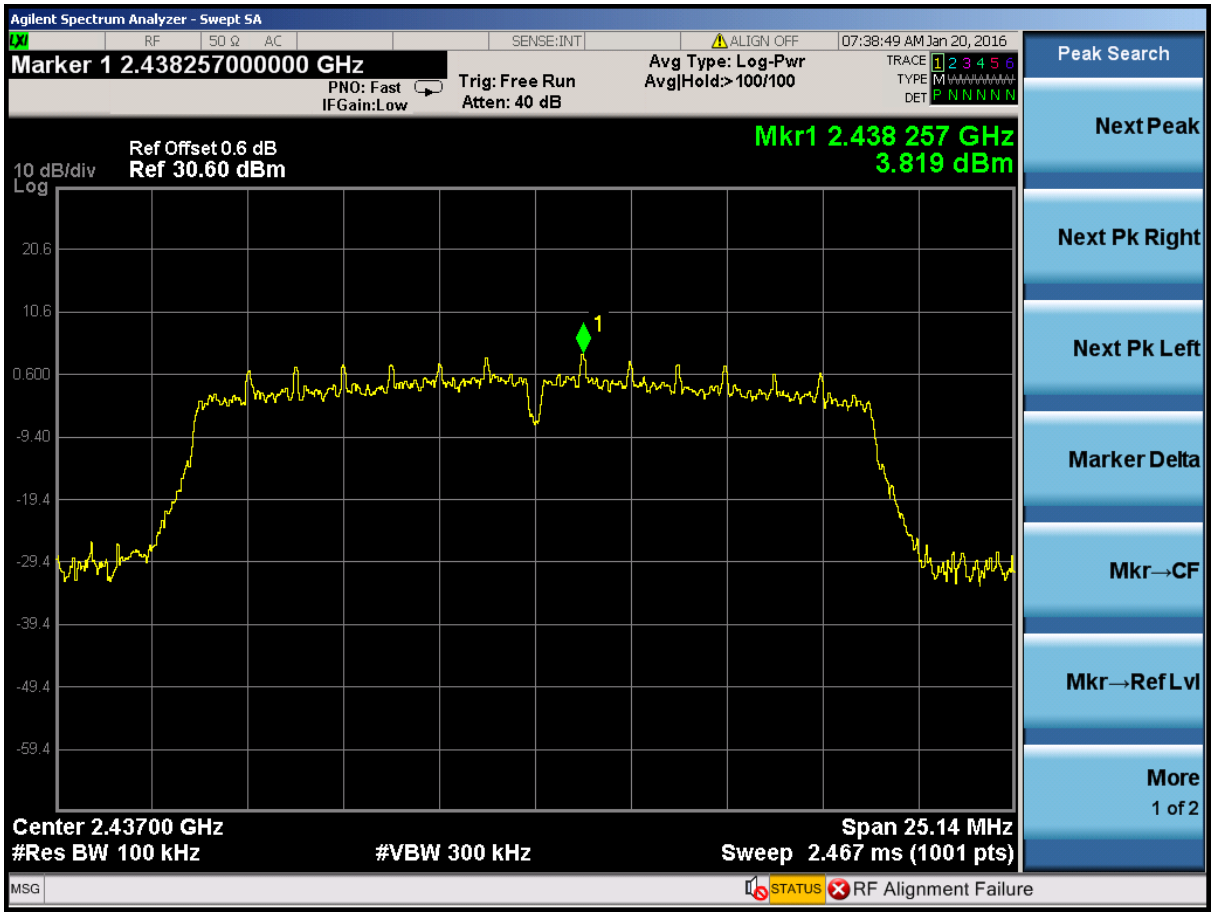
| Channel | Frequency (MHz) | Report PSD (dBm/100KHz) | Refer to Plot | Limits (dBm/3KHz) | Verdict |
|---|---|---|---|---|---|
| 1 | 2412 | 2.619 | Plot 4.4.3 A | 8 | **PASS** |
| 6 | 2437 | 3.819 | Plot 4.4.3 B | 8 | PASS |
| 11 | 2462 | 2.802 | Plot 4.4.3 C | 8 | PASS |

Note:
1. For 802.11n HT20 mode at finial test to get the worst-case emission at 6.5Mbps.
2. The test results including the cable lose.

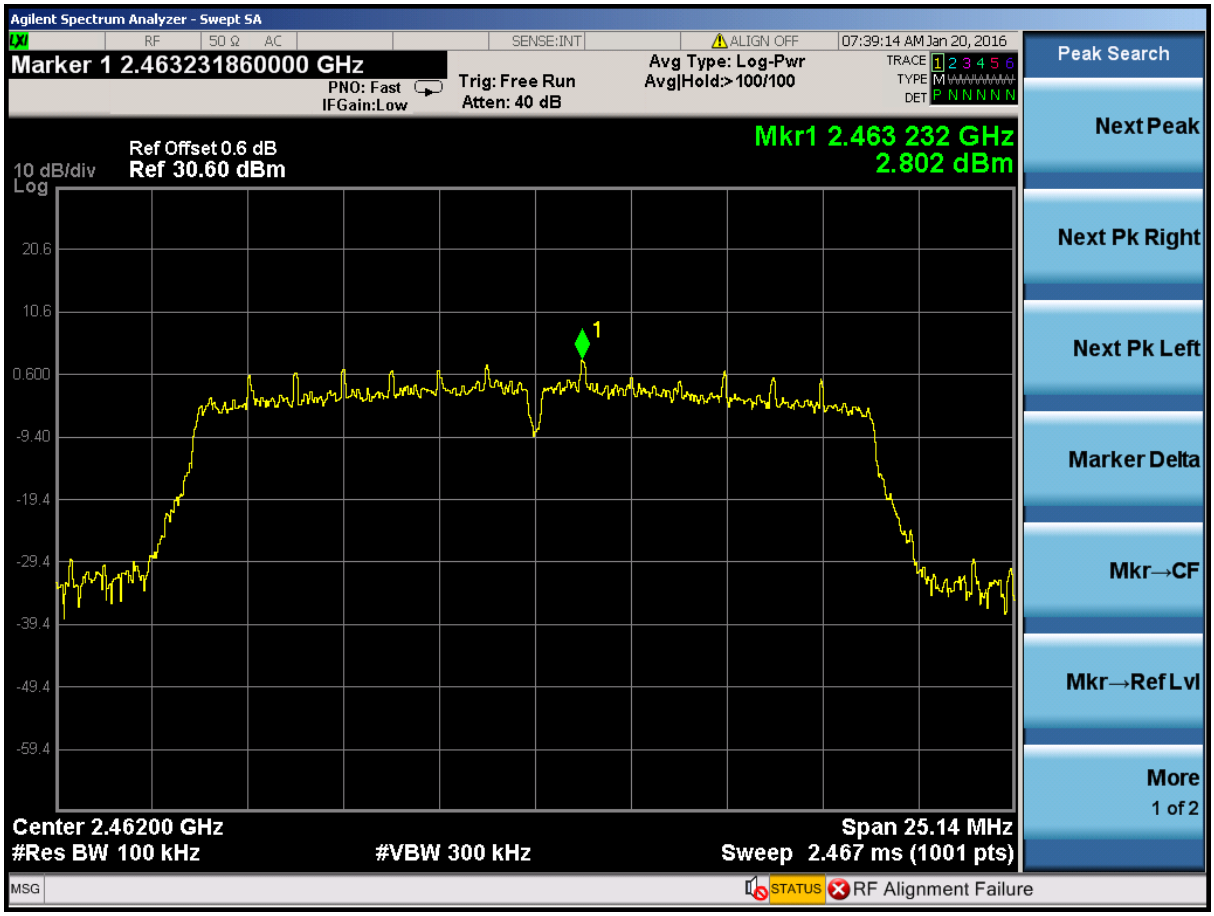
B. Test Plot




(Plot 4.4.3 A: Channel 1: 2412MHz @ 802.11n HT20)




(Plot 4.4.3 B: Channel 6: 2437MHz @ 802.11n HT20)




(Plot 4.4.3 C: Channel 11: 2462MHz @ 802.11n HT20)

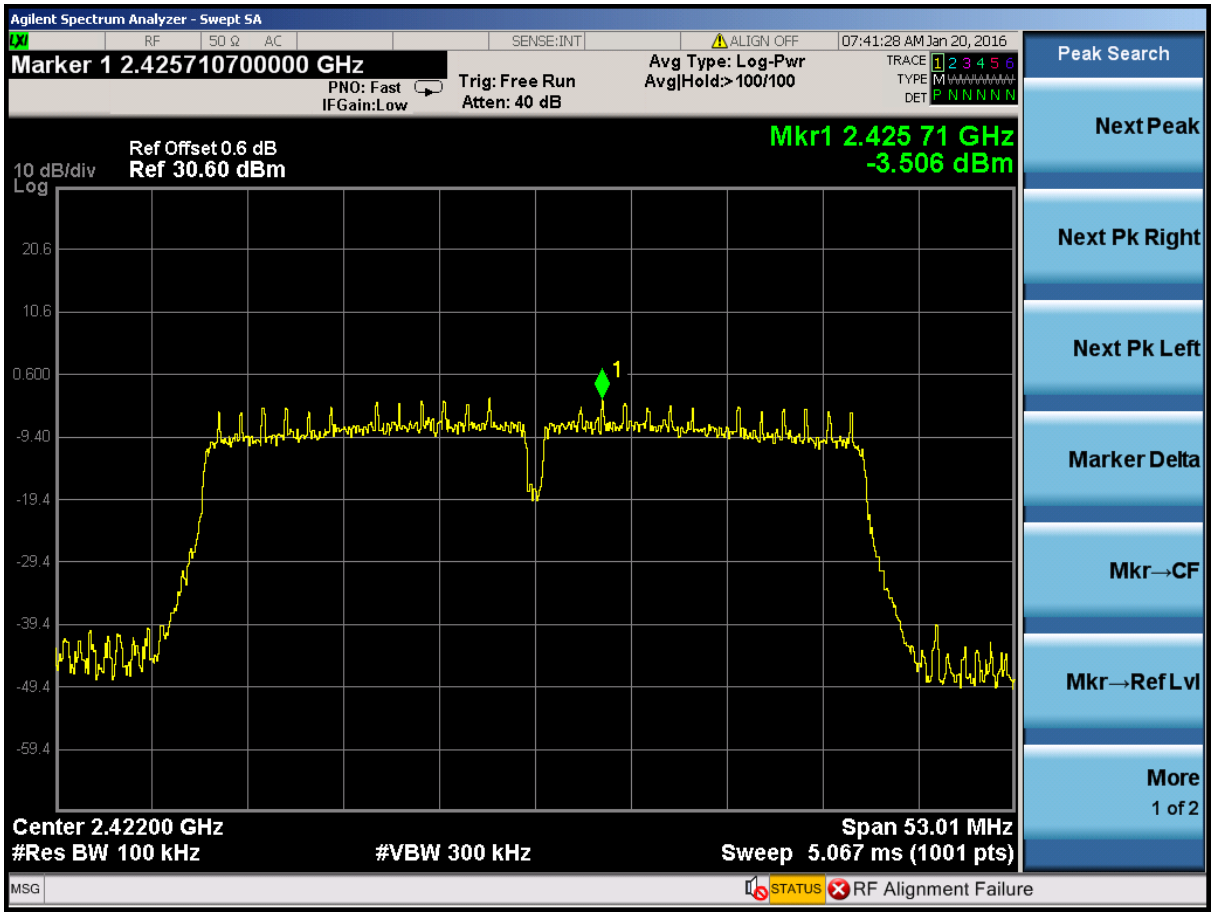
## 4.4.4 802.11n HT40 Test Mode

A. Test Verdict

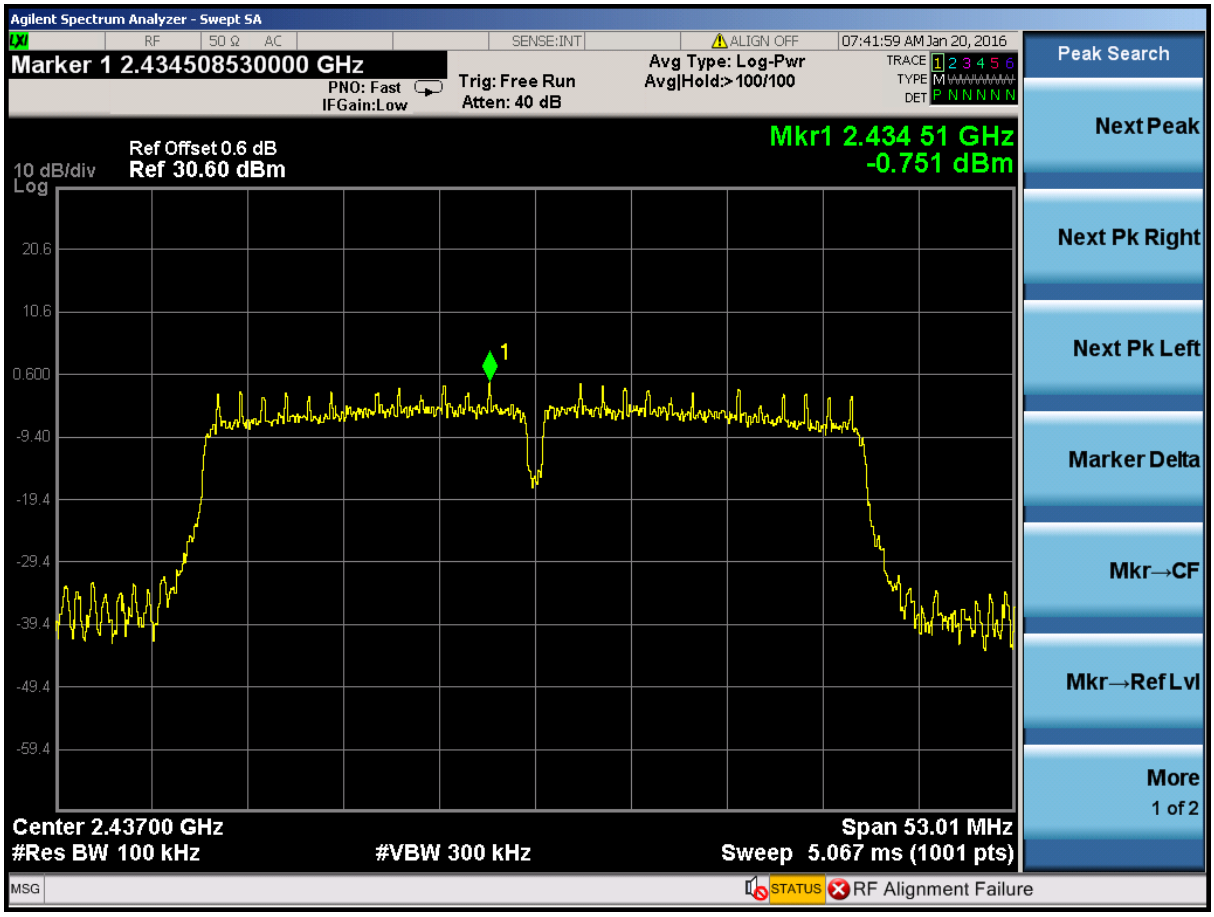
| Channel | Frequency (MHz) | Report PSD (dBm/100kHz) | Refer to Plot | Limits (dBm/3KHz) | Verdict |
|---|---|---|---|---|---|
| 3 | 2422 | -3.506 | Plot 4.4.4 A | 8 | PASS |
| 6 | 2437 | -0.751 | Plot 4.4.4 B | 8 | PASS |
| 9 | 2452 | -2.919 | Plot 4.4.4 C | 8 | PASS |

Note:
1. For 802.11n HT40 mode at finial test to get the worst-case emission at 13.5Mbps.
2. The test results including the cable lose.

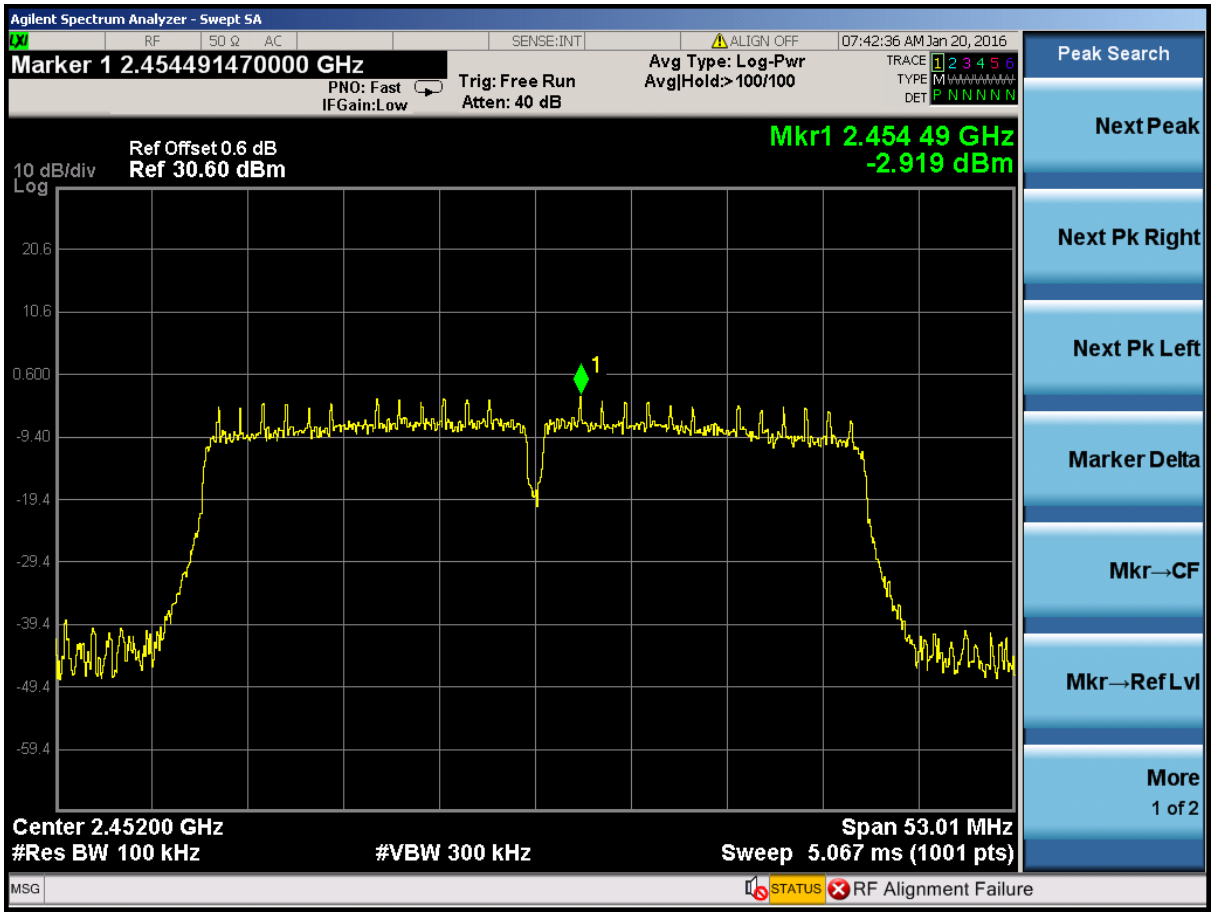
B. Test Plots




(Plot 4.4.4 A: Channel 3: 2422MHz @ 802.11n HT40))



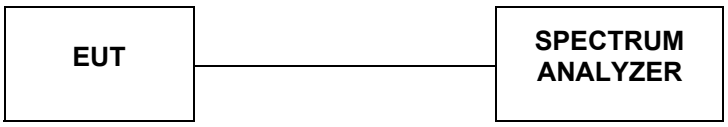

(Plot 4.4.4 B: Channel 6: 2437MHz @ 802.11n HT40)




(Plot 4.4.4 C: Channel 9: 2452MHz @ 802.11n HT40)

## 4.5 Spurious RF Conducted Emission

**TEST CONFIGURATION**




**TEST PROCEDURE**

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100 kHz and VBW= 300 KHz to measure the peak field strength, and measure frequency range from 9 KHz to 26.5GHz.

**LIMIT**

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

**TEST RESULTS**

Remark: The measurement frequency range is from 9 KHz to the $10^{th}$ harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

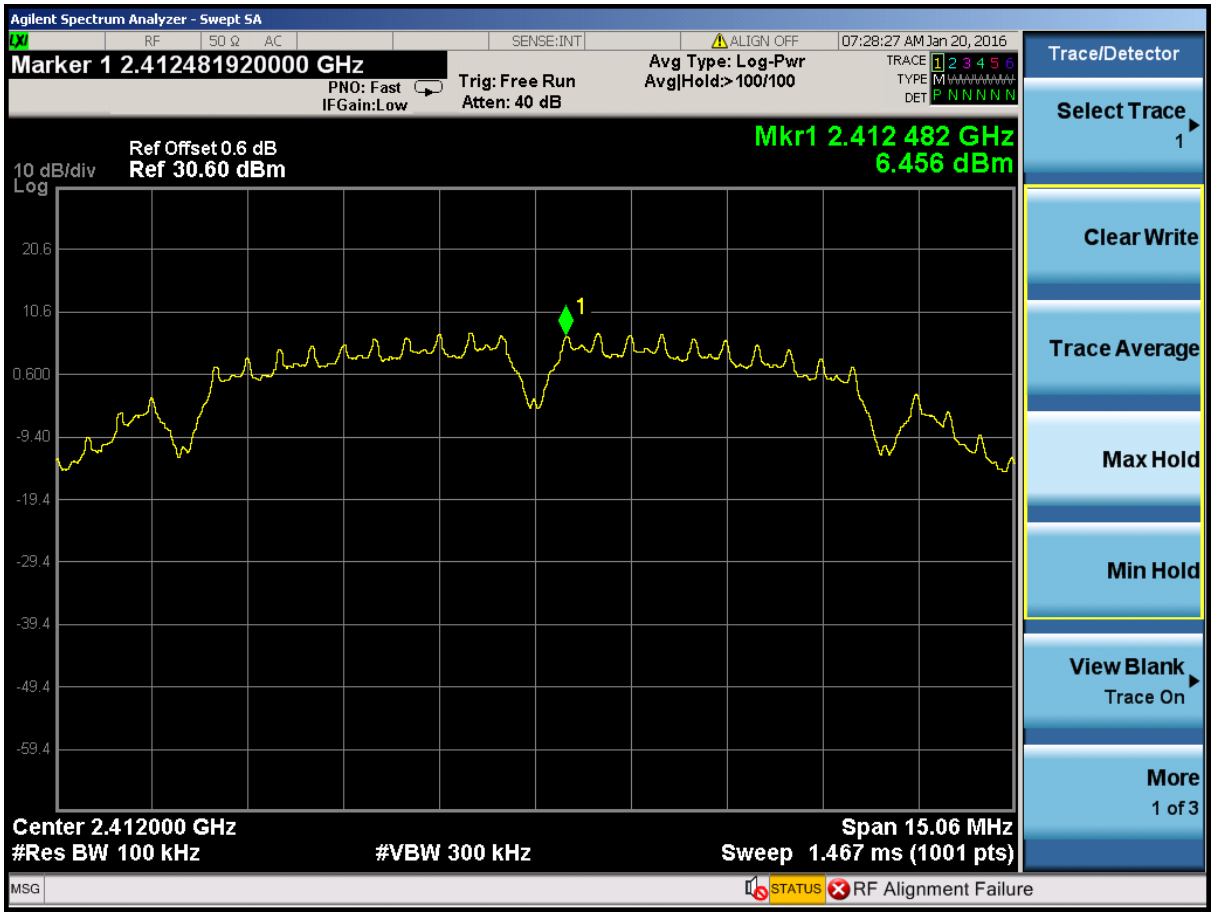
### 4.5.1 802.11b Test Mode

A. Test Verdict

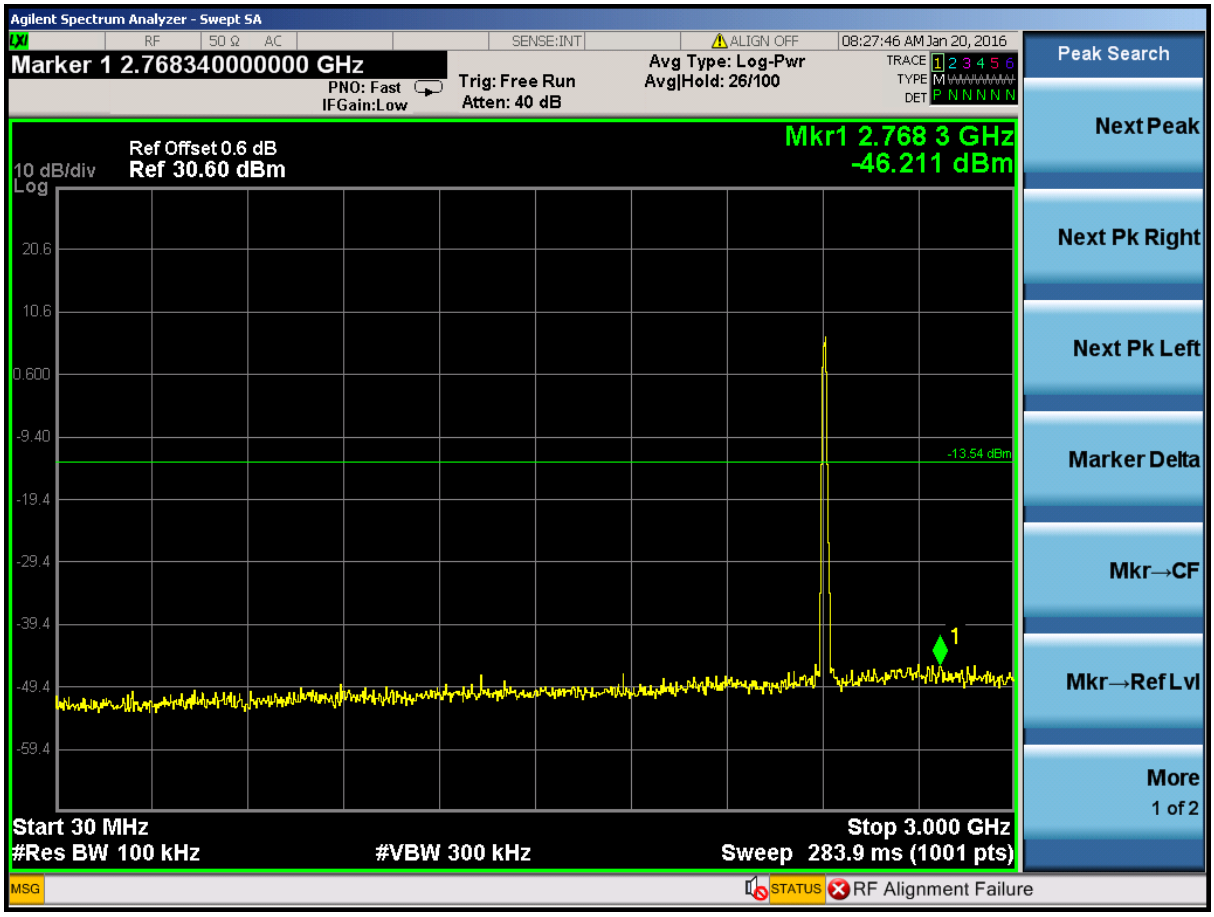
| Channel | Frequency (MHz) | Frequency Range | Refer to Plot | Limit (dBc) | Verdict |
|---|---|---|---|---|---|
| 1 | 2412 | 2.412 GHz | Plot 4.5.1 A1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.1 A2 | -20 | PASS |
| | | 3GHz-.25 GHz | Plot 4.5.1 A3 | -20 | PASS |
| 6 | 2437 | 2.437 GHz | Plot 4.5.1 B1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.1 B2 | -20 | PASS |
| | | 3GHz-25GHz | Plot 4.5.1 B3 | -20 | PASS |
| 11 | 2462 | 2.462 GHz | Plot 4.5.1 C1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.1 C2 | -20 | PASS |
| | | 3GHz-25 GHz | Plot 4.5.1 C3 | -20 | PASS |

| | | | | |
|---|---|---|---|---|
| Conducted bandedge | Left Band edge | Plot 4.5.1 D1 | -20 | PASS |
| | Right Band edge | Plot 4.5.1 D2 | -20 | PASS |

Note:
1. For 802.11b mode at finial test to get the worst-case emission at 1Mbps.
2. The test results including the cable lose.
3. For 9KHz -30MHz,Because there was only background, So We did not recorded data.

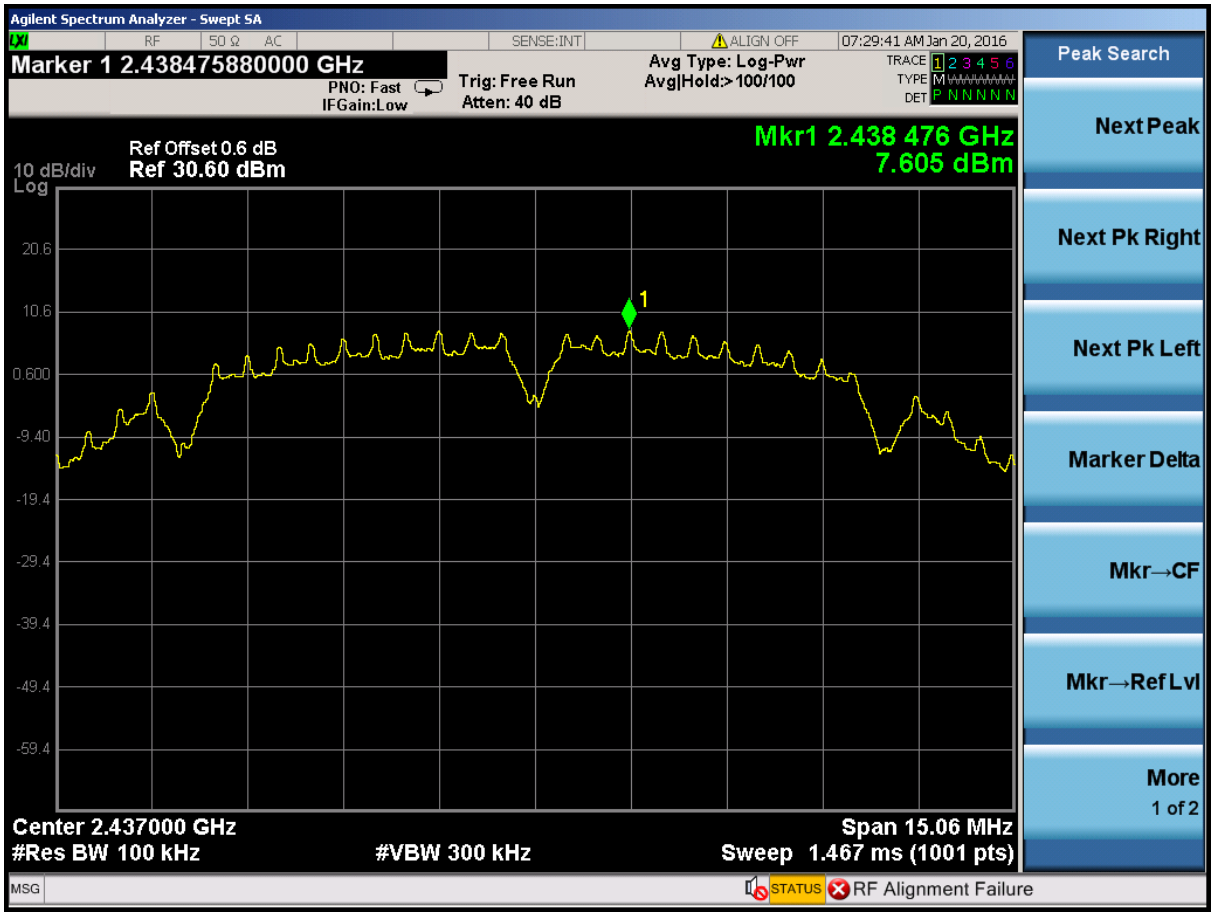



(Plot 4.5.1 A1: Channel 1: 2412MHz @ 802.11b)

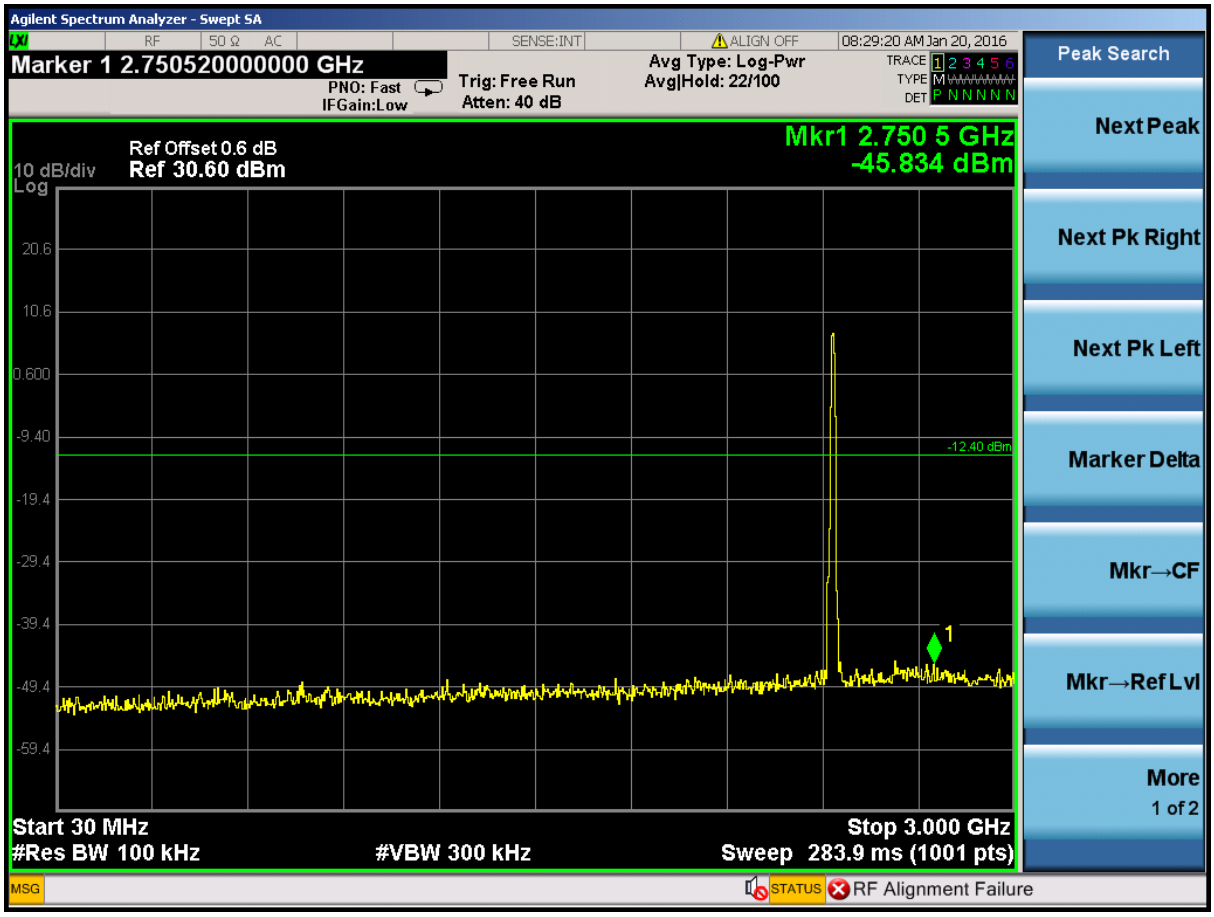



(Plot 4.5.1 A2: Channel 1: 2412MHz @ 802.11b)


(Plot 4.5.1 A3: Channel 1: 2412MHz @ 802.11b)

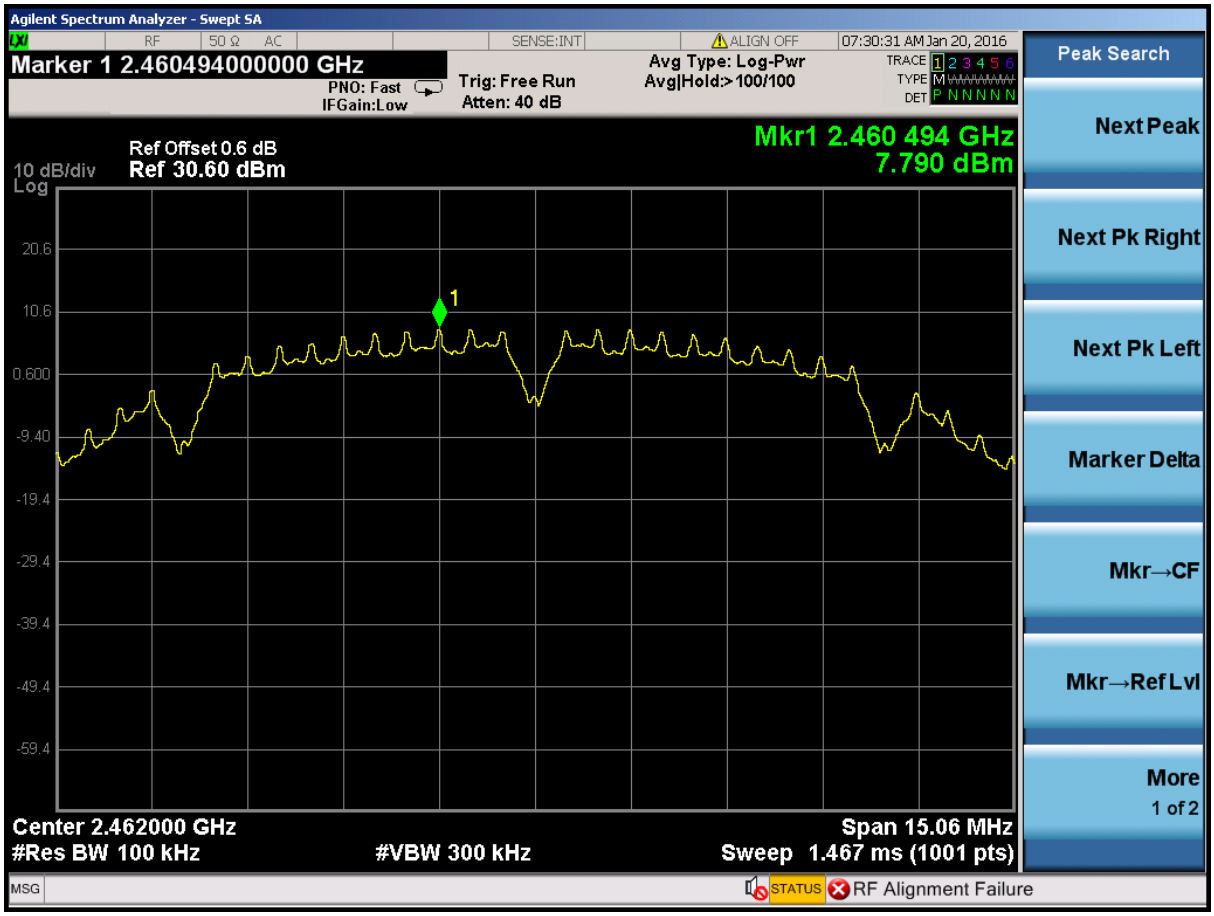



(Plot 4.5.1 B1: Channel 6: 2437MHz @ 802.11b)

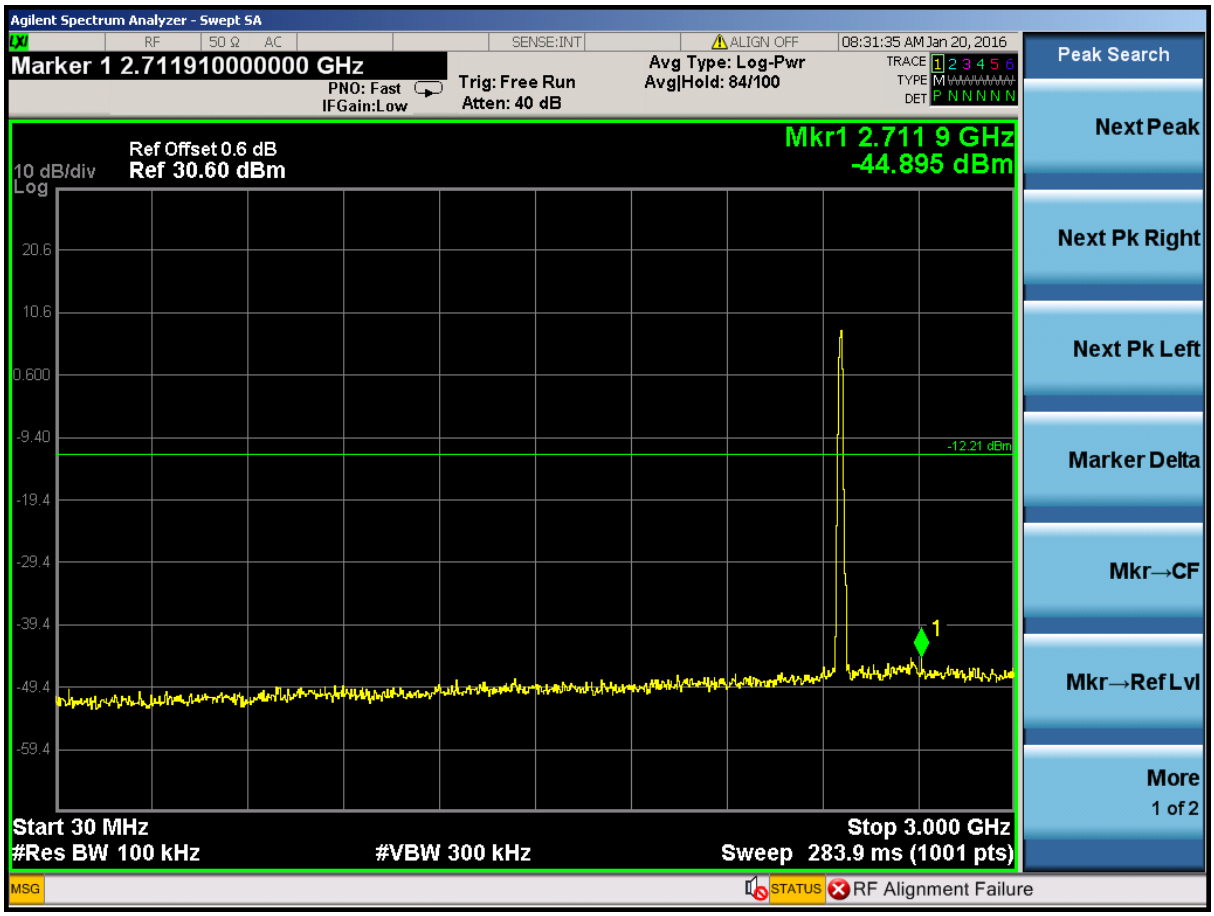



(Plot 4.5.1 B2: Channel 6: 2437MHz @ 802.11b)


(Plot 4.5.1 B3: Channel 6: 2437MHz @ 802.11b)

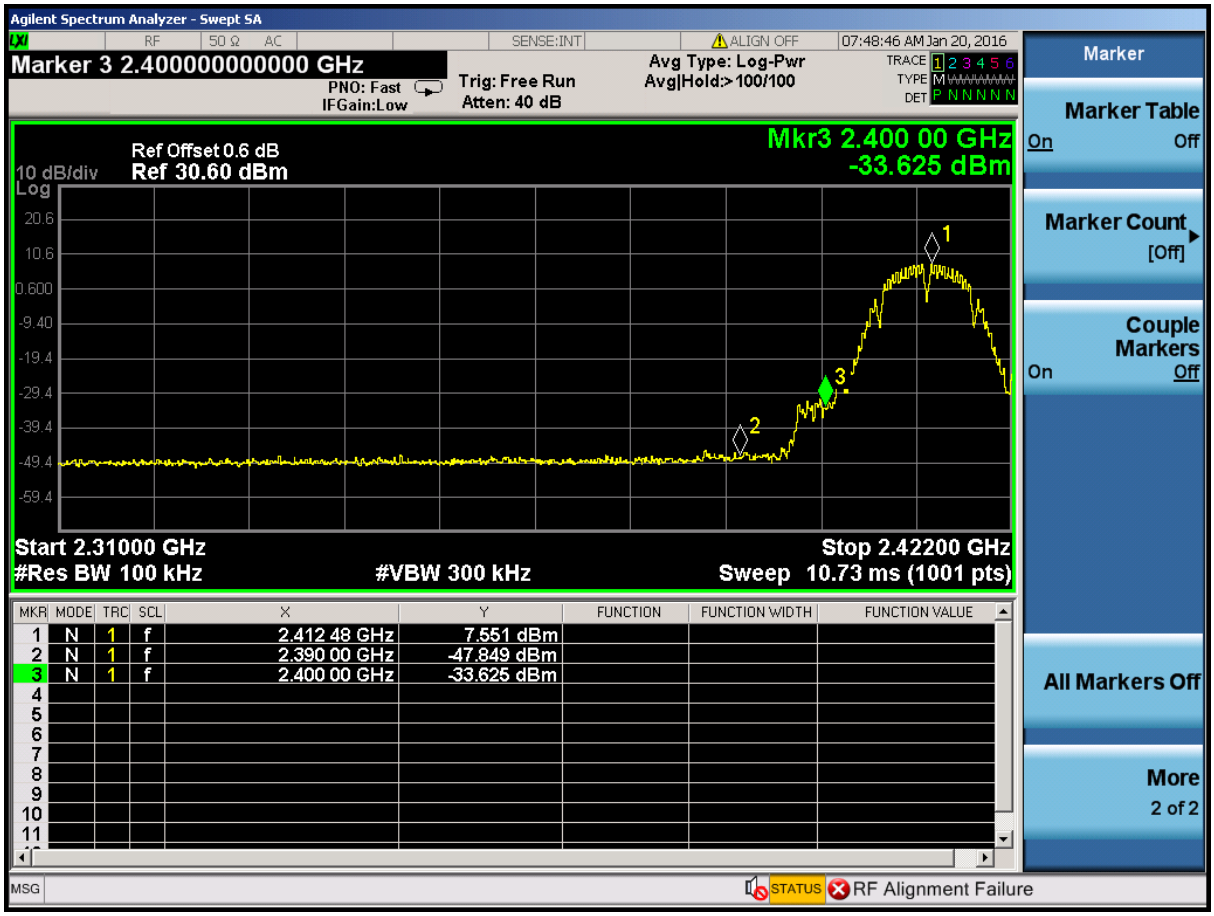



(Plot 4.5.1 C1: Channel 11: 2462MHz @ 802.11b)




(Plot 4.5.1 C2: Channel 11: 2462MHz @ 802.11b)


(Plot 4.5.1 C3: Channel 11: 2462MHz @ 802.11b)




(Plot 4.5.1 D1: Left Band edge @ 802.11b)


(Plot 4.5.1 D2: Right Band edge @ 802.11b)

## 4.5.2 802.11g Test Mode

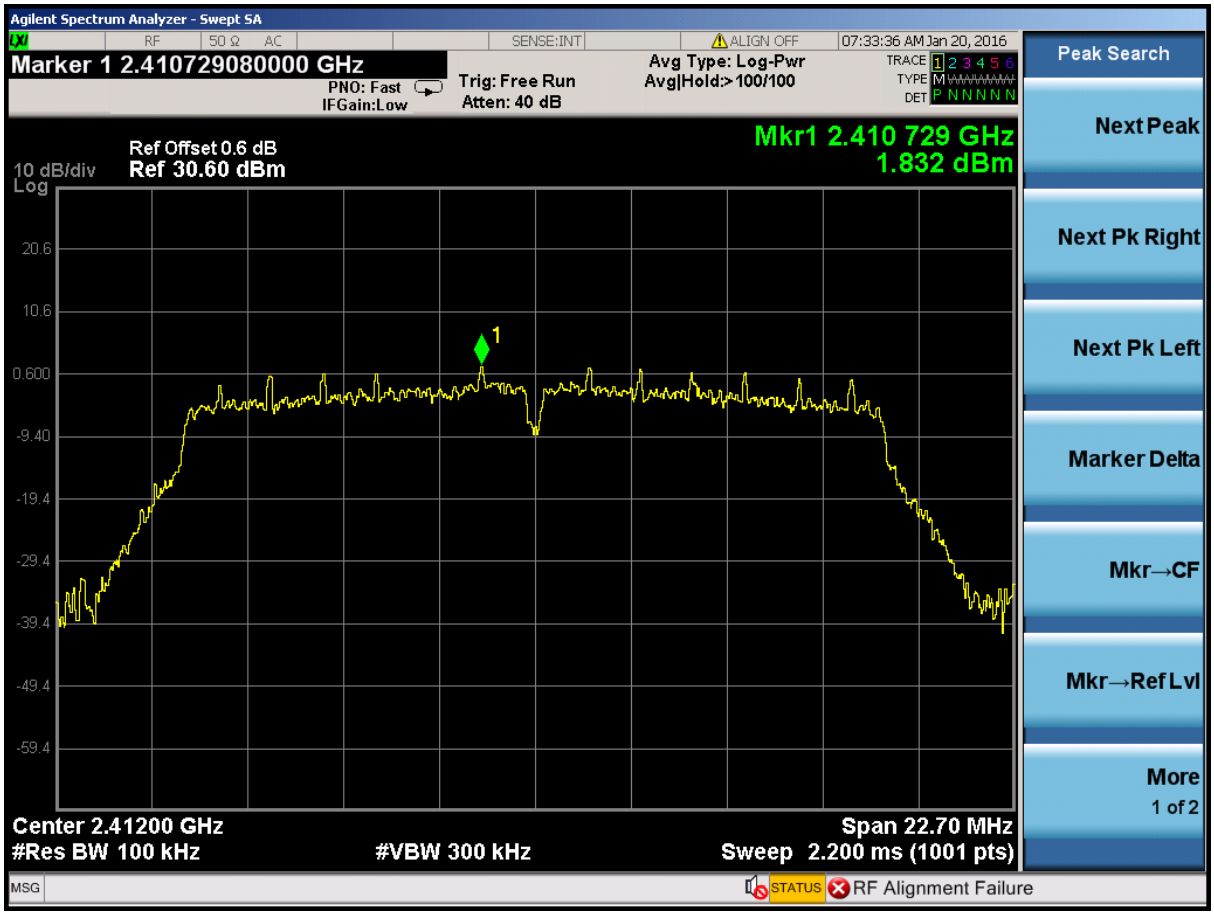
A. Test Verdict

| Channel | Frequency (MHz) | Frequency Range | Refer to Plot | Limit (dBc) | Verdict |
|---|---|---|---|---|---|
| 1 | 2412 | 2.412 GHz | Plot 4.5.2 A1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.2 A2 | -20 | PASS |
| | | 3GHz-.25 GHz | Plot 4.5.2 A3 | -20 | PASS |
| 6 | 2437 | 2.437 GHz | Plot 4.5.2 B1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.2 B2 | -20 | PASS |
| | | 3GHz-25GHz | Plot 4.5.2 B3 | -20 | PASS |
| 11 | 2462 | 2.462 GHz | Plot 4.5.2 C1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.2 C2 | -20 | PASS |
| | | 3GHz-25 GHz | Plot 4.5.2 C3 | -20 | PASS |

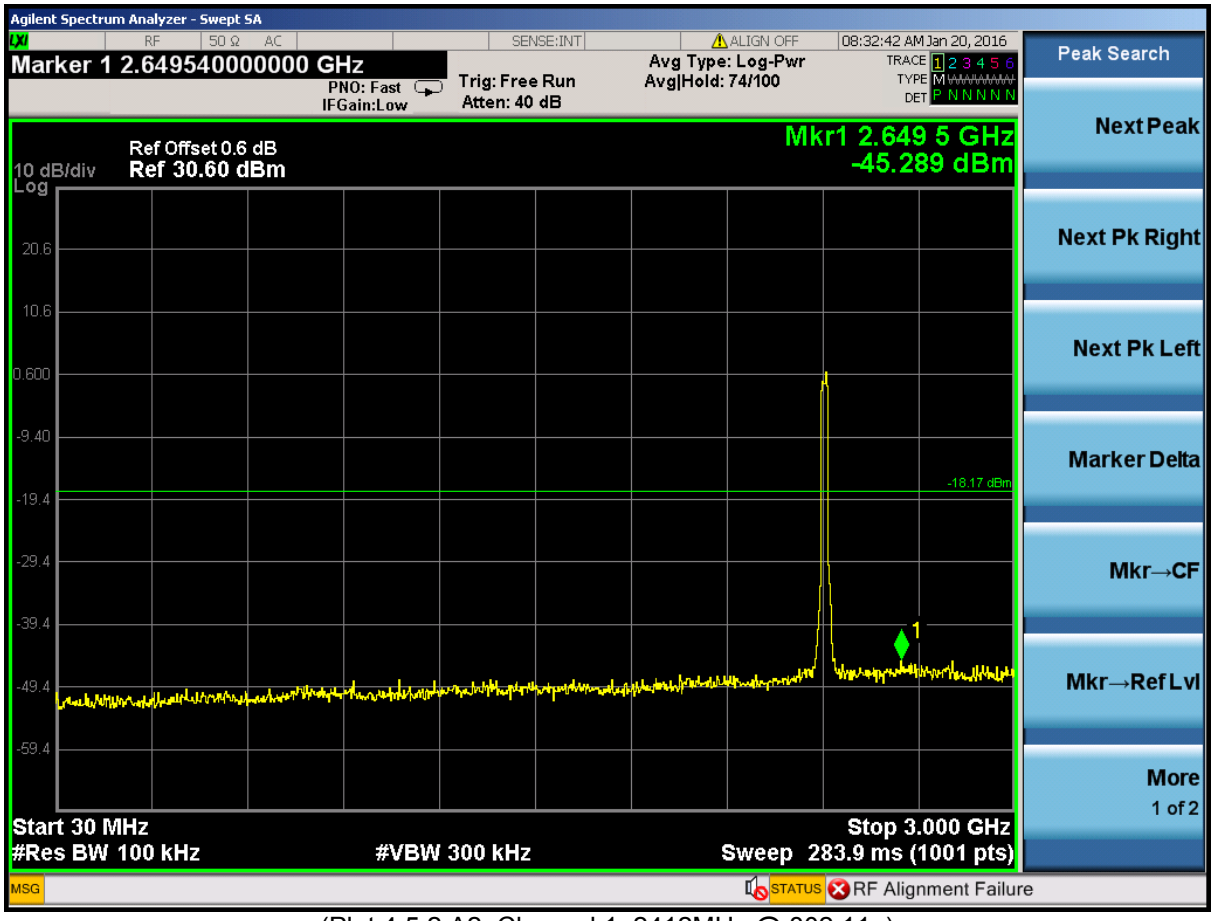
| | | | | |
|---|---|---|---|---|
| Conducted bandedge | Left Band edge | Plot 4.5.2 D1 | -20 | PASS |
| | Right Band edge | Plot 4.5.2 D2 | -20 | PASS |

Note:
1. For 802.11g mode at finial test to get the worst-case emission at 6Mbps.
2. The test results including the cable lose.
3. For 9KHz -30MHz,Because there was only background, So We did not recorded data.

B. Test Plots




(Plot 4.5.2 A1: Channel 1: 2412MHz @ 802.11g)

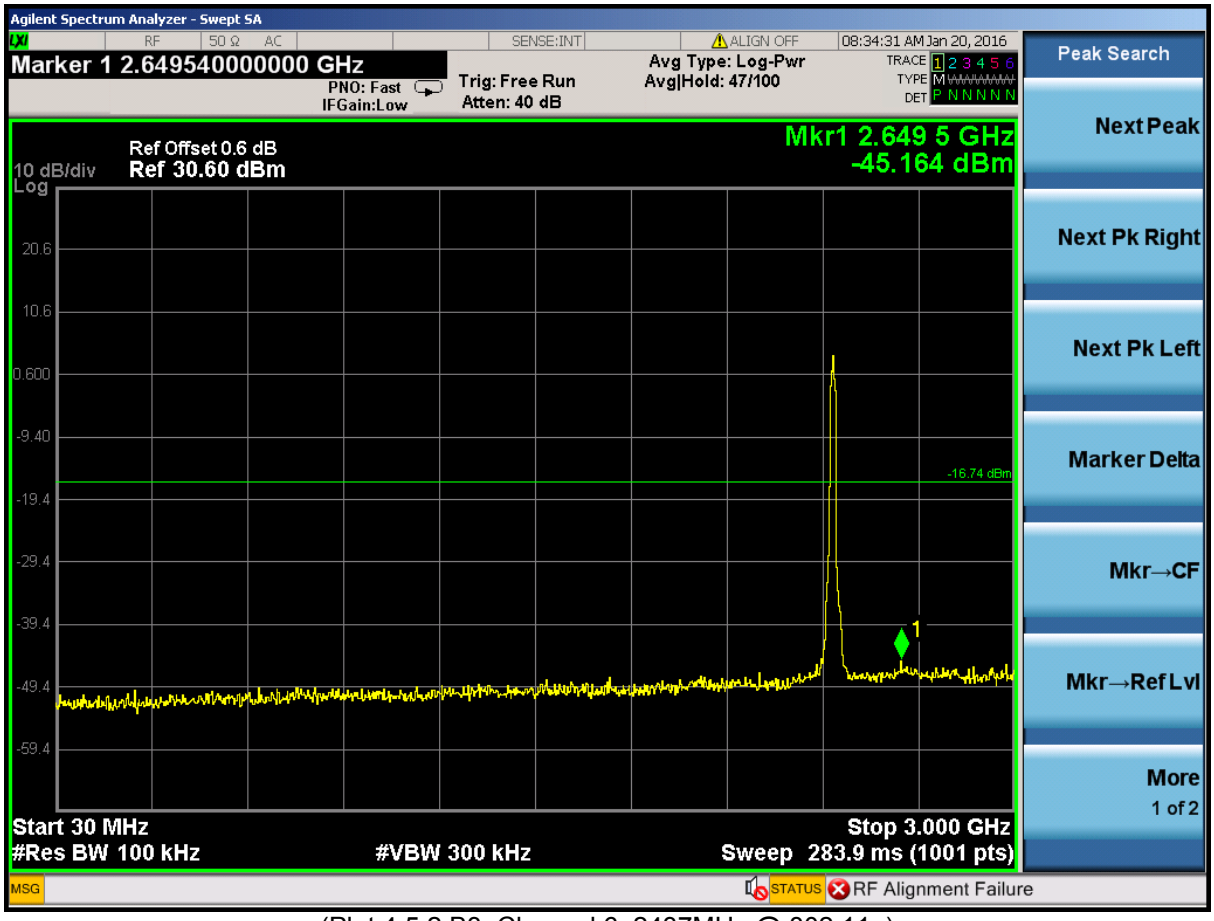



(Plot 4.5.2 A2: Channel 1: 2412MHz @ 802.11g)

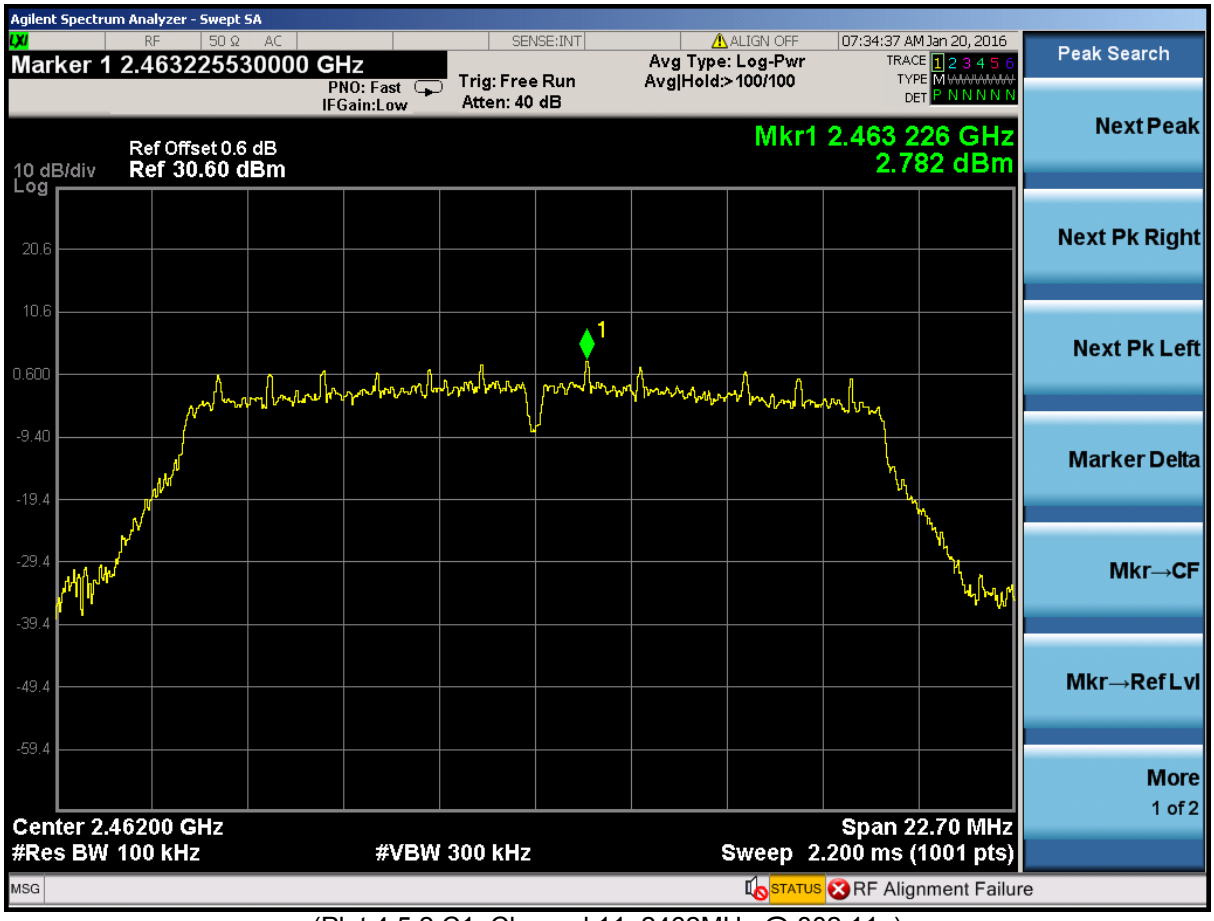

(Plot 4.5.2 A3: Channel 1: 2412MHz @ 802.11g)


(Plot 4.5.2 B1: Channel 6: 2437MHz @ 802.11g)

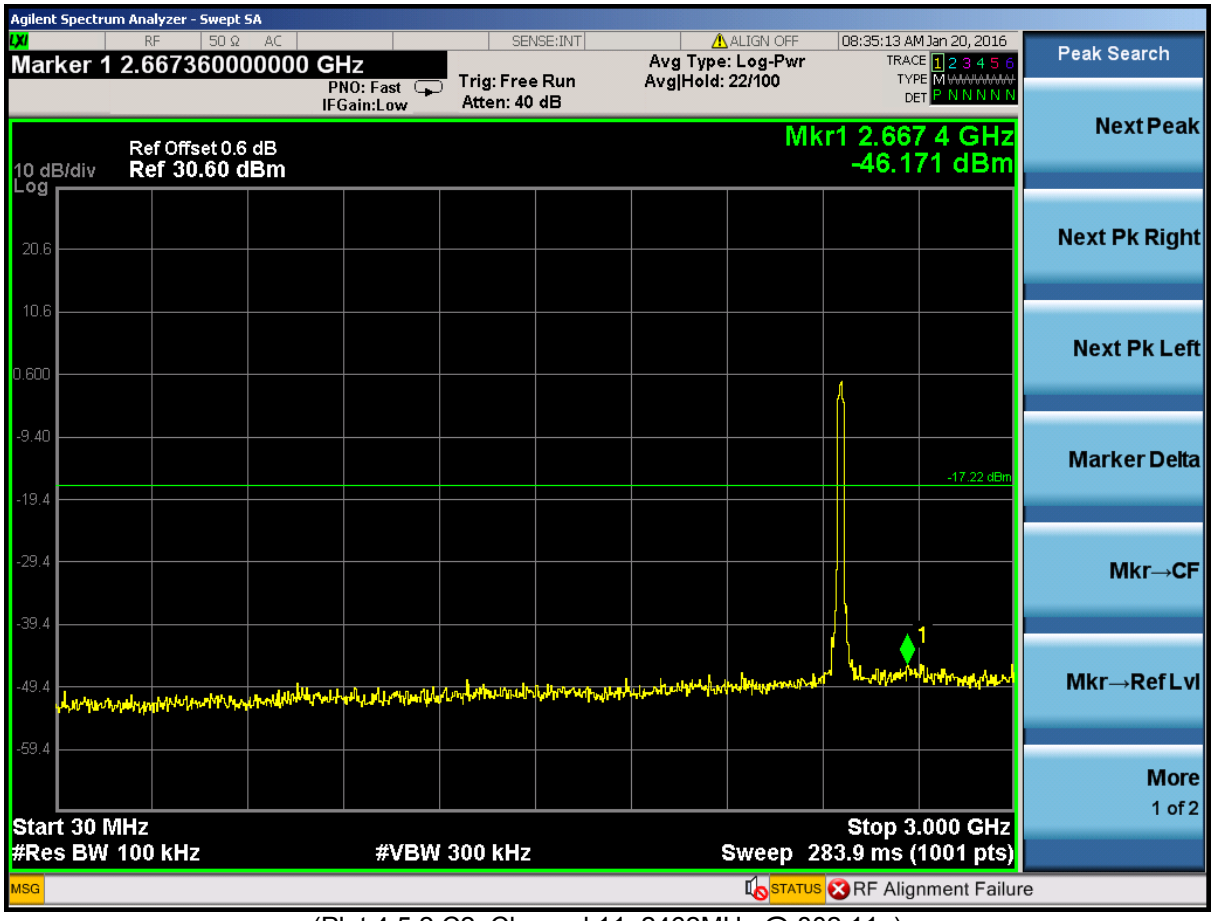

(Plot 4.5.2 B2: Channel 6: 2437MHz @ 802.11g)




(Plot 4.5.2 B3: Channel 6: 2437MHz @ 802.11g)

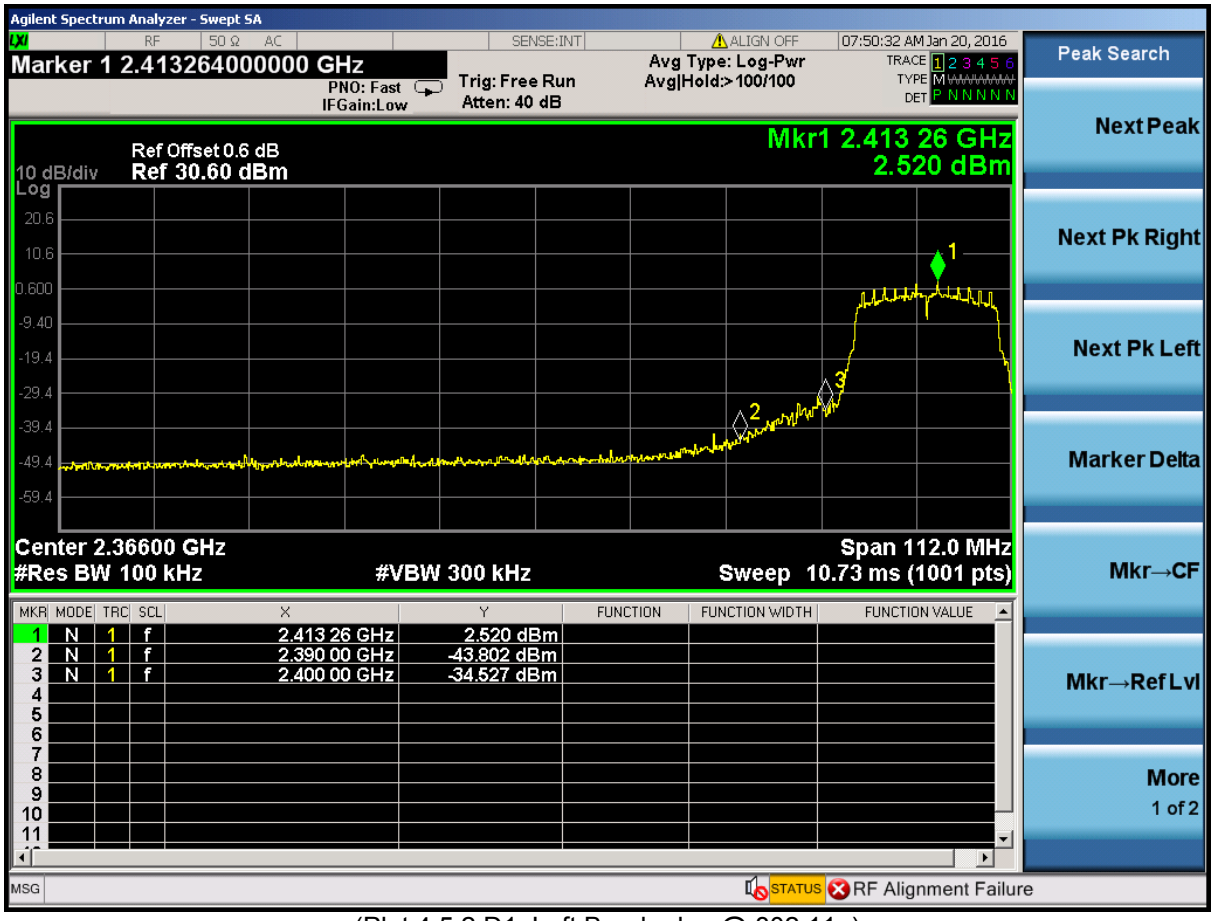



(Plot 4.5.2 C1: Channel 11: 2462MHz @ 802.11g)




(Plot 4.5.2 C2: Channel 11: 2462MHz @ 802.11g)


(Plot 4.5.2 C3: Channel 11: 2462MHz @ 802.11g)




(Plot 4.5.2 D1: Left Band edge @ 802.11g)


(Plot 4.5.2 D2: Right Band edge @ 802.11g)

### 4.5.3 802.11n HT20MHz Test Mode

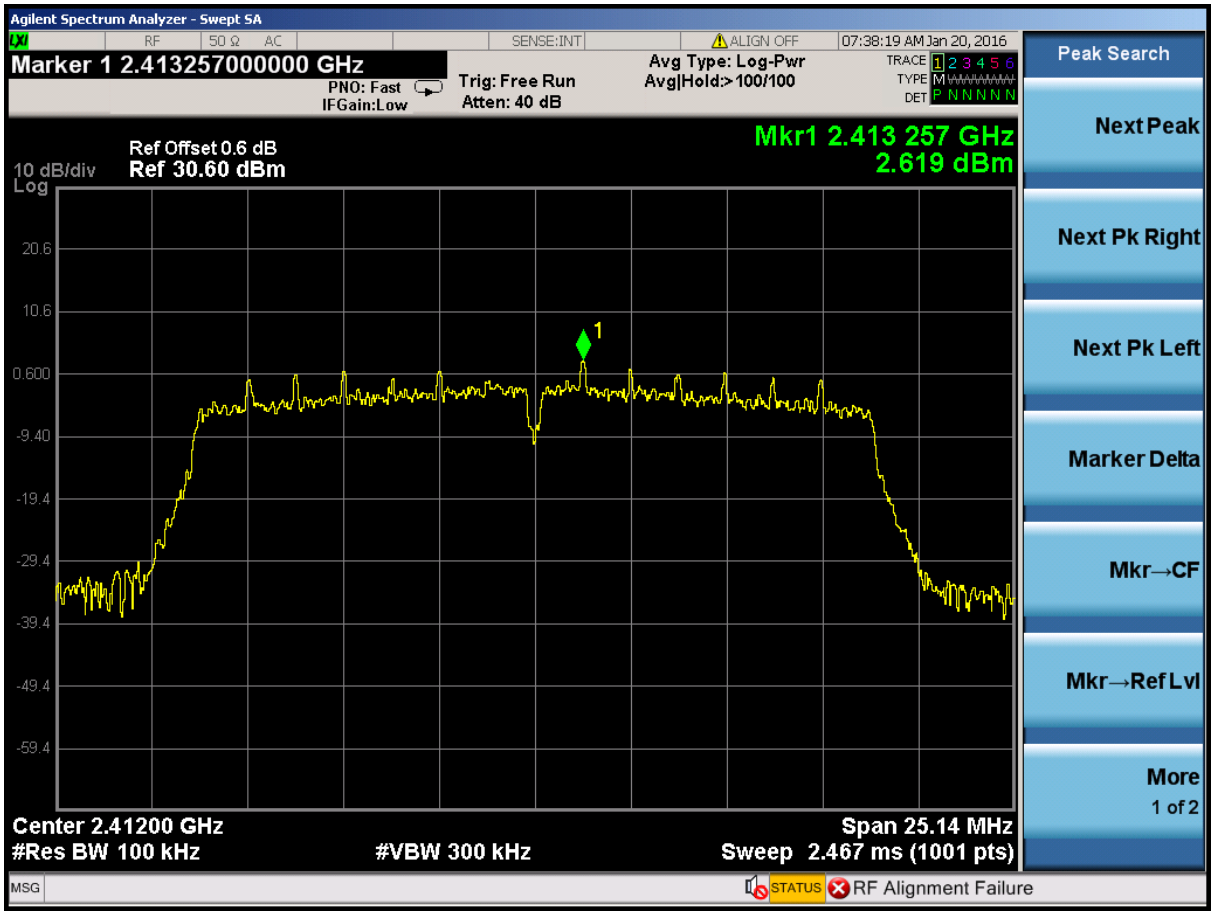
A. Test Verdict

| Channel | Frequency (MHz) | Frequency Range | Refer to Plot | Limit (dBc) | Verdict |
|---|---|---|---|---|---|
| 1 | 2412 | 2.412 GHz | Plot 4.5.3 A1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.3 A2 | -20 | PASS |
| | | 3GHz-.25 GHz | Plot 4.5.3 A3 | -20 | PASS |
| 6 | 2437 | 2.437 GHz | Plot 4.5.3 B1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.3 B2 | -20 | PASS |
| | | 3GHz-25GHz | Plot 4.5.3 B3 | -20 | PASS |
| 11 | 2462 | 2.462 GHz | Plot 4.5.3 C1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.3 C2 | -20 | PASS |
| | | 3GHz-25 GHz | Plot 4.5.3 C3 | -20 | PASS |

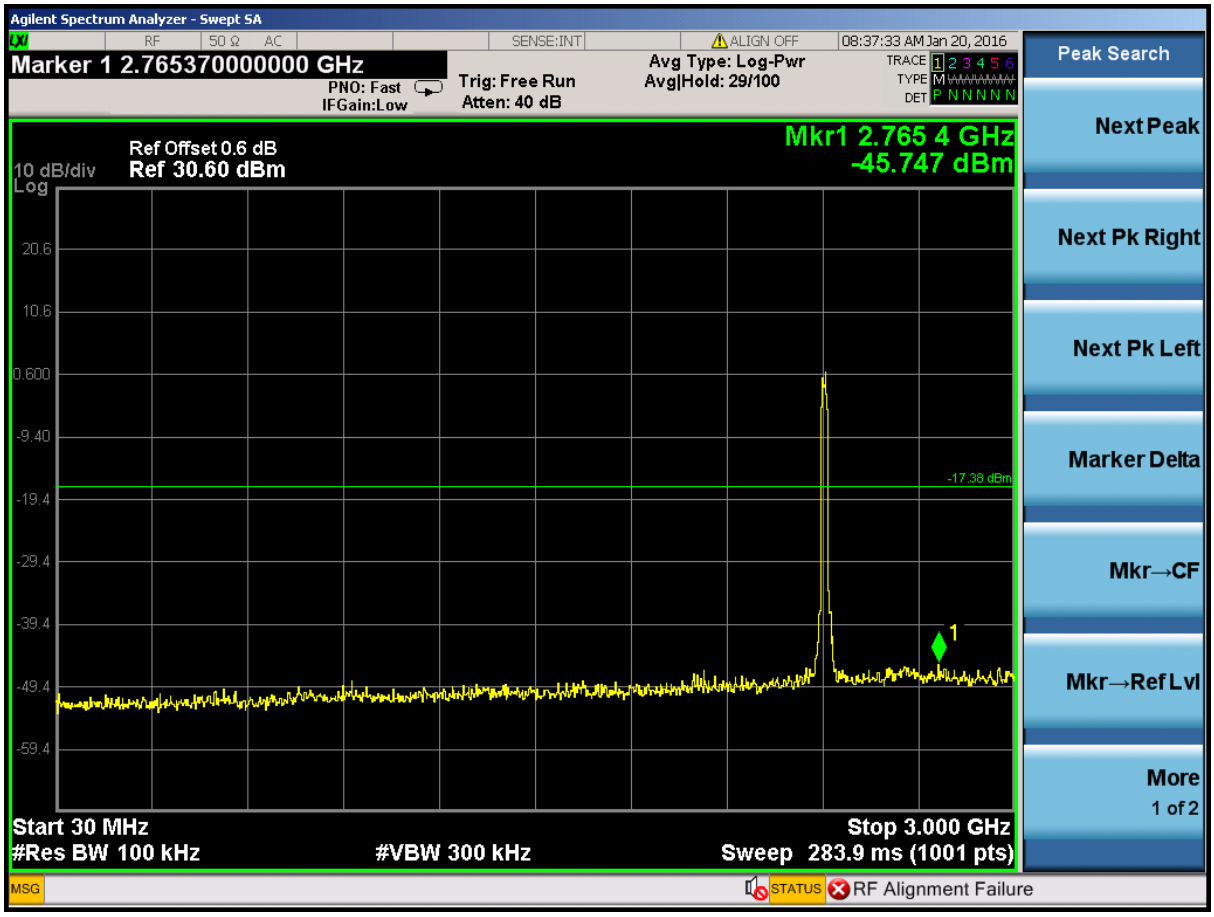
| | | | | |
|---|---|---|---|---|
| Conducted bandedge | Left Band edge | Plot 4.5.3 D1 | -20 | PASS |
| | Right Band edge | Plot 4.5.3 D2 | -20 | PASS |

Note:
1. For 802.11n HT20MHz mode at finial test to get the worst-case emission at 6.5Mbps.
2. The test results including the cable lose.
3. For 9KHz -30MHz,Because there was only background, So We did not recorded data.

B. Test Plots

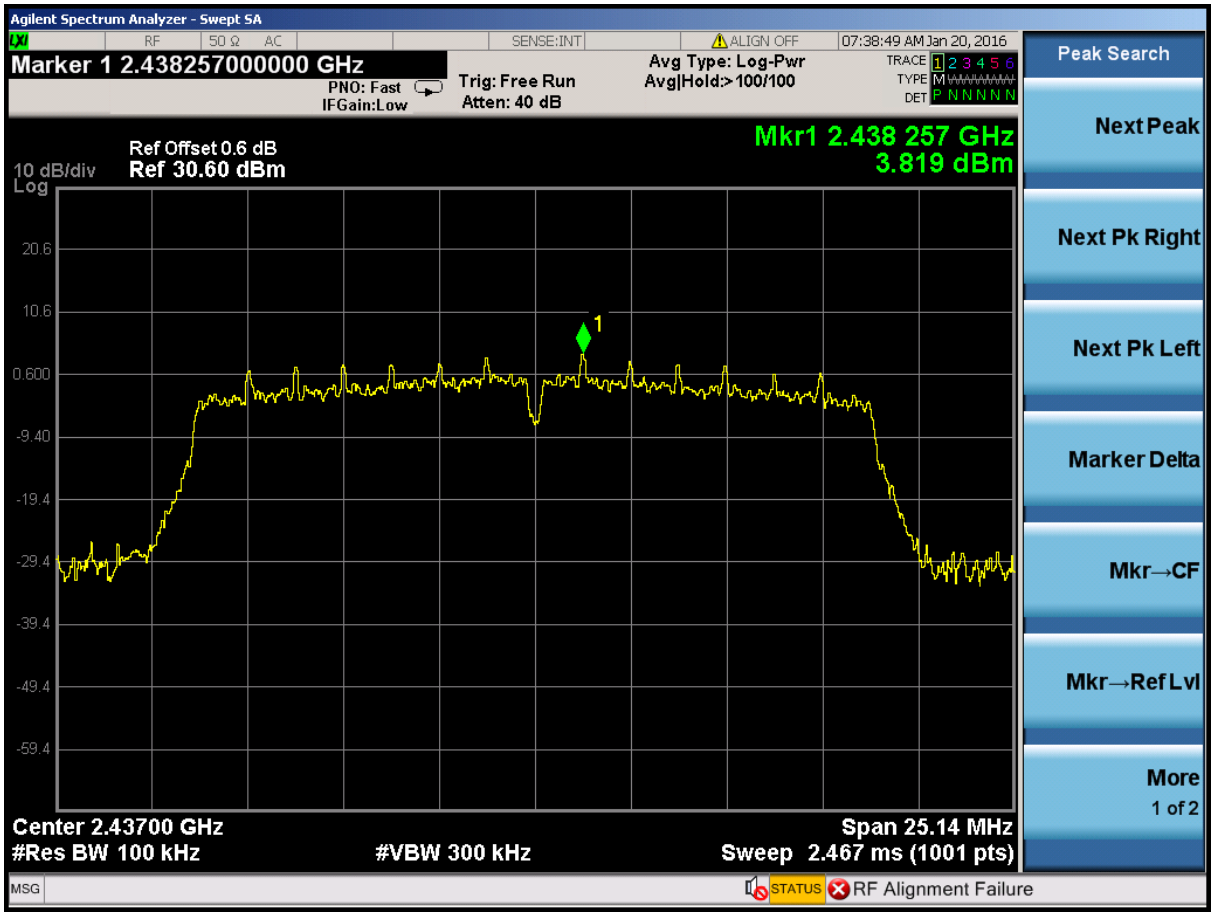



(Plot 4.5.3 A1: Channel 1: 2412MHz @ 802.11n HT20)

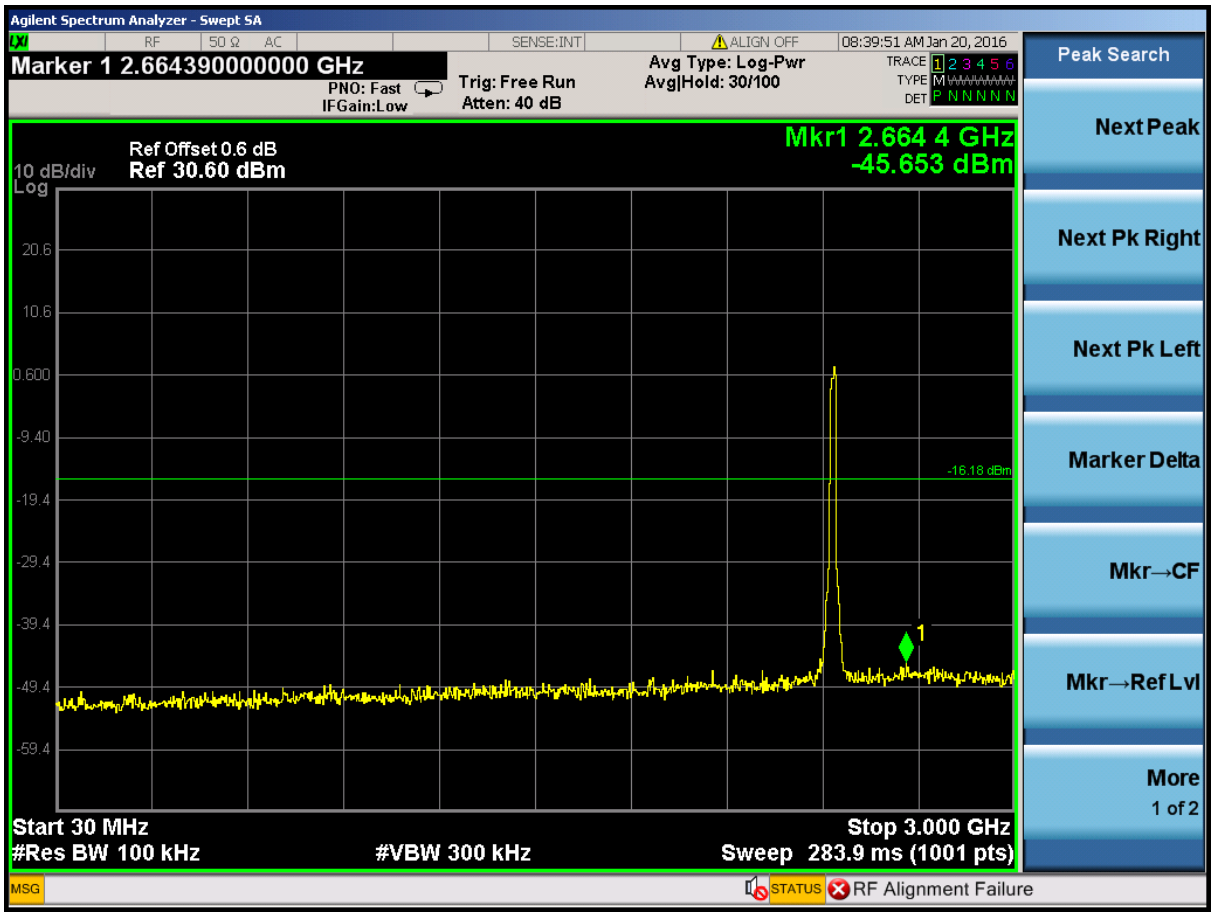



(Plot 4.5.3 A2: Channel 1: 2412MHz @ 802.11n HT20)


(Plot 4.5.3 A3: Channel 1: 2412MHz @ 802.11n HT20)

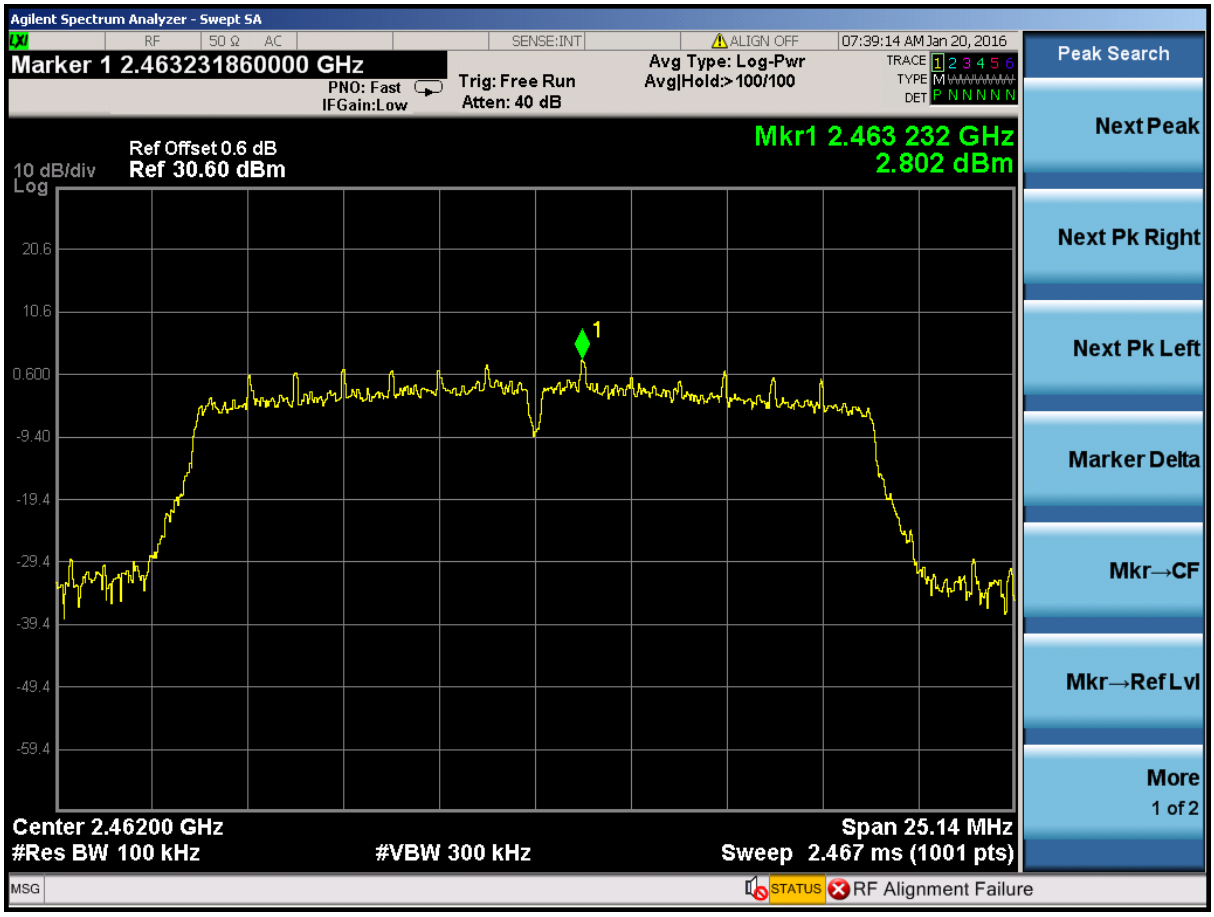



(Plot 4.5.3 B1: Channel 6: 2437MHz @ 802.11n HT20)

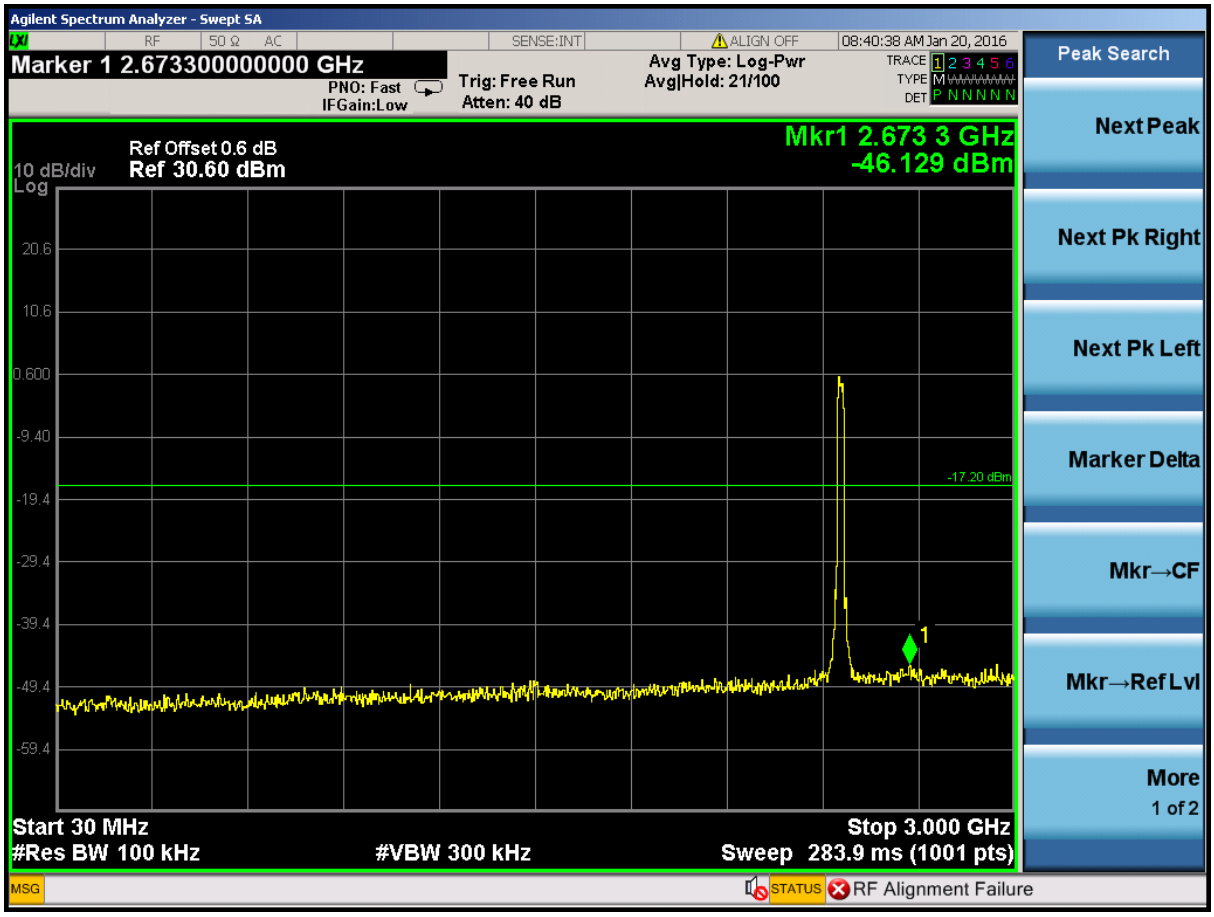



(Plot 4.5.3 B2: Channel 6: 2437MHz @ 802.11n HT20)


(Plot 4.5.3 B3: Channel 6: 2437MHz @ 802.11n HT20)

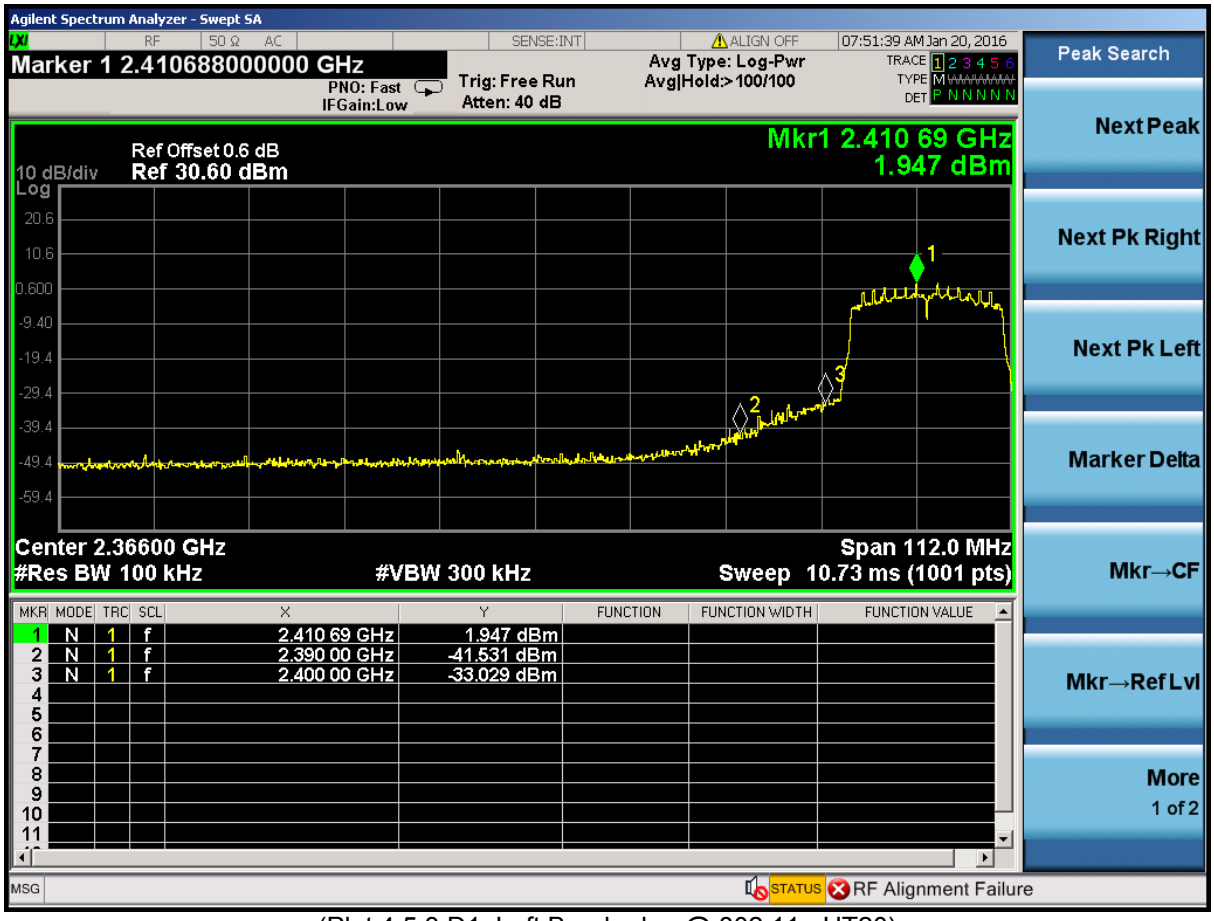



(Plot 4.5.3 C1: Channel 11: 2462MHz @ 802.11n HT20)

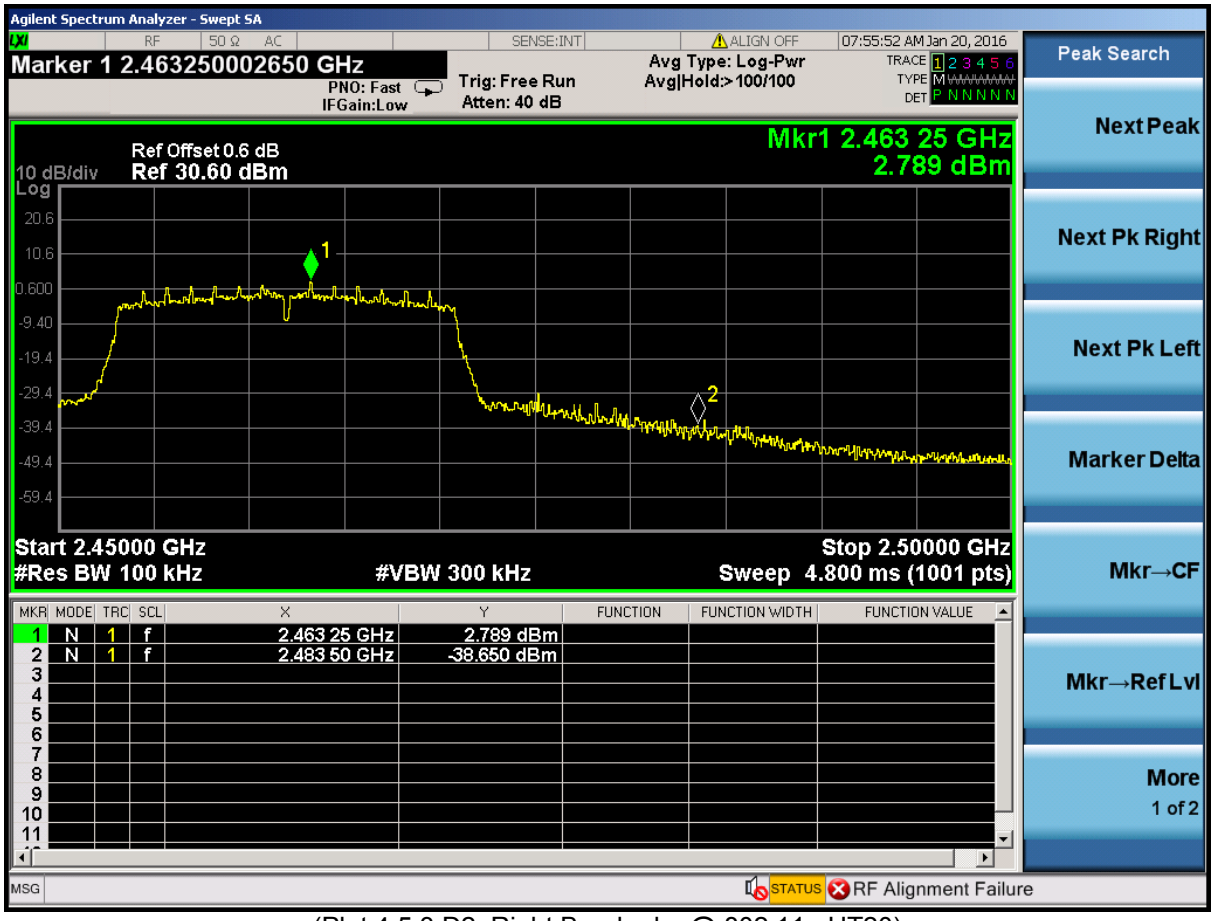



(Plot 4.5.3 C2: Channel 11: 2462MHz @ 802.11n HT20)


(Plot 4.5.3 C3: Channel 11: 2462MHz @ 802.11n HT20)




(Plot 4.5.3 D1: Left Band edge @ 802.11n HT20)




(Plot 4.5.3 D2: Right Band edge@ 802.11n HT20)

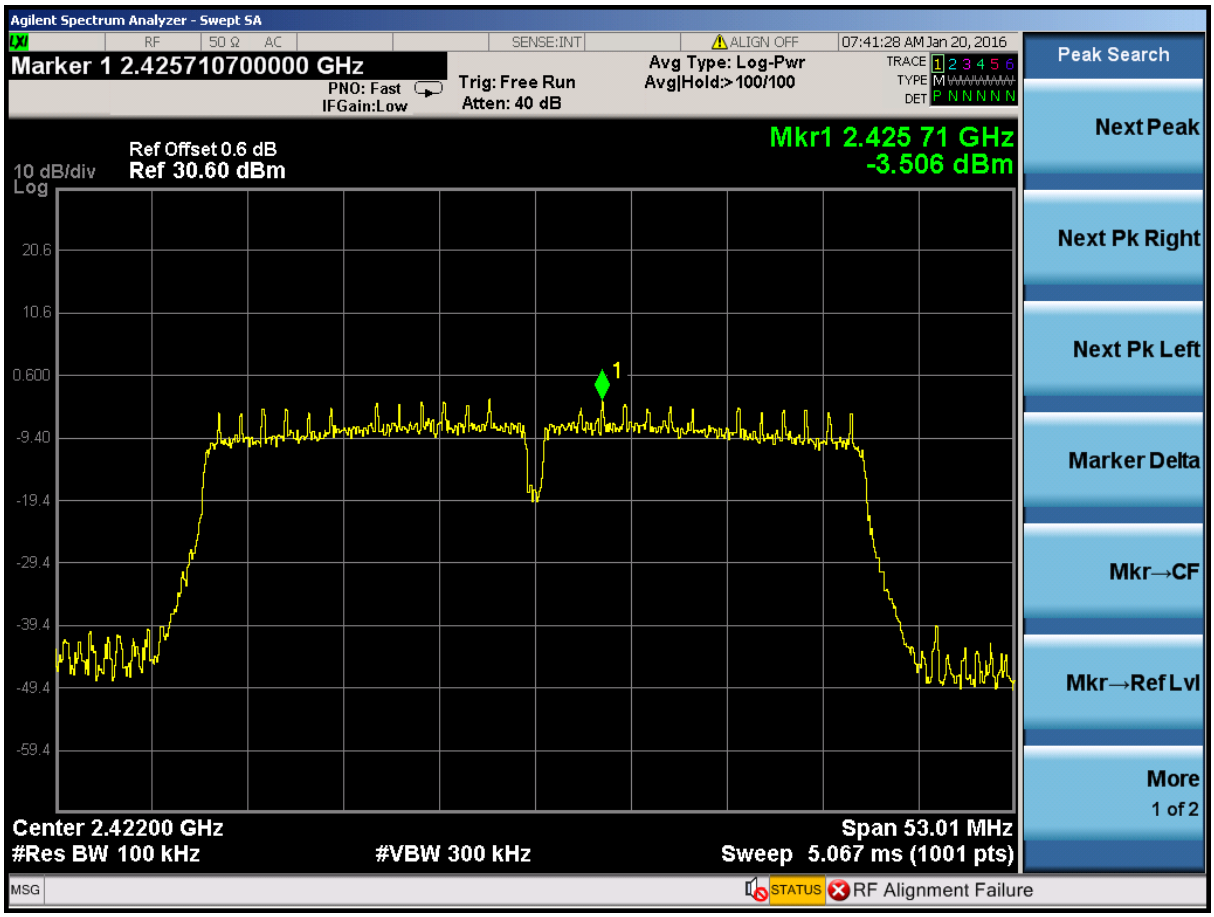
## 4.5.4 802.11n HT40MHz Test Mode

A. Test Verdict

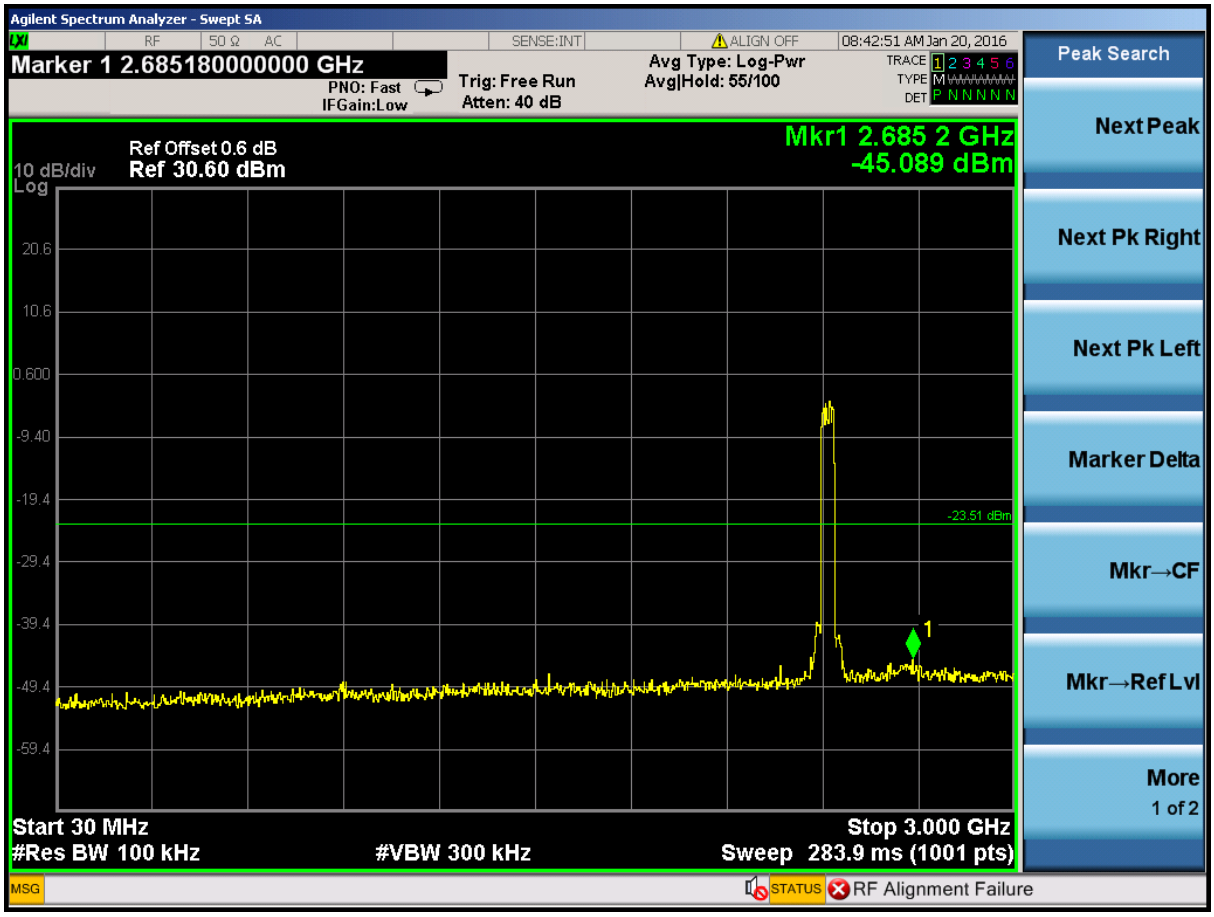
| Channel | Frequency (MHz) | Frequency Range | Refer to Plot | Limit (dBc) | Verdict |
|---|---|---|---|---|---|
| 3 | 2422 | 2.422 GHz | Plot 4.5.4 A1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.4 A2 | -20 | PASS |
| | | 3GHz-.25 GHz | Plot 4.5.4 A3 | -20 | PASS |
| 6 | 2437 | 2.437 GHz | Plot 4.5.4 B1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.4 B2 | -20 | PASS |
| | | 3GHz-25GHz | Plot 4.5.4 B3 | -20 | PASS |
| 9 | 2452 | 2.452 GHz | Plot 4.5.4 C1 | --- | PASS |
| | | 30MHz -3GHz | Plot 4.5.4 C2 | -20 | PASS |
| | | 3GHz-25 GHz | Plot 4.5.4 C3 | -20 | PASS |

Note:
1. For 802.11n HT40MHz mode at finial test to get the worst-case emission at 13.5Mbps.
2. The test results including the cable lose.
3. For 9KHz -30MHz,Because there was only background, So We did not recorded data.

B. Test Plots

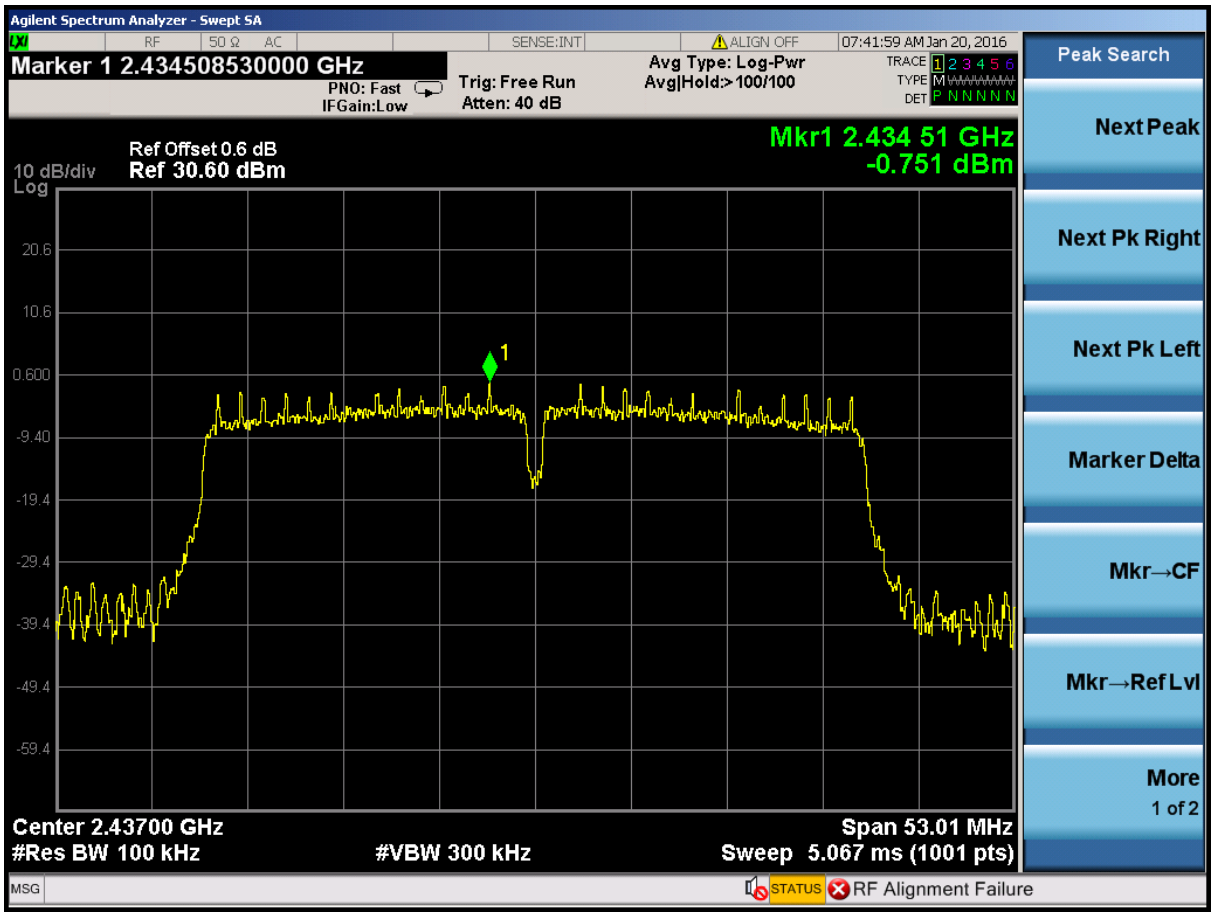



(Plot 4.5.4 A1: Channel 3: 2422MHz @ 802.11n HT40)

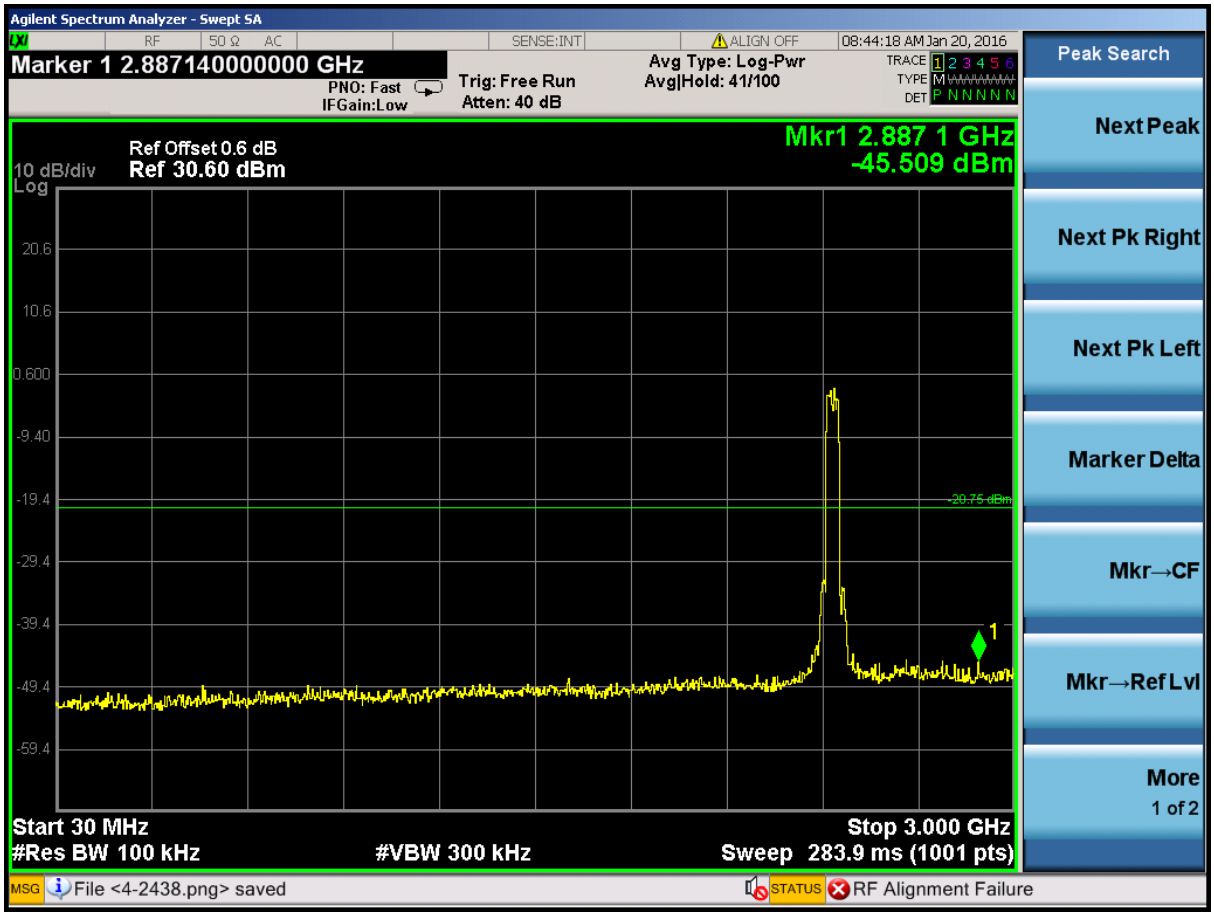



(Plot 4.5.4 A2: Channel 3: 2422MHz @ 802.11n HT40)


(Plot 4.5.4 A3: Channel 3: 2422MHz @ 802.11n HT40)

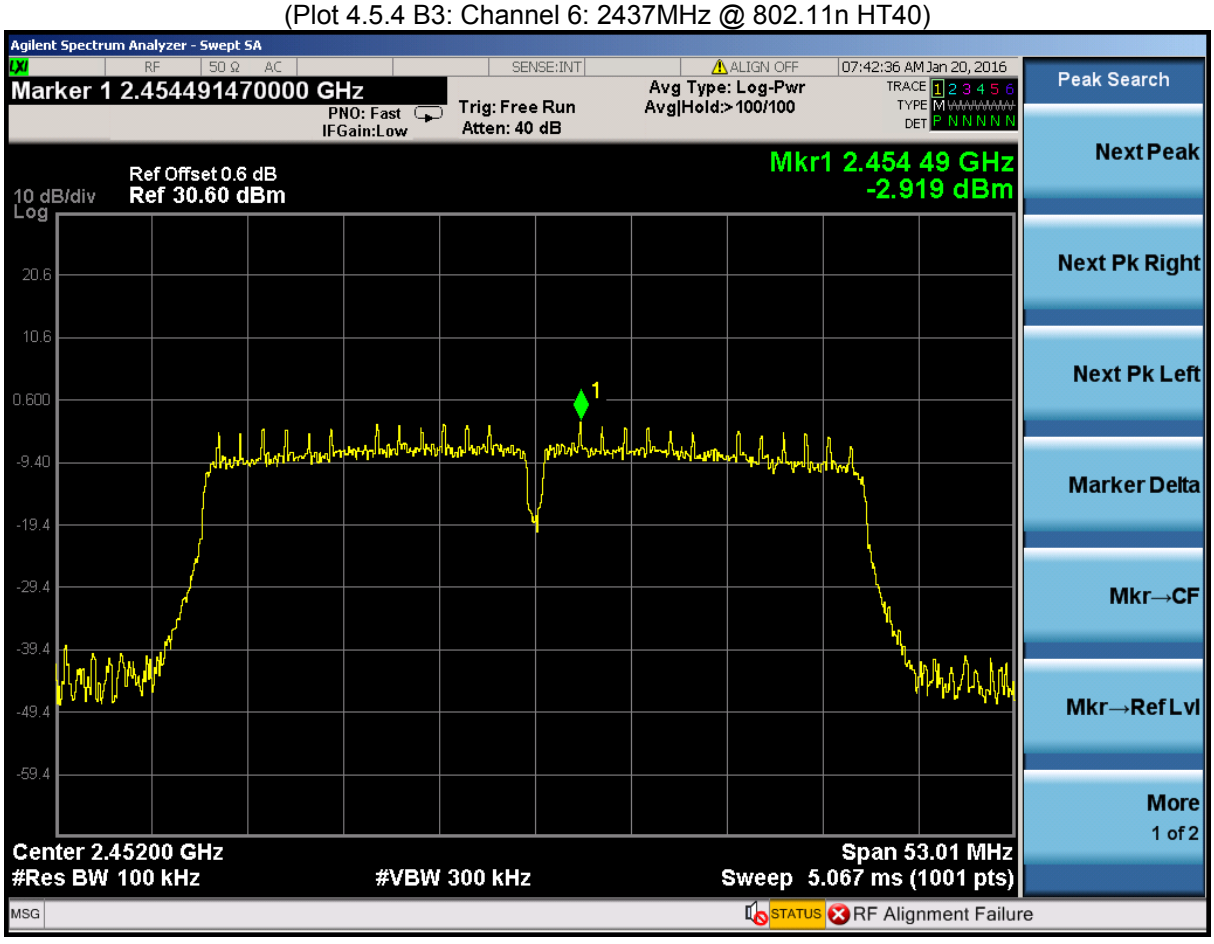



(Plot 4.5.4 B1: Channel 6: 2437MHz @ 802.11n HT40)

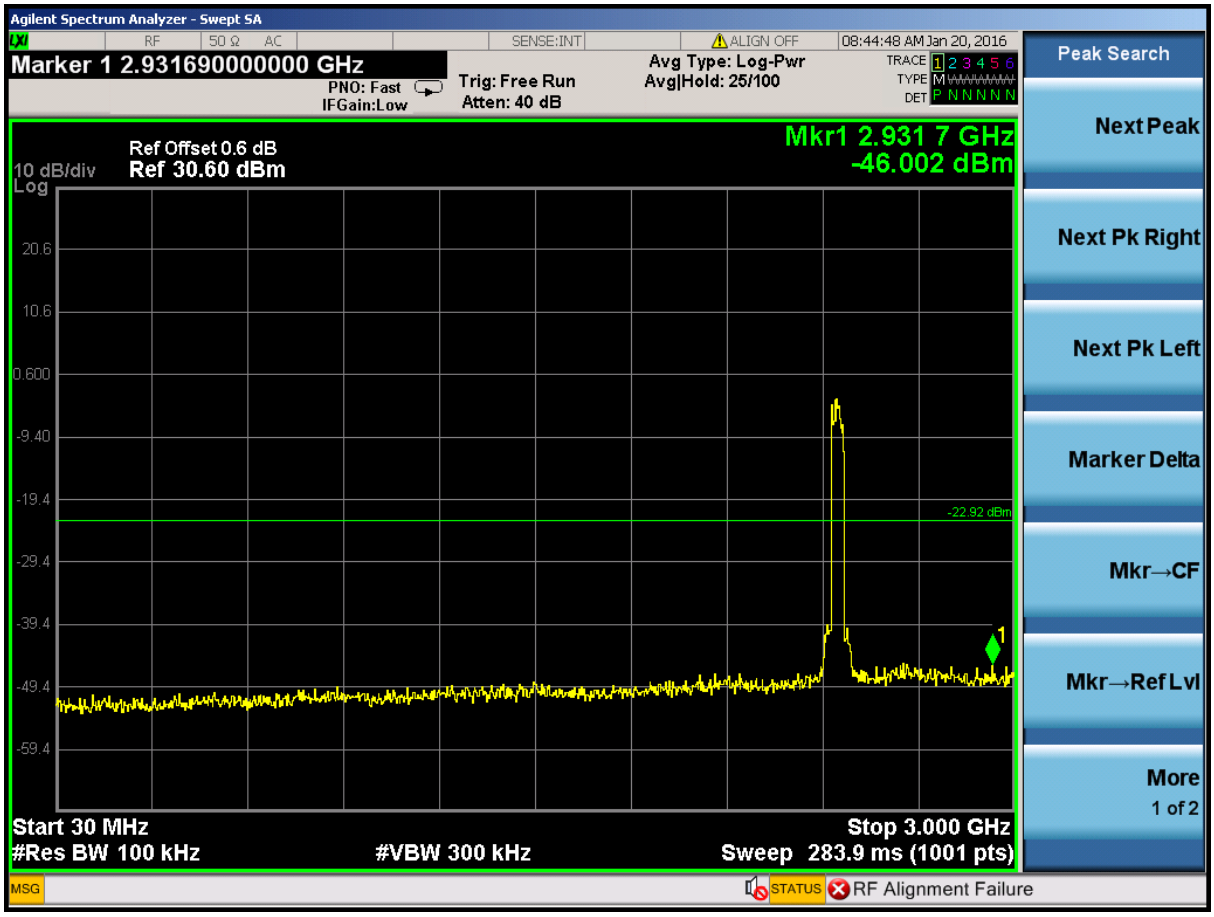


(Plot 4.5.4 B2: Channel 6: 2437MHz @ 802.11n HT40)


(Plot 4.5.4 B3: Channel 6: 2437MHz @ 802.11n HT40)

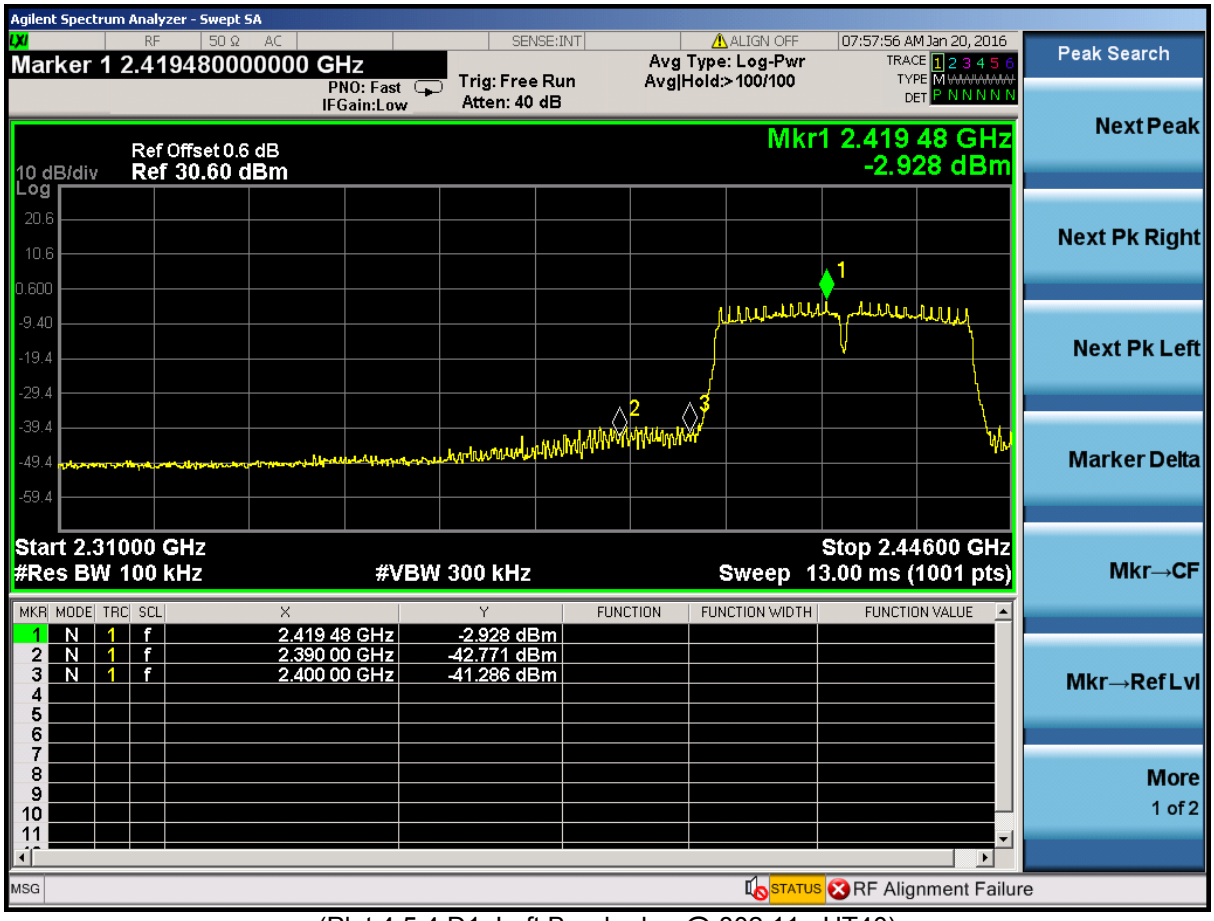



(Plot 4.5.4 C1: Channel 9 : 2452MHz @ 802.11n HT40)

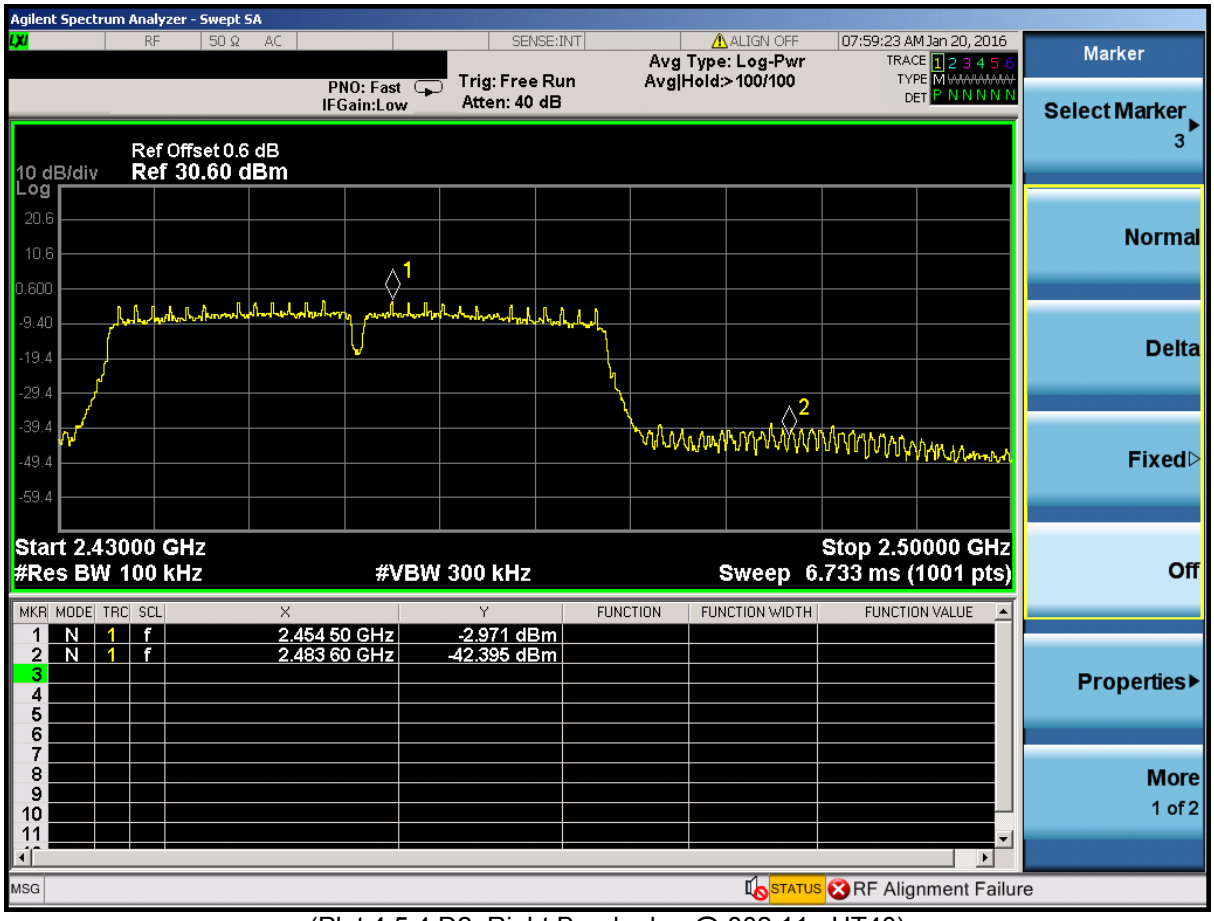



(Plot 4.5.4 C2: Channel 9: 2452MHz @ 802.11n HT40)


(Plot 4.5.4 C3: Channel 9: 2452MHz @ 802.11n HT40)



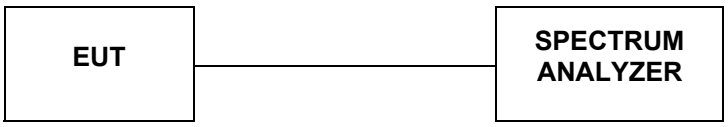

(Plot 4.5.4 D1: Left Band edge @ 802.11n HT40)




(Plot 4.5.4 D2: Right Band edge @ 802.11n HT40)

## 4.6 6dB Bandwidth

**TEST CONFIGURATION**




**TEST PROCEDURE**

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz.
The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.
According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

**LIMIT**

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

**TEST RESULTS**

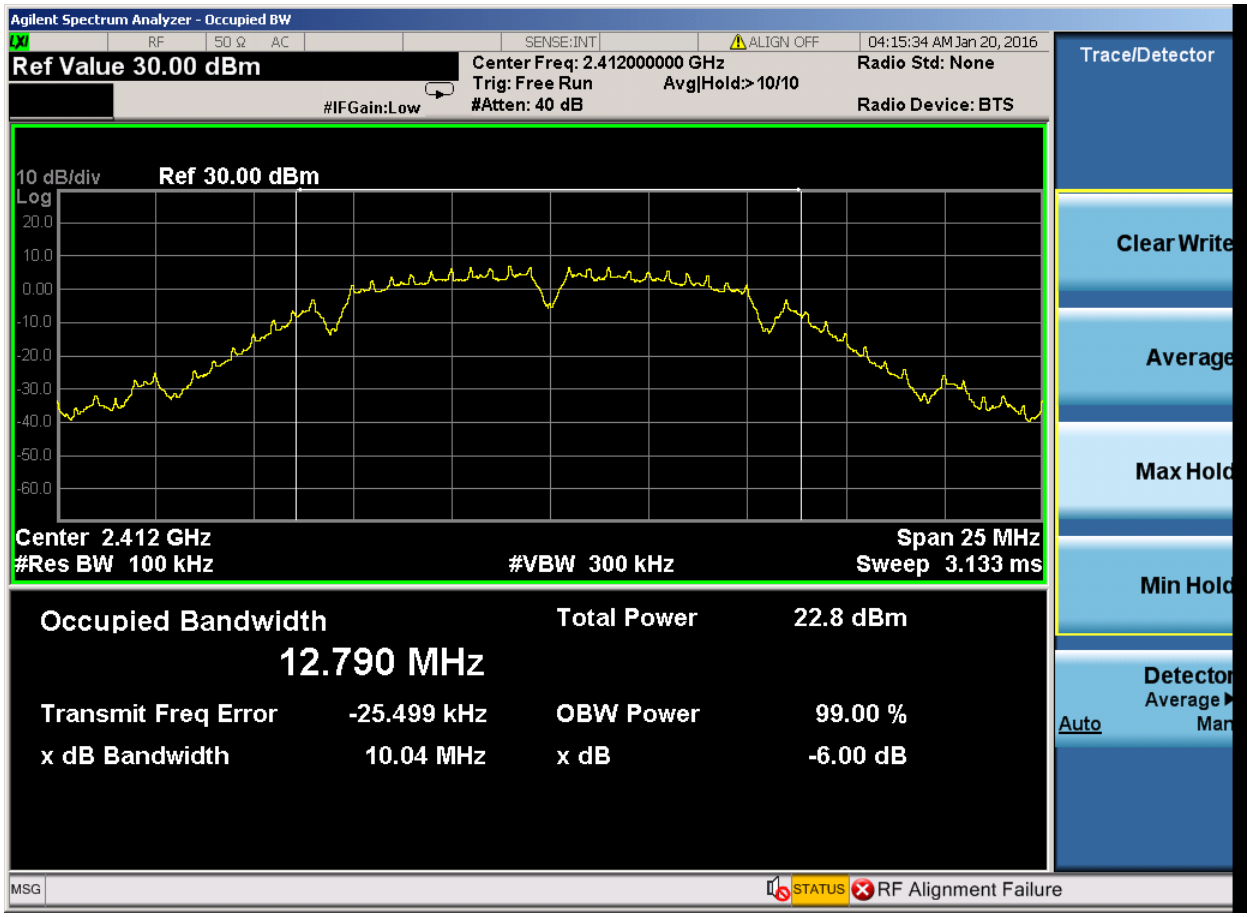
### 4.6.1 801.11b Test Mode

A. Test Verdict

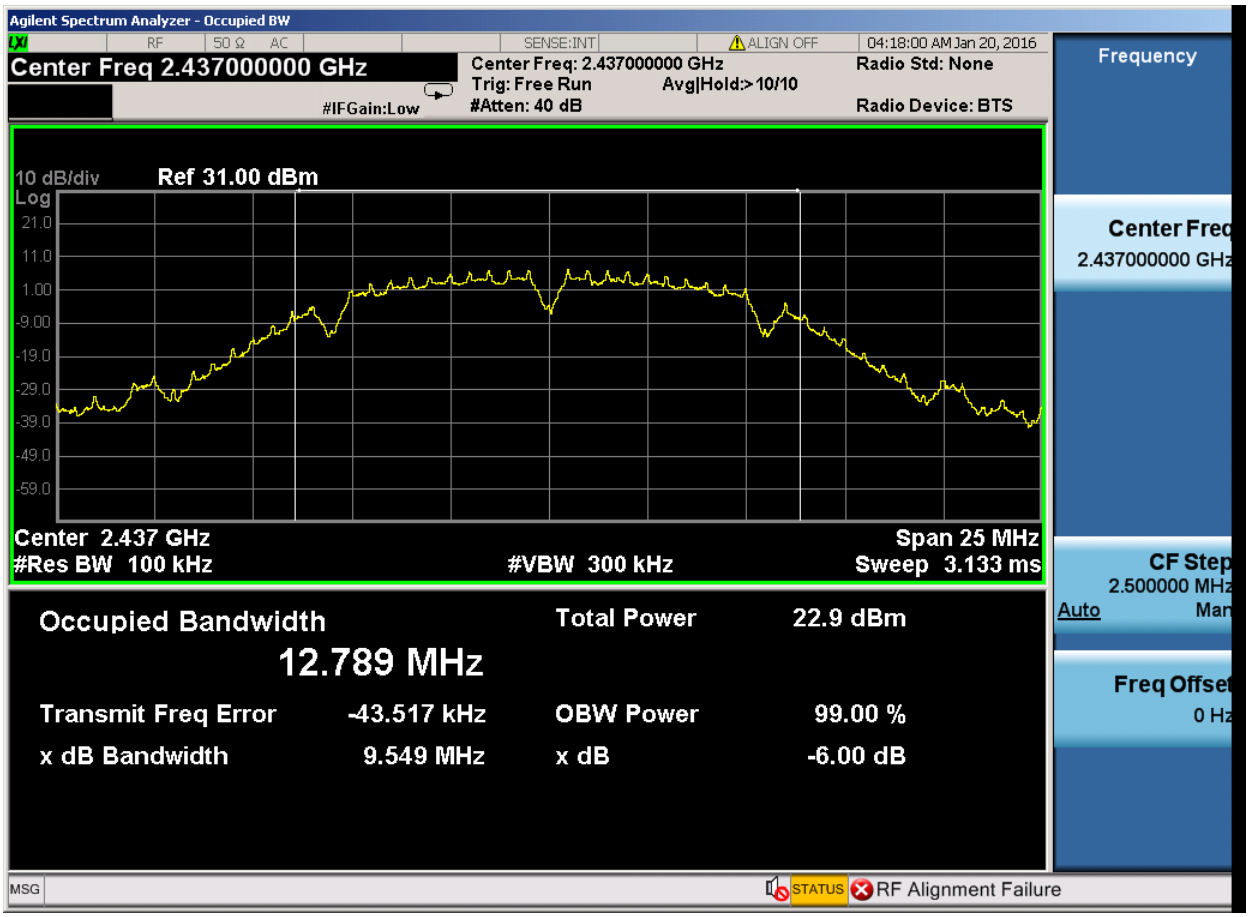
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Refer to Plot | Limits (kHz) | Verdict |
|---|---|---|---|---|---|
| 1 | 2412 | 10.04 | Plot 4.6.1 A | ≥500 | PASS |
| 6 | 2437 | 9.549 | Plot 4.6.1 B | ≥500 | PASS |
| 11 | 2462 | 10.04 | Plot 4.6.1 C | ≥500 | PASS |

Note:
1. For 802.11b mode at finial test to get the worst-case emission at 1Mbps.
2.The test results including the cable lose.

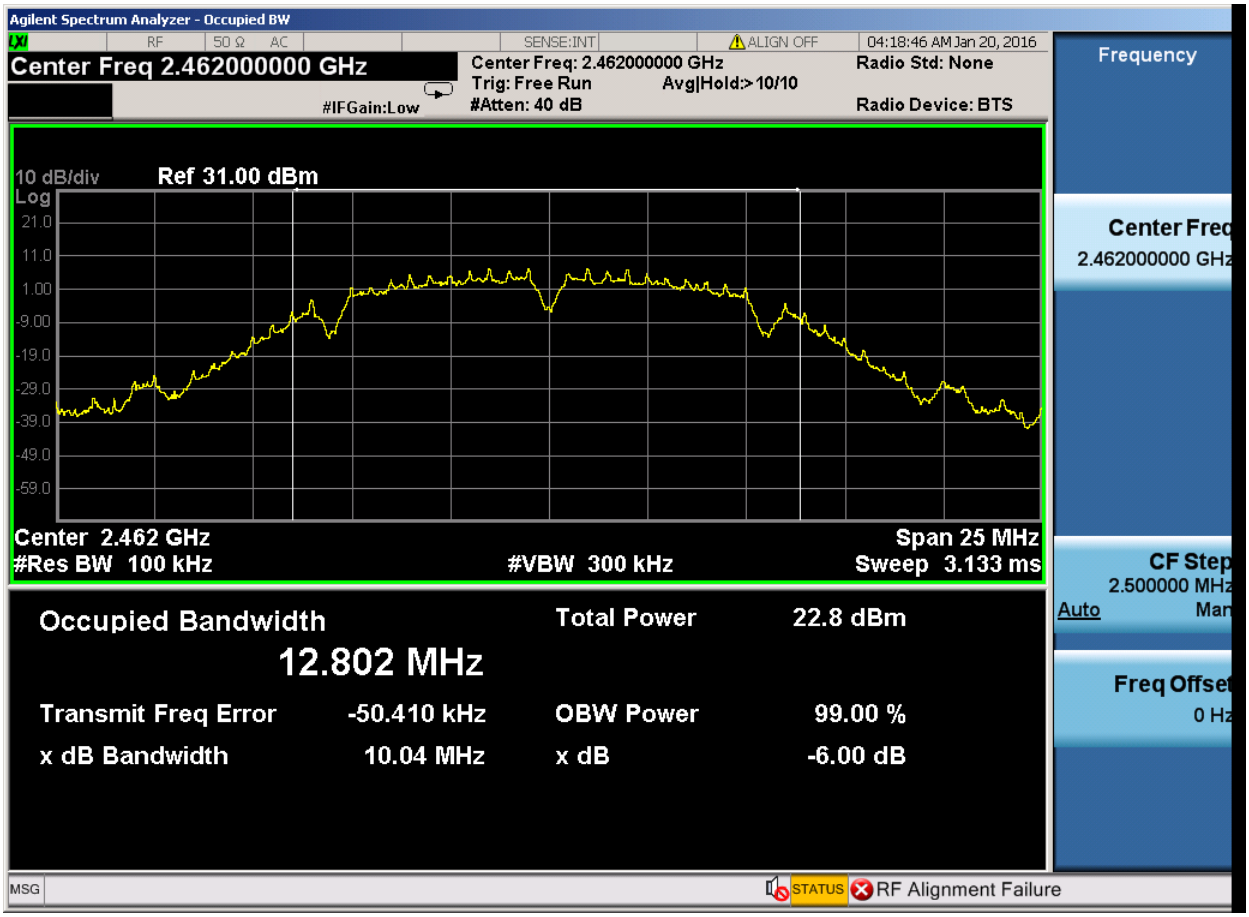
B. Test Plots




(Plot 4.6.1 A: Channel 1: 2412MHz @ 802.11b)




(Plot 4.6.1 B: Channel 6: 2437MHz @ 802.11b)




(Plot 4.6.1 C: Channel 11: 2462MHz @ 802.11b)

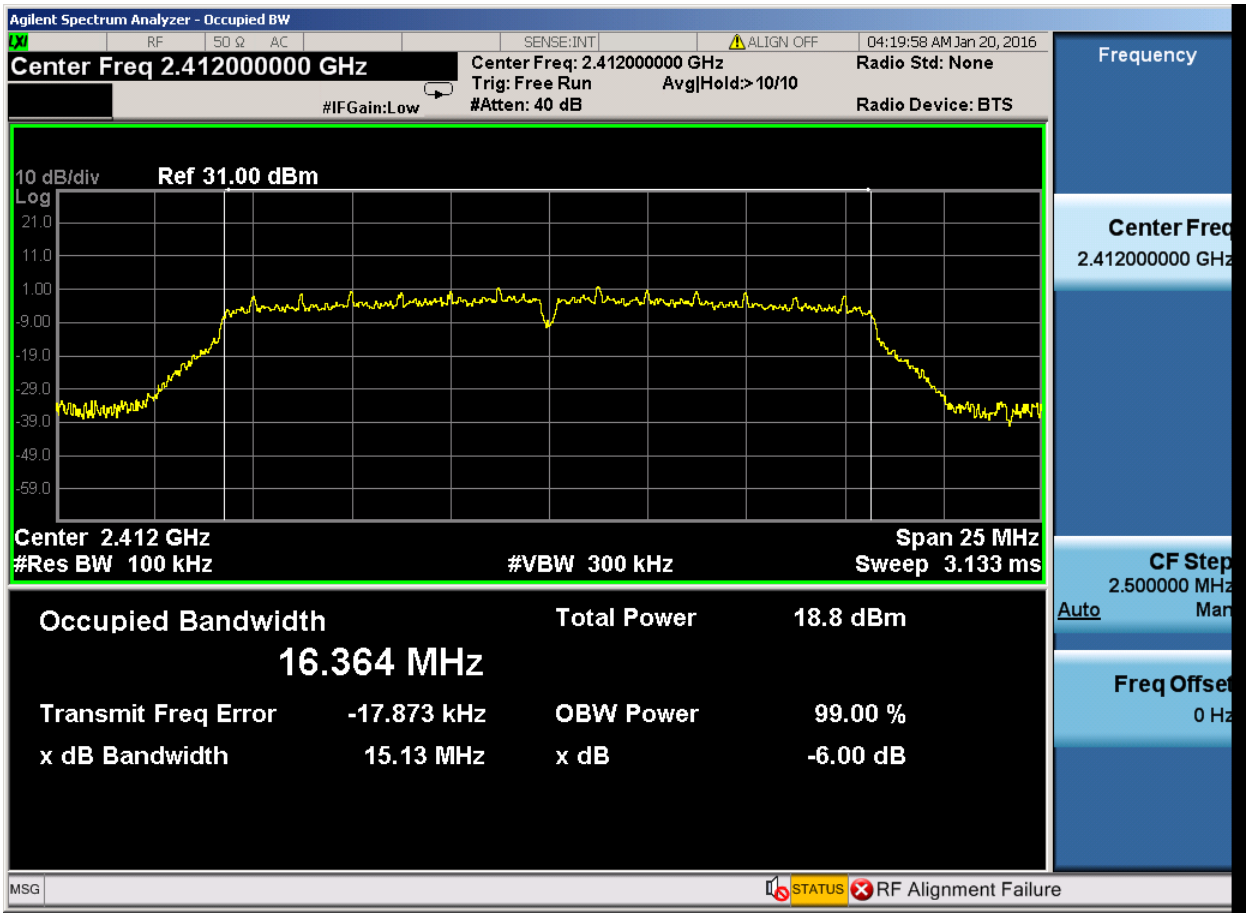
## 4.6.2 801.11g Test Mode

A. Test Verdict

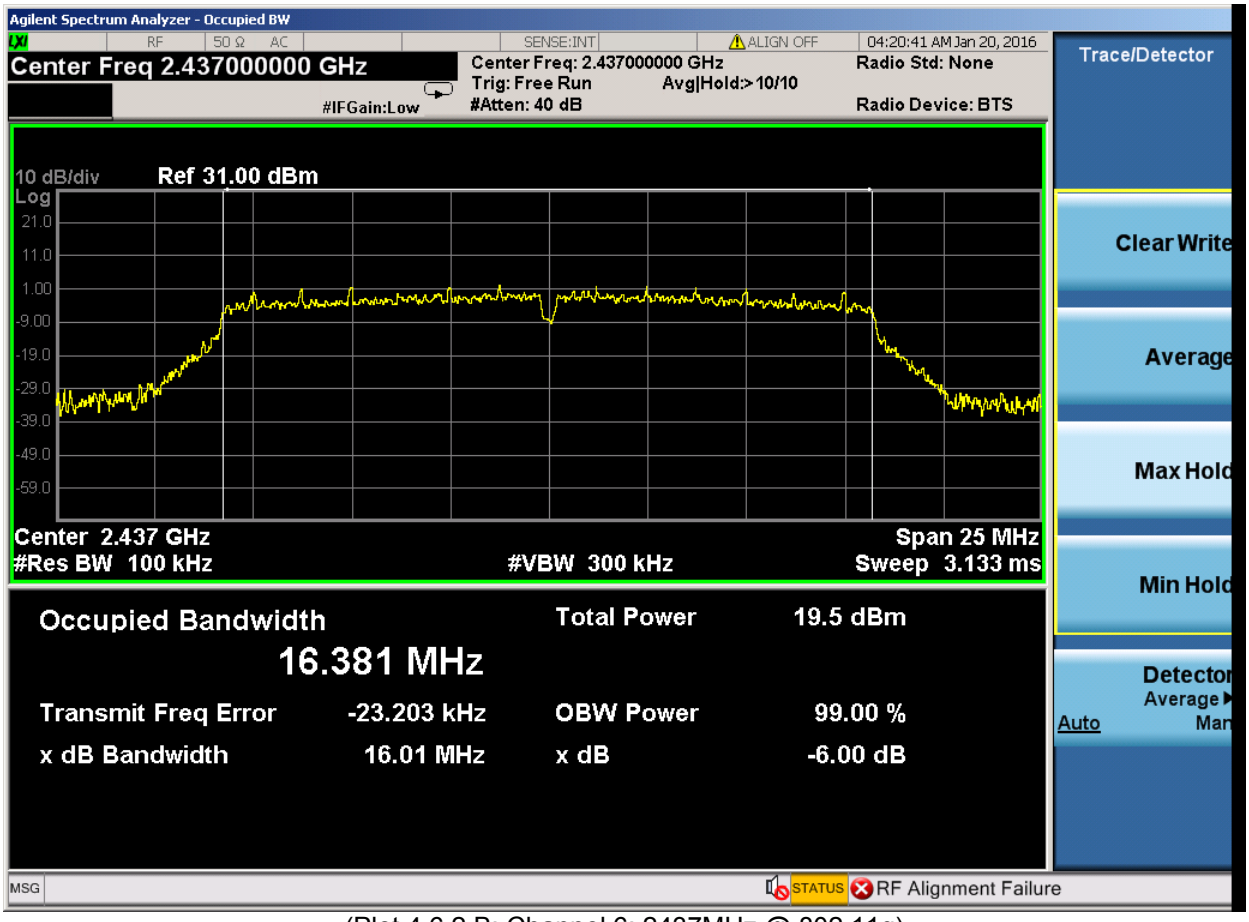
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Refer to Plot | Limits (kHz) | Verdict |
|---|---|---|---|---|---|
| 1 | 2412 | 15.13 | Plot 4.6.2 A | ≥500 | PASS |
| 6 | 2437 | 16.01 | Plot 4.6.2 B | ≥500 | PASS |
| 11 | 2462 | 15.44 | Plot 4.6.2 C | ≥500 | PASS |

Note:
1. For 802.11g mode at finial test to get the worst-case emission at 6Mbps.
2.The test results including the cable lose.

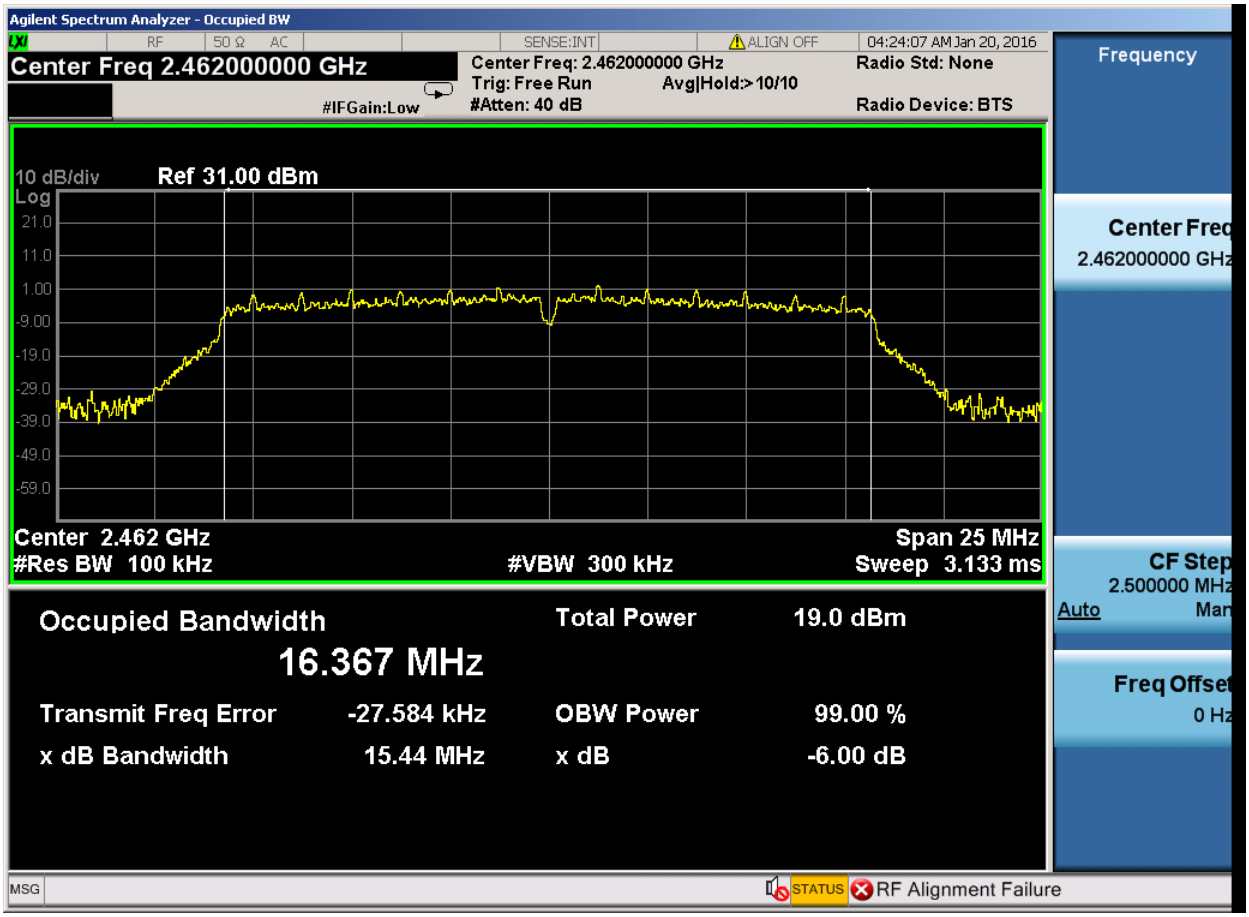
B. Test Plots




(Plot 4.6.2 A: Channel 1: 2412MHz @ 802.11g)




(Plot 4.6.2 B: Channel 6: 2437MHz @ 802.11g)




(Plot 4.6.2 C: Channel 11: 2462MHz @ 802.11g)

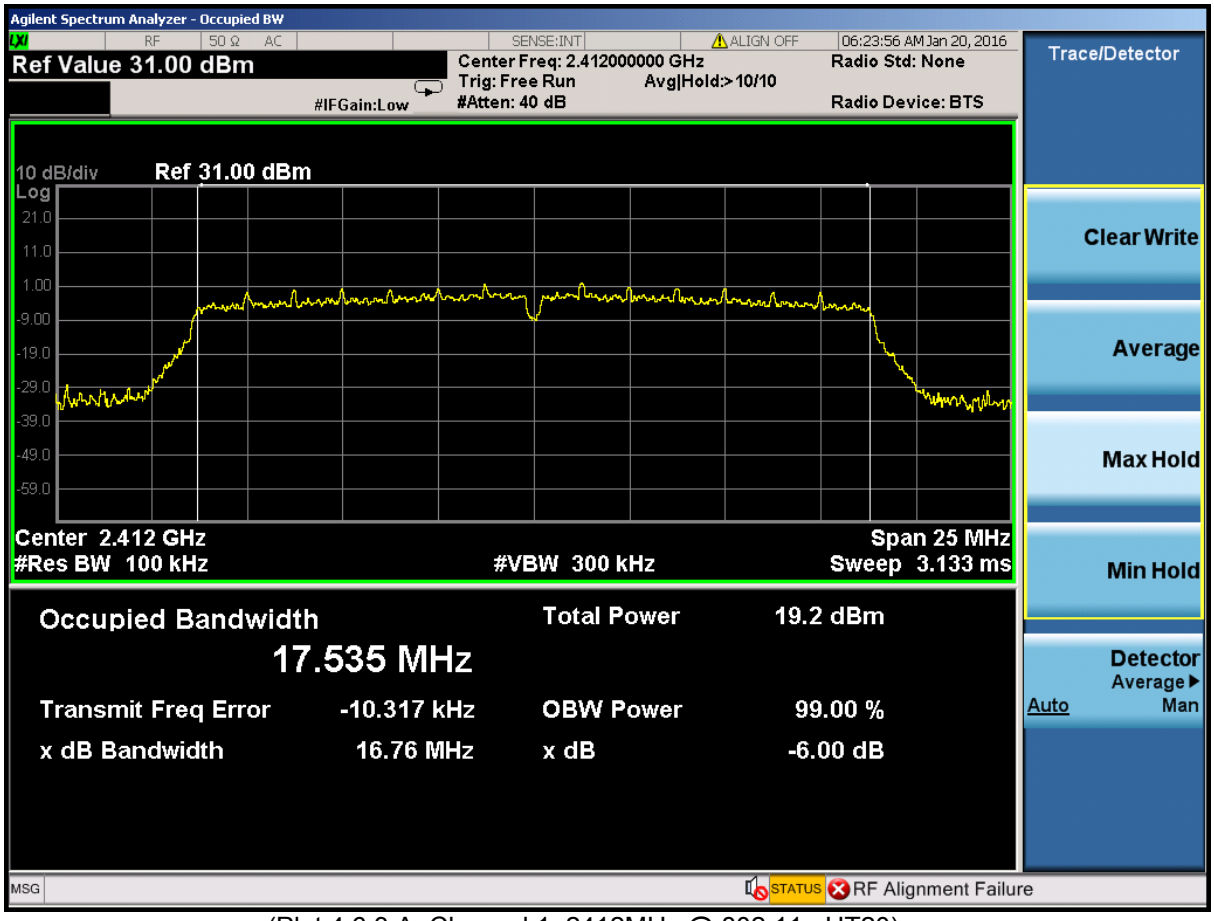
### 4.6.3 801.11n HT20 Test Mode

A. Test Verdict

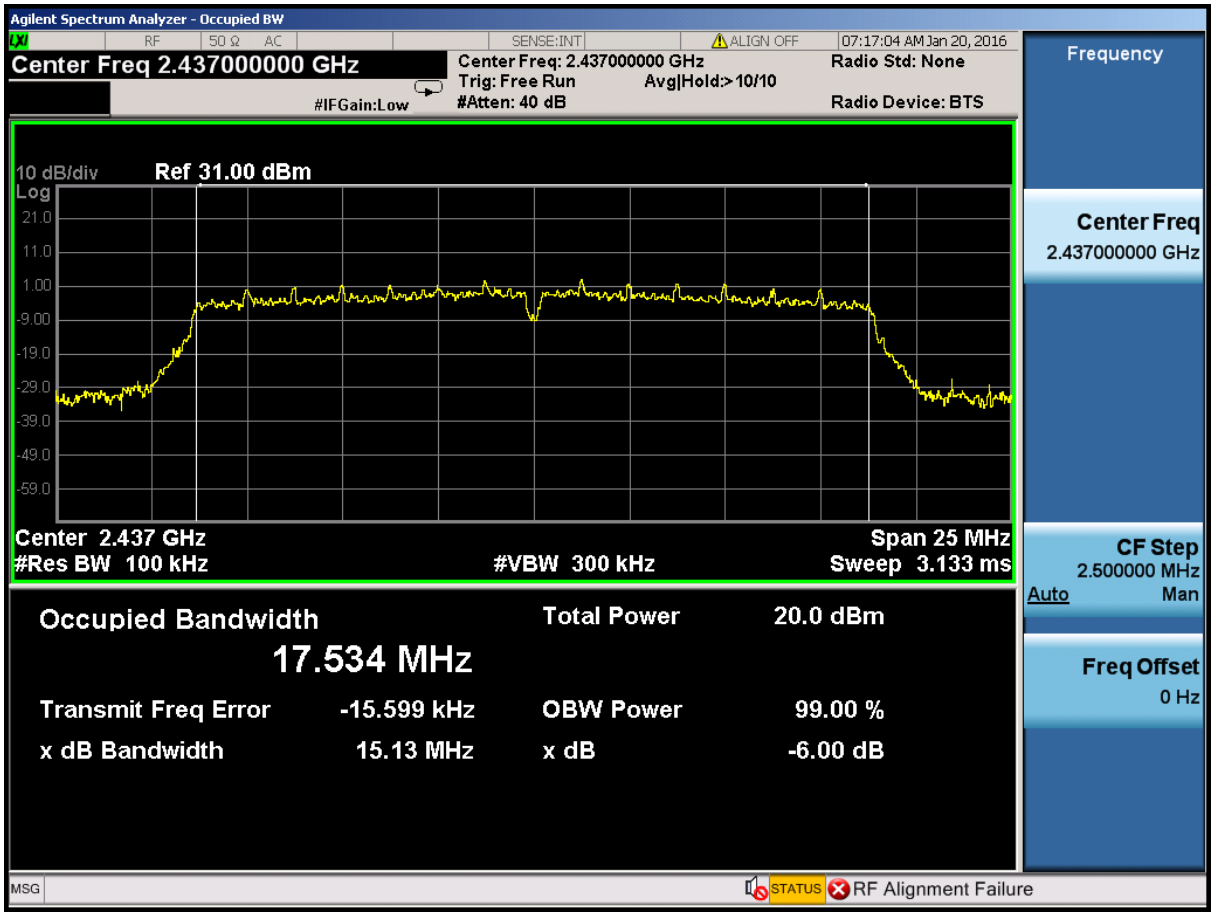
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Refer to Plot | Limits (kHz) | Verdict |
|---|---|---|---|---|---|
| 1 | 2412 | 16.76 | Plot 4.6.3 A | ≥500 | PASS |
| 6 | 2437 | 15.13 | Plot 4.6.3 B | ≥500 | PASS |
| 11 | 2462 | 15.46 | Plot 4.6.3 C | ≥500 | PASS |

Note:
1. For 802.11n HT20 mode at finial test to get the worst-case emission at 6.5Mbps.
2.The test results including the cable lose.

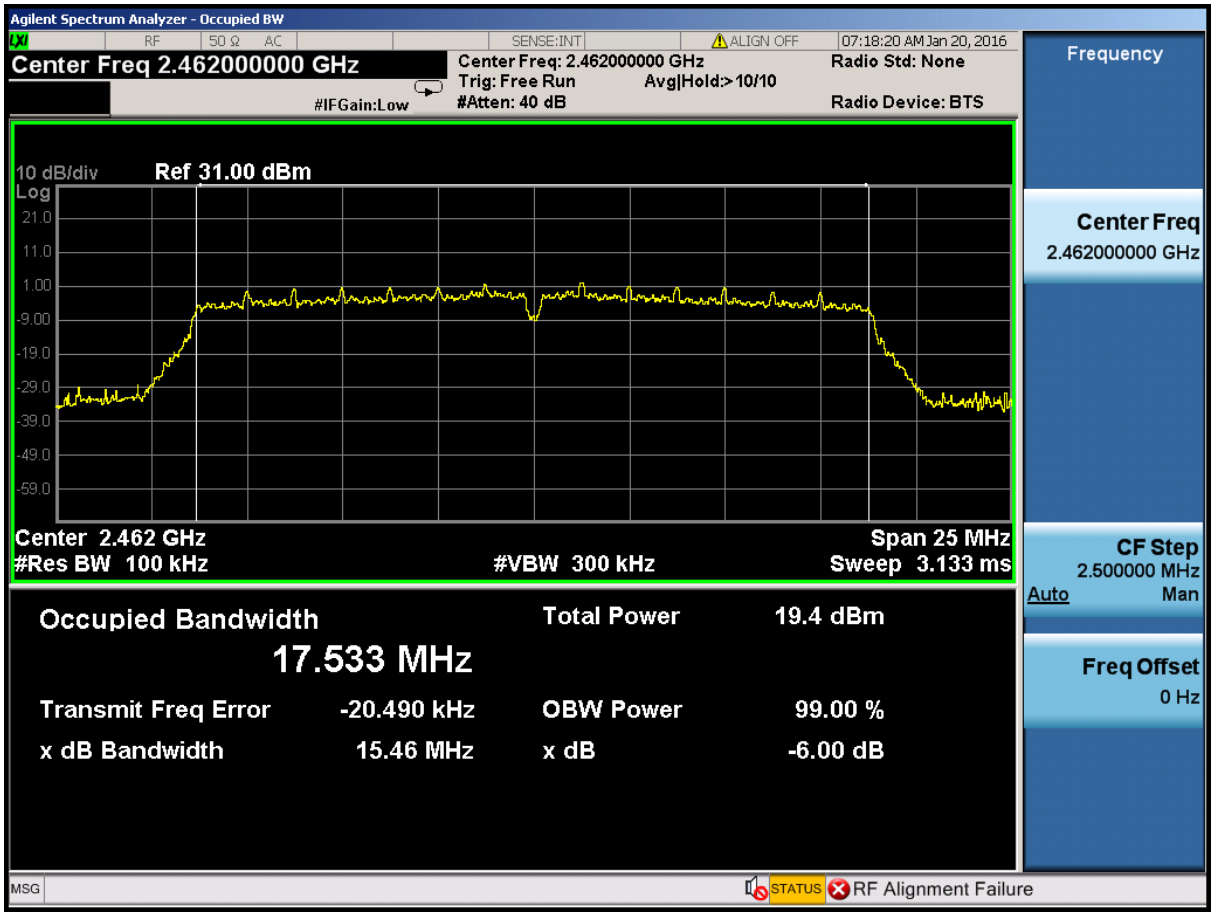
B. Test Plots




(Plot 4.6.3 A: Channel 1: 2412MHz @ 802.11n HT20)




(Plot 4.6.3 B: Channel 6: 2437MHz @ 802.11n HT20)




(Plot 4.6.3 C: Channel 11: 2462MHz @ 802.11n HT20)

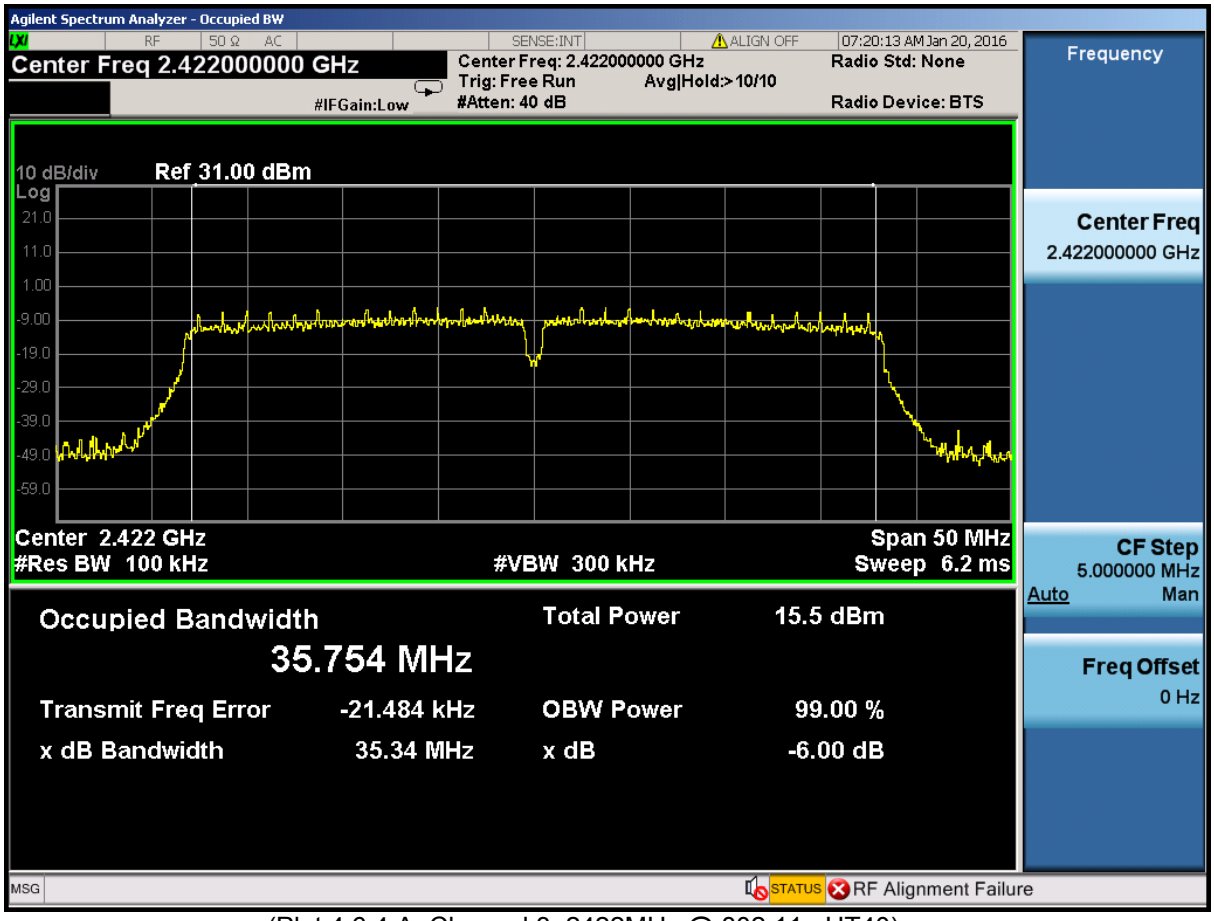
### 4.6.4 801.11n HT40 Test Mode

A. Test Verdict

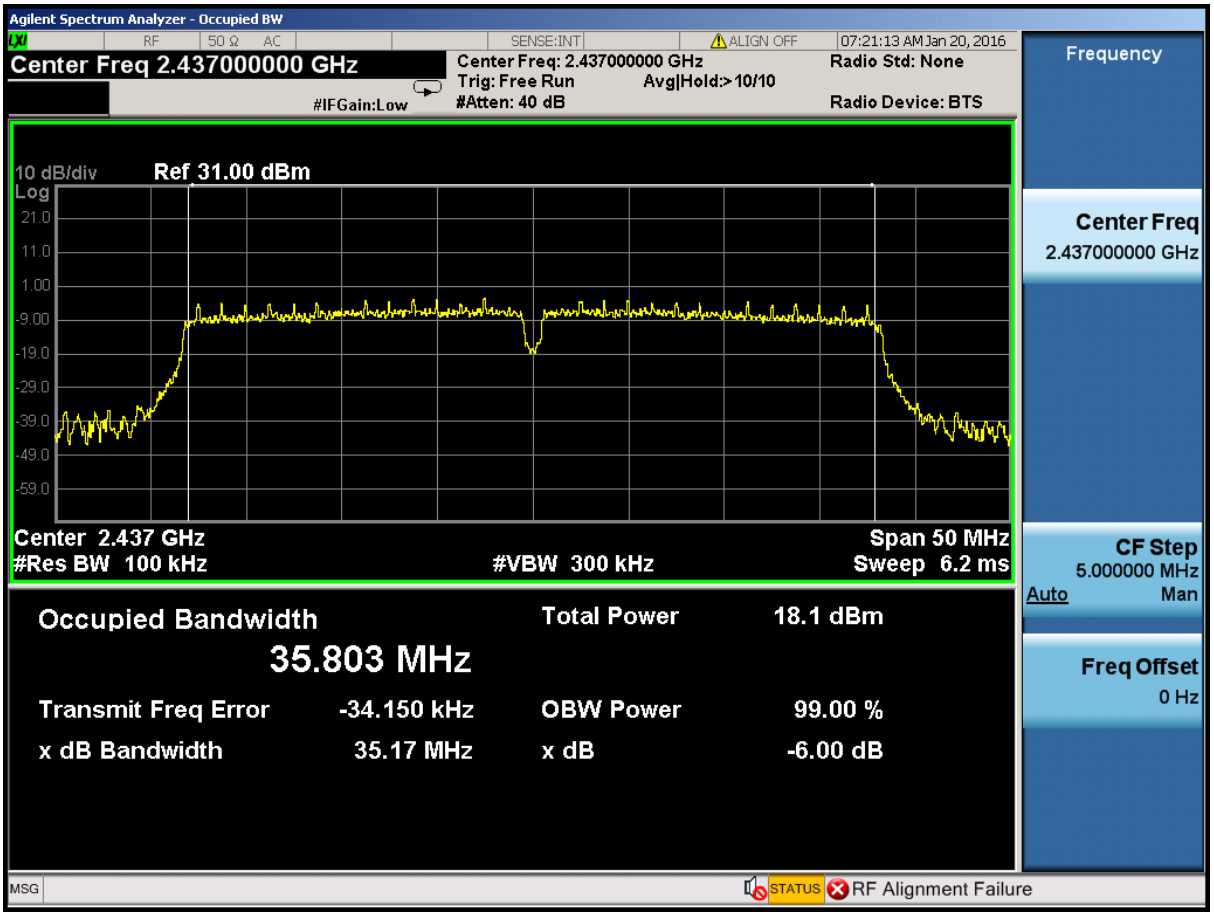
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Refer to Plot | Limits (kHz) | Verdict |
|---|---|---|---|---|---|
| 3 | 2422 | 35.34 | Plot 4.6.4 A | ≥500 | PASS |
| 6 | 2437 | 35.17 | Plot 4.6.4 B | ≥500 | PASS |
| 9 | 2452 | 35.21 | Plot 4.6.4 C | ≥500 | PASS |

Note:
1. For 802.11n HT40 mode at finial test to get the worst-case emission at 13.5Mbps.
2. The test results including the cable lose.

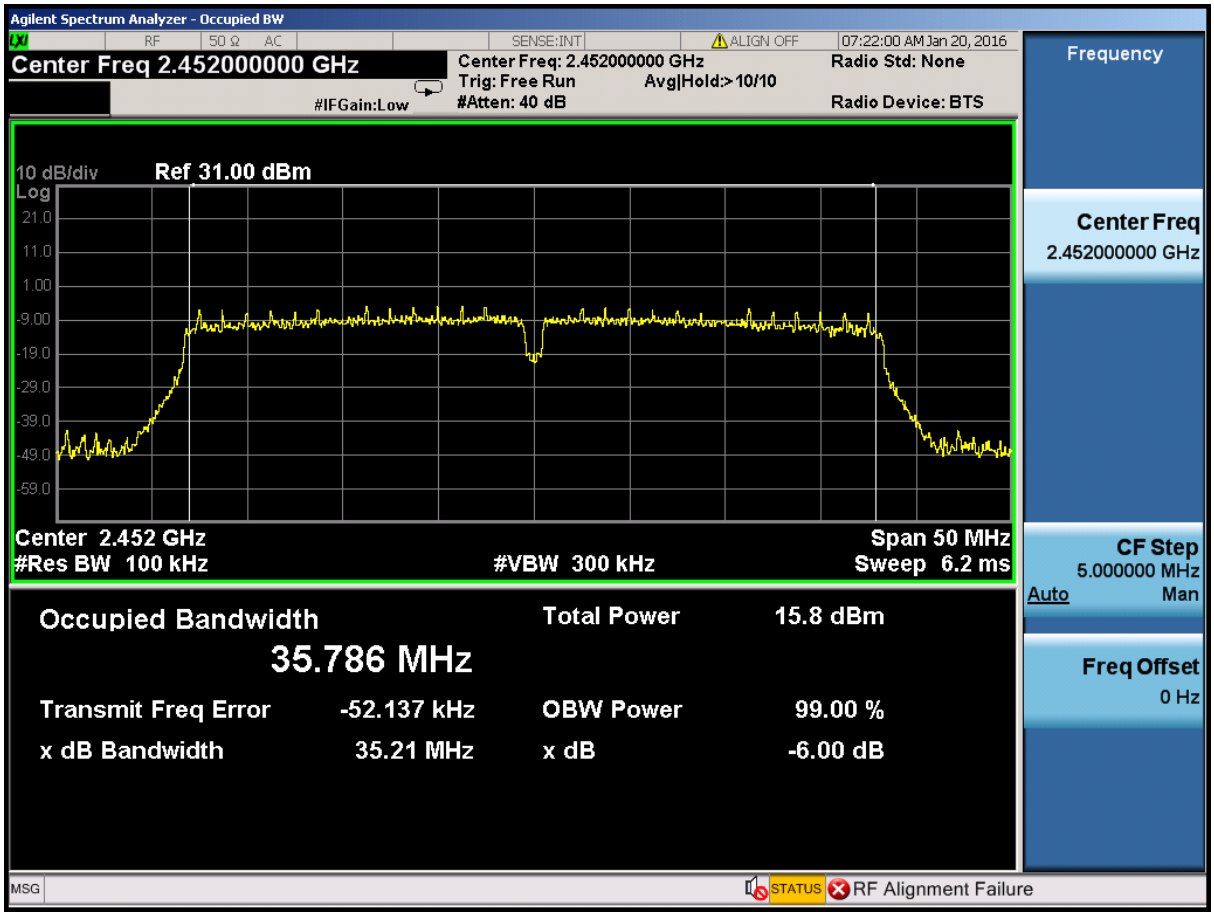
B. Test Plots




(Plot 4.6.4 A: Channel 3: 2422MHz @ 802.11n HT40)




(Plot 4.6.4 B: Channel 6: 2437MHz @ 802.11n HT40




(Plot 4.6.4 C: Channel 9: 2452MHz @ 802.11n HT40)

## 4.7 Antenna Requirement

**Standard Applicable**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

**Refer to statement below for compliance.**

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

**Measurement**

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.For normal WLAN devices, the DSSS mode is used.

Conducted power refer ANSI C63.10 :2013 Output power test procedure for DTS devices
Radiated power refer to ANSI C63.10 :2013 Radiated emissions tests.

**Measurement parameters**

| Measurement parameter | |
|---|---|
| Detector: | Peak |
| Sweep time: | Auto |
| Resolution bandwidth: | 1MHz |
| Video bandwidth: | 3MHz |
| Trace-Mode: | Max hold |

**Limits**

| FCC | IC |
|---|---|
| Antenna Gain | |
| 6 dBi | |

**Results**

| $T_{nom}$ | $V_{nom}$ | Lowest Channel 2412 MHz | Middle Channel 2437 MHz | Highest Channel 2462 MHz |
|---|---|---|---|---|
| Conducted power [dBm] Measured with DSSS modulation | | 10.58 | 11.09 | 11.02 |
| Conducted power [dBm] Measured with DSSS modulation | | 11.37 | 12.04 | 11.82 |
| Gain [dBi] Calculated | | 0.79 | 0.95 | 0.80 |
| Measurement uncertainty | | ± 0.6 dB (cond.) / ± 2.56 dB (rad.) | | |

# 5 Test Setup Photos of the EUT

Please refer to separated files for Test Setup Photos of the EUT.

# 6 External Photos of the EUT

Please refer to separated files for External Photos of the EUT.

# 7 Internal Photos of the EUT

Please refer to separated files for Internal Photos of the EUT.

**.....End of Report.....**