PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctestlab.com

# MEASUREMENT REPORT
## FCC PART 15.247 Bluetooth

**Applicant Name:**
Samsung Electronics Co., Ltd.
129, Samsung-ro, Maetan dong,
Yeongtong-gu, Suwon-si
Gyeonggi-do 443-742, Korea

**Date of Testing:**
02/16-03/04/2015
**Test Site/Location:**
PCTEST Lab. Columbia, MD, USA
**Test Report Serial No.:**
0Y1502160484.A3L

| | |
|---|---|
| **FCC ID:** | **A3LSC04G** |
| **APPLICANT:** | **Samsung Electronics Co., Ltd.** |

| | |
|---|---|
| **Application Type:** | Certification |
| **Model(s):** | SC-04G |
| **EUT Type:** | Portable Handset |
| **Max. RF Output Power:** | 12.924 mW (11.11 dBm) Peak Conducted |
| **Frequency Range:** | 2402 – 2480MHz (Bluetooth for US) |
| **Type of Modulation:** | GFSK, π/4-DQPSK, 8DPSK |
| **FCC Classification:** | FCC Part 15 Spread Spectrum Transmitter (DSS) |
| **FCC Rule Part(s):** | Part 15 Subpart C (15.247) |
| **Test Procedure(s):** | DA 00-705, KDB 648474 D03 v01r02 |

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in DA 00-705. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01


© 2015 PCTEST Engineering Laboratory, Inc.

# TABLE OF CONTENTS


FCC PART 15.247 MEASUREMENT REPORT ..... 3

1.0 INTRODUCTION ..... 4

1.1 SCOPE ..... 4

1.2 PCTEST TEST LOCATION ..... 4

2.0 PRODUCT INFORMATION ..... 5

2.1 EQUIPMENT DESCRIPTION ..... 5

2.2 DEVICE CAPABILITIES ..... 5

2.3 TEST CONFIGURATION ..... 5

2.4 EMI SUPPRESSION DEVICE(S)/MODIFICATIONS ..... 5

3.0 DESCRIPTION OF TEST ..... 6

3.1 EVALUATION PROCEDURE ..... 6

3.2 AC LINE CONDUCTED EMISSIONS ..... 6

3.3 RADIATED EMISSIONS ..... 7

3.4 ENVIRONMENTAL CONDITIONS ..... 7

4.0 ANTENNA REQUIREMENTS ..... 8

5.0 TEST EQUIPMENT CALIBRATION DATA ..... 9

6.0 TEST RESULTS ..... 10

6.1 SUMMARY ..... 10

6.2 20DB BANDWIDTH MEASUREMENT ..... 11

6.3 OUTPUT POWER MEASUREMENT ..... 17

6.4 BAND EDGE COMPLIANCE ..... 27

6.5 CARRIER FREQUENCY SEPARATION ..... 30

6.6 TIME OF OCCUPANCY ..... 31

6.7 NUMBER OF HOPPING CHANNELS ..... 32

6.8 CONDUCTED SPURIOUS EMISSIONS ..... 34

6.9 RADIATED SPURIOUS EMISSION MEASUREMENTS – ABOVE 1GHZ ..... 38

6.10 RADIATED RESTRICTED BAND EDGE MEASUREMENTS ..... 44

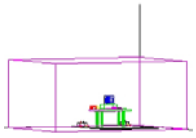
6.11 RADIATED SPURIOUS EMISSIONS MEASUREMENTS – BELOW 1GHZ ..... 46

6.12 LINE CONDUCTED MEASUREMENT DATA ..... 49

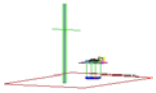
7.0 CONCLUSION ..... 51




© 2015 PCTEST Engineering Laboratory, Inc.



# MEASUREMENT REPORT
## FCC Part 15.247



## § 2.1033 General Information

| | |
|---|---|
| **APPLICANT:** | Samsung Electronics Co., Ltd. |
| **APPLICANT ADDRESS:** | 129, Samsung-ro, Maetan dong,<br>Yeongtong-gu, Suwon-si, Gyeonggi-do 443-742, Korea |
| **TEST SITE:** | PCTEST ENGINEERING LABORATORY, INC. |
| **TEST SITE ADDRESS:** | 7185 Oakland Mills Road, Columbia, MD 21046 USA |
| **FCC RULE PART(S):** | Part 15 Subpart C (15.247) |
| **BASE MODEL:** | SC-04G |
| **FCC ID:** | A3LSC04G |
| **FCC CLASSIFICATION:** | FCC Part 15 Spread Spectrum Transmitter (DSS) |
| **Test Device Serial No.:** | 1C129, 1C4E6, 1C0C3, 1C0C4 ☐ Production ☒ Pre-Production ☐ Engineering |
| **Method/System:** | Frequency Hopping Spread Spectrum (FHSS) |
| **DATE(S) OF TEST:** | 02/16-03/04/2015 |
| **TEST REPORT S/N:** | 0Y1502160484.A3L |

## Test Facility / Accreditations

**Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.**

- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.

- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.


© 2015 PCTEST Engineering Laboratory, Inc.

# 1.0 INTRODUCTION

## 1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

## 1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Internt'l (BWI) airport, the city of Baltimore and the Washington, DC area. (*See Figure 1-1*).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on February 15, 2012.

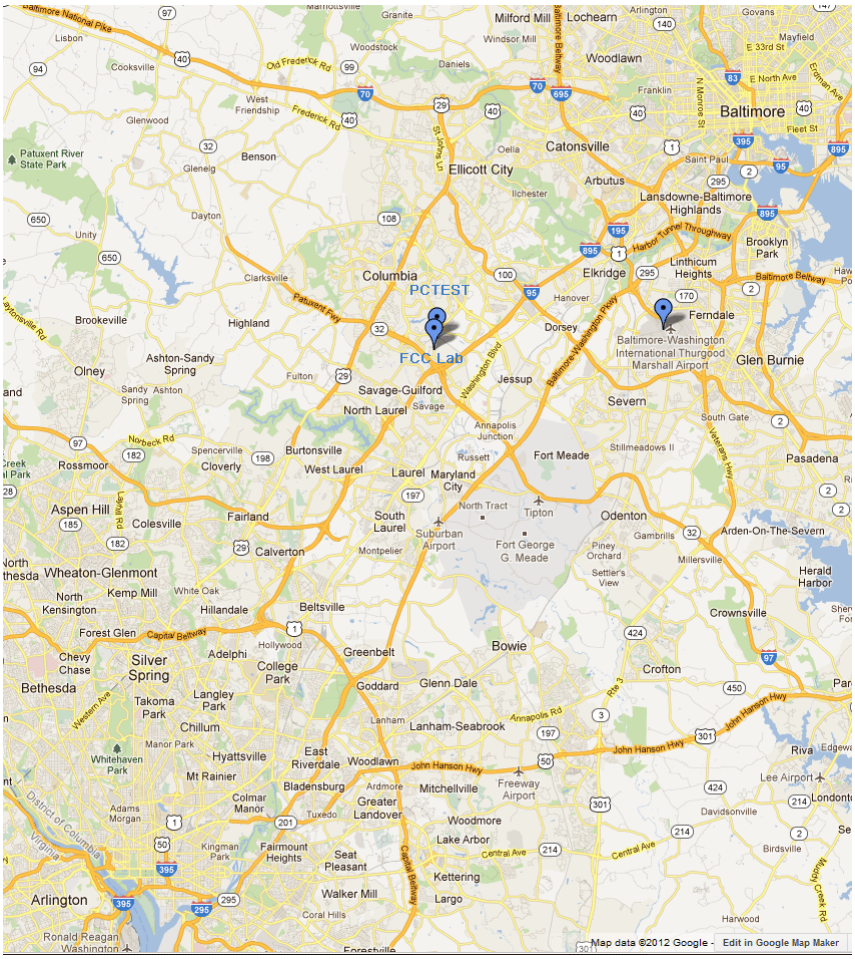



**Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area**


© 2015 PCTEST Engineering Laboratory, Inc.

# 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSC04G**. The test data contained in this report pertains only to the emissions due to the EUT's Bluetooth transmitter.

- This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:
  - A) The hopping sequence is pseudorandom
  - B) All channels are used equally on average
  - C) The receiver input bandwidth equals the transmit bandwidth
  - D) The receiver hops in sequence with the transmit signal
- 15.247(g): In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.
- 15.247(h): In accordance with the Bluetooth Industry Standard, the system does not coordinate its channels selection/ hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.
- 15.247(h): The EUT employs Adaptive Frequency Hopping (AFH) which identifies sources of interference namely devices operating in 802.11 WLAN and excludes them from the list of available channels. The process of re-mapping reduces the number of test channels from 79 channels to a minimum number of 20 channels.

## 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC, ANT+

## 2.3 Test Configuration

The Samsung Portable Handset FCC ID: A3LSC04G was tested per the guidance of ANSI C63.10-2009 and DA 00-705. ANSI C63.10-2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, and 6.8 for antenna port conducted emissions test setups.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r02. Additional radiated spurious emission measurements were performed with the EUT lying flat on a certified wireless charging pad while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

## 2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.


© 2015 PCTEST Engineering Laboratory, Inc.

# 3.0 DESCRIPTION OF TEST

## 3.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) and the "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems" (DA 00-705) were used in the measurement of the **Samsung Portable Handset FCC ID: A3LSC04G.**

**Deviation from measurement procedure…….....None**

## 3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or resolution, clock or data exchange speed, scrolling H pattern to the EUT and/or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 6.12. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.


© 2015 PCTEST Engineering Laboratory, Inc.

## 3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Clause 5, Figure 5.7 of ANSI C63.4-2009. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 78cm high PVC support structure is placed on top of the turntable. A ¾" (~1.9cm) sheet of high density polyethylene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

## 3.4 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).


© 2015 PCTEST Engineering Laboratory, Inc.

# 4.0 ANTENNA REQUIREMENTS

**Excerpt from §15.203 of the FCC Rules/Regulations:**
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antennas of the Samsung Portable Handset are **permanently attached.**
- There are no provisions for connection to an external antenna.

**Conclusion:**

The **Samsung Portable Handset FCC ID: A3LSC04G** unit complies with the requirement of §15.203.

| Ch. | Frequency (MHz) |
|---|---|
| 00 | 2402 |
| : | : |
| 39 | 2441 |
| : | : |
| 78 | 2480 |

**Table 4-1. Frequency/ Channel Operations**


© 2015 PCTEST Engineering Laboratory, Inc.

# 5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

| Manufacturer | Model | Description | Cal Date | Cal Interval | Cal Due | Serial Number |
|---|---|---|---|---|---|---|
| - | BT2 | Bluetooth Cable Set | 10/15/2014 | Annual | 10/15/2015 | N/A |
| - | RE1 | Radiated Emissions Cable Set (UHF/EHF) | 10/24/2014 | Annual | 10/24/2015 | N/A |
| - | RE1-S2 | Radiated Emissions Cable (UHF/EHF) | 6/2/2014 | Annual | 6/2/2015 | 13121701 001 |
| Agilent | 8447D | Broadband Amplifier | 5/30/2014 | Annual | 5/30/2015 | 2443A01900 |
| Agilent | N4010A | Wireless Connectivity Test Set | N/A | | | GB46170464 |
| Agilent | N9020A | MXA Signal Analyzer | 10/27/2014 | Annual | 10/27/2015 | US46470561 |
| Agilent | N9030A | PXA Signal Analyzer (44GHz) | 5/8/2014 | Annual | 5/8/2015 | MY52350166 |
| Agilent | N9038A | MXE EMI Receiver | 3/3/2014 | Annual | 3/3/2015 | MY51210133 |
| Com-Power | AL-130 | 9kHz - 30MHz Loop Antenna | 6/26/2013 | Biennial | 6/26/2015 | 121034 |
| Emco | 3115 | Horn Antenna (1-18GHz) | 1/30/2014 | Biennial | 1/30/2016 | 9704-5182 |
| ETS Lindgren | 3117 | 1-18 GHz DRG Horn (Medium) | 4/8/2014 | Biennial | 4/8/2016 | 125518 |
| ETS Lindgren | 3160-09 | 18-26.5 GHz Standard Gain Horn | 6/17/2014 | Biennial | 6/17/2016 | 135427 |
| K & L | 11SH10-3075/U18000 | High Pass Filter | 12/1/2014 | Annual | 12/1/2015 | 2 |
| Pasternack | NMLC-1 | Line Conducted Emissions Cable (NM) | 10/17/2014 | Annual | 10/17/2015 | N/A |
| Rohde & Schwarz | CMU200 | Base Station Simulator | N/A | | | 836536/0005 |
| Rohde & Schwarz | ESU26 | EMI Test Receiver (26.5GHz) | 3/27/2014 | Annual | 3/27/2015 | 100342 |
| Rohde & Schwarz | ESU40 | EMI Test Receiver (40GHz) | 5/21/2014 | Annual | 5/21/2015 | 100348 |
| Rohde & Schwarz | TS-PR18 | 1-18 GHz Pre-Amplifier | 3/5/2014 | Annual | 3/5/2015 | 100071 |
| Rohde & Schwarz | TS-PR26 | 18-26.5 GHz Pre-Amplifier | 3/12/2014 | Annual | 3/12/2015 | 100040 |
| Seekonk | NC-100 | Torque Wrench 5/16", 8" lbs | 3/18/2014 | Biennial | 3/18/2016 | N/A |
| Solar Electronics | 8012-50-R-24-BNC | Line Impedance Stabilization Network | 6/20/2013 | Biennial | 6/20/2015 | 310233 |
| Sunol | JB5 | Bi-Log Antenna (30M - 5GHz) | 1/28/2014 | Biennial | 1/28/2016 | A051107 |
| VWR | 62344-734 | Thermometer with Clock | 2/20/2014 | Biennial | 2/20/2016 | 140140420 |

**Table 5-1. Annual Test Equipment Calibration Schedule**

**Notes:**

1. For equipment listed above that has a calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.


© 2015 PCTEST Engineering Laboratory, Inc.

# 6.0 TEST RESULTS

## 6.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSC04G

Method/System: Frequency Hopping Spread Spectrum (FHSS)

Number of Channels: 79

| FCC Part Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|---|---|---|---|---|---|
| **TRANSMITTER MODE (Tx)** | | | | | |
| 15.247(a)(1)(iii) | 20dB Bandwidth | < 1 MHz only if using less than 15 non-overlapping channels | CONDUCTED | PASS | Section 6.2 |
| 15.247(b)(1) | Peak Transmitter Output Power | < 1 Watt if ≥ 75 non-overlapping channels used | | PASS | Section 6.3 |
| 15.247(a)(1) | Channel Separation | > 2/3 of 20 dB BW for systems with Output Power < 125mW | | PASS | Section 6.5 |
| 15.247(a)(1)(iii) | Number of Channels | > 15 Channels | | PASS | Section 6.7 |
| 15.247(a)(1)(iii) | Time of Occupancy | < 0.4 sec in 31.6 sec period | | PASS | Section 6.6 |
| 15.247(d) | Band Edge / Out-of-Band Emissions | Conducted > 20dBc | | PASS | Section 6.4, Section 6.8 |
| 15.205<br>15.209 | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-210 table 3 limits) | RADIATED | PASS | Section 6.9, Section 6.10, Section 6.11 |
| 15.207 | AC Conducted Emissions 150kHz – 30MHz | < FCC 15.207 limits or<br>< RSS-Gen table 2 limits | LINE CONDUCTED | PASS | Section 6.12 |

**Table 6-1. Summary of Test Results**

**Notes:**

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "BT Auto", Version 2.6.


© 2015 PCTEST Engineering Laboratory, Inc.

## 6.2 20dB Bandwidth Measurement

**§15.247 (a.1.iii)**

The bandwidth at 20dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies. ***The maximum permissible 20dB bandwidth is 1 MHz, unless more than 15 non-overlapping channels are employed.***

| Frequency [MHz] | Data Rate [Mbps] | Channel No. | 20dB Bandwidth Test Results | |
|---|---|---|---|---|
| | | | Measured Bandwidth [kHz] | Pass/Fail |
| 2402 | 1.0 | 0 | 1017.00 | Pass |
| 2441 | 1.0 | 39 | 879.90 | Pass |
| 2480 | 1.0 | 78 | 917.40 | Pass |
| 2402 | 2.0 | 0 | 1342.00 | Pass |
| 2441 | 2.0 | 39 | 1355.00 | Pass |
| 2480 | 2.0 | 78 | 1339.00 | Pass |
| 2402 | 3.0 | 0 | 1288.00 | Pass |
| 2441 | 3.0 | 39 | 1368.00 | Pass |
| 2480 | 3.0 | 78 | 1338.00 | Pass |

**Table 6-2. Conducted 20dB Bandwidth Measurements**

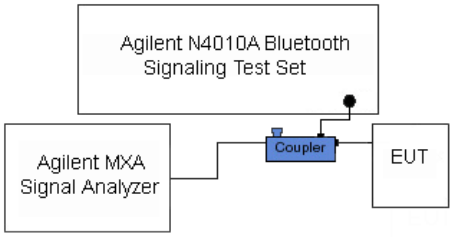
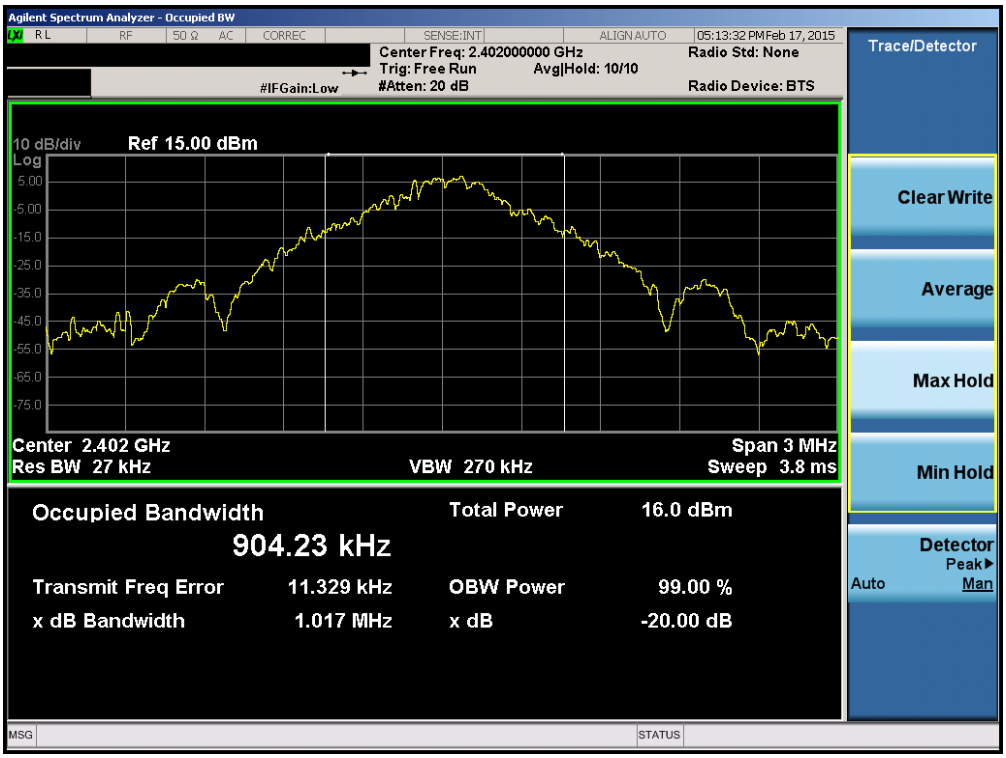
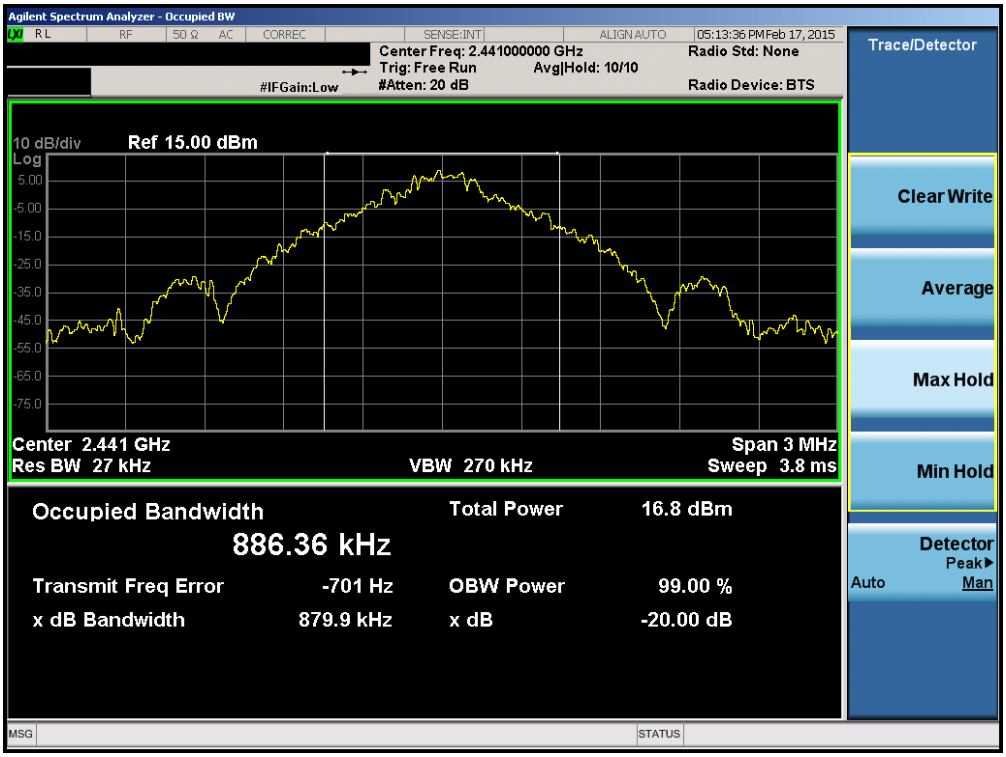



**Figure 6-1. Test Instrument & Measurement Setup**


© 2015 PCTEST Engineering Laboratory, Inc.

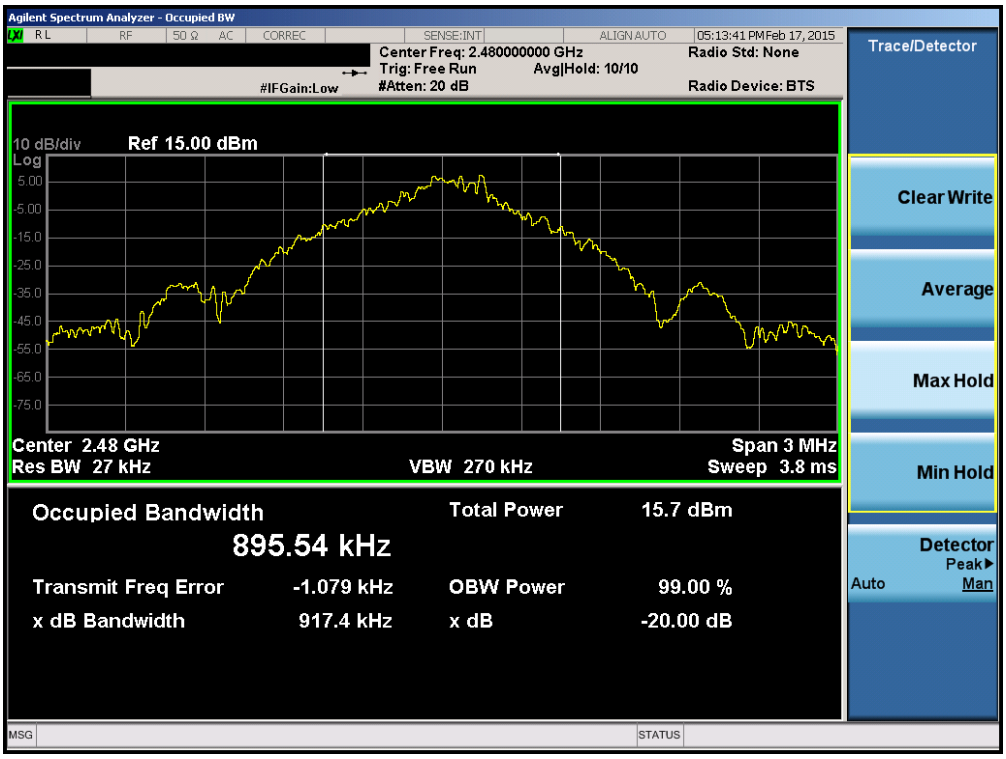



**Plot 6-1. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 0)**

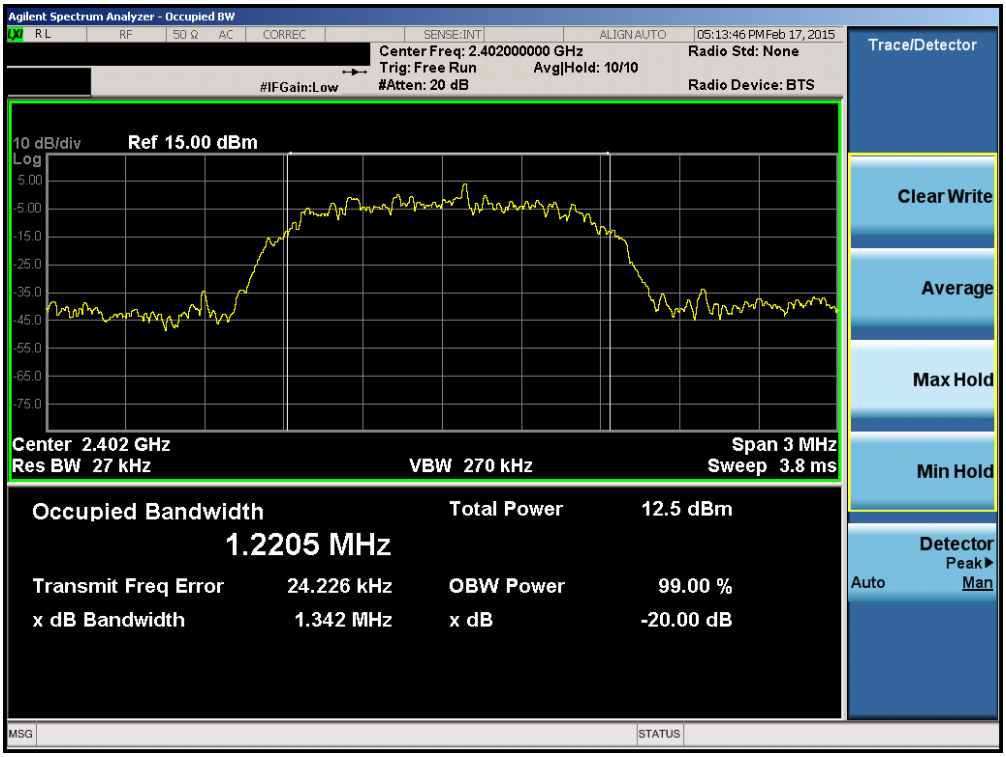



**Plot 6-2. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 39)**


© 2015 PCTEST Engineering Laboratory, Inc.

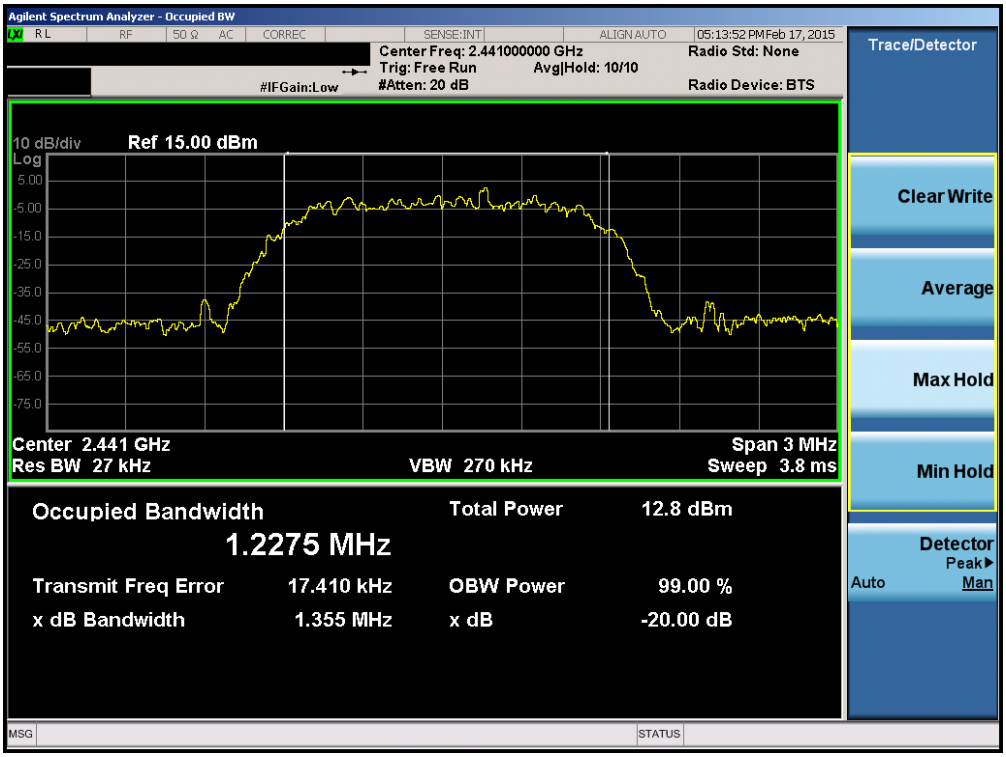



**Plot 6-3. 20dB Bandwidth Plot (Bluetooth, 1Mbps – Ch. 78)**

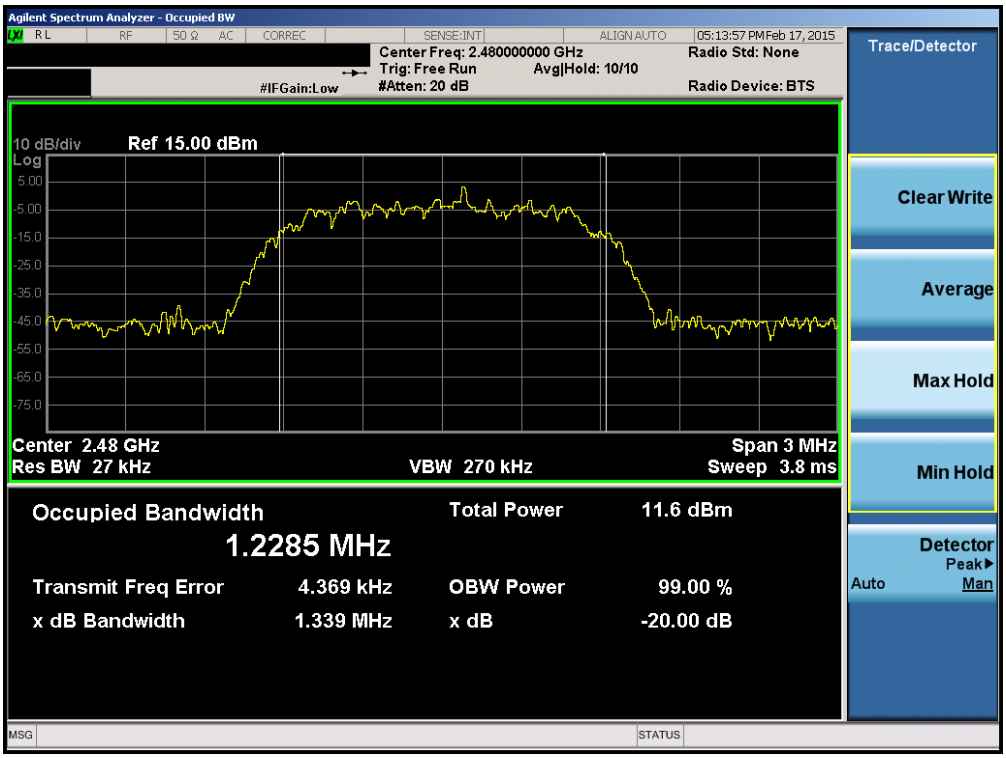



**Plot 6-4. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 0)**


© 2015 PCTEST Engineering Laboratory, Inc.

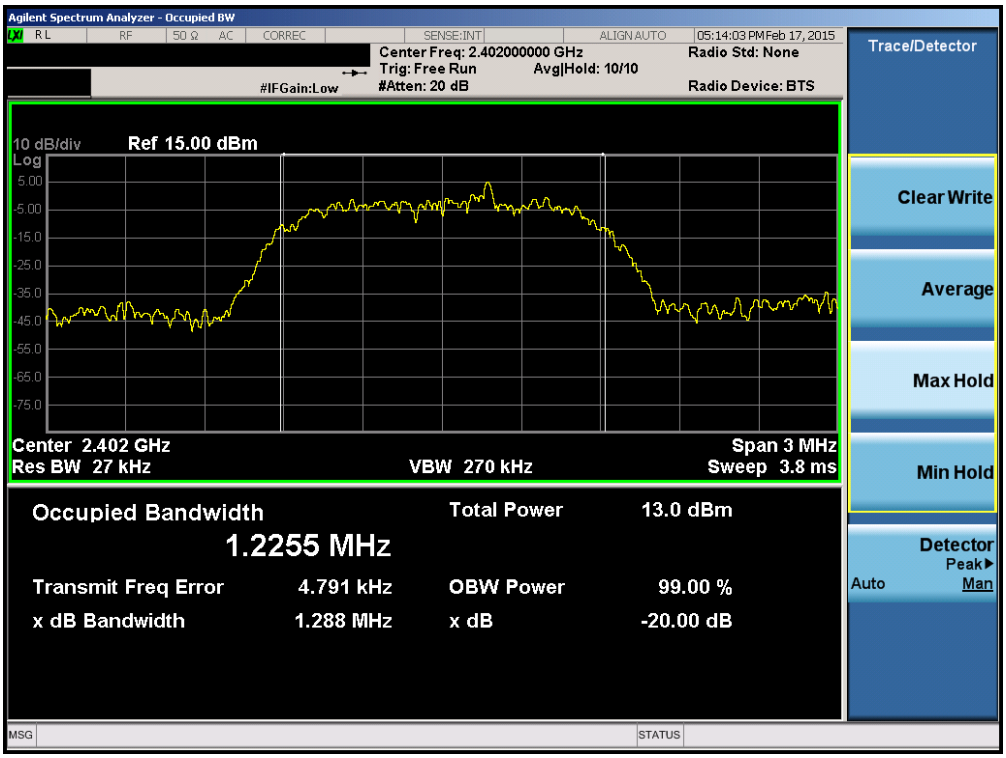



**Plot 6-5. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 39)**

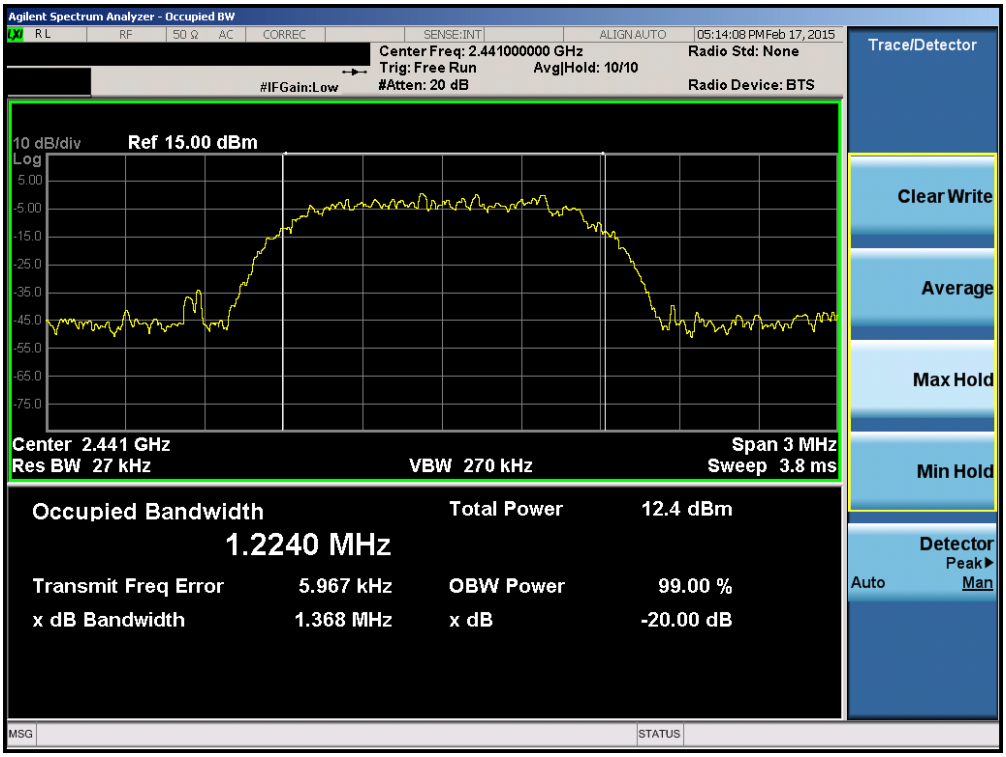



**Plot 6-6. 20dB Bandwidth Plot (Bluetooth, 2Mbps – Ch. 78)**


© 2015 PCTEST Engineering Laboratory, Inc.

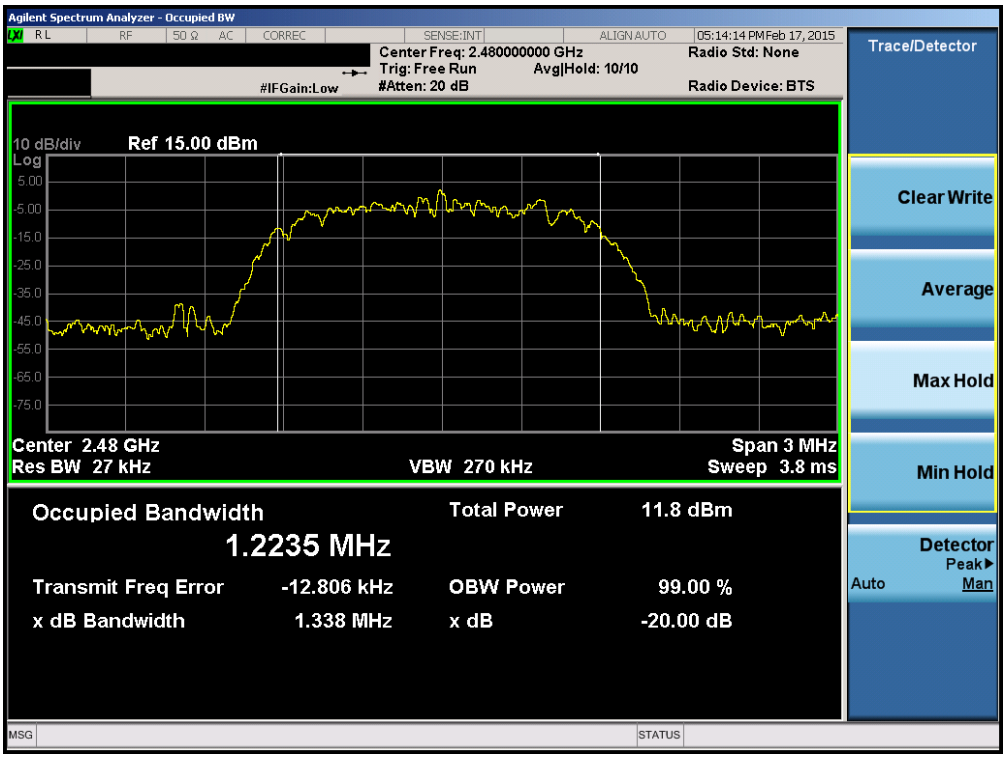



**Plot 6-7. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 0)**




**Plot 6-8. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 39)**


© 2015 PCTEST Engineering Laboratory, Inc.




**Plot 6-9. 20dB Bandwidth Plot (Bluetooth, 3Mbps – Ch. 78)**


© 2015 PCTEST Engineering Laboratory, Inc.

## 6.3 Output Power Measurement

**§15.247 (b.1)**

Measurement is made while the EUT is operating in non-hopping transmission mode. The powers shown below were measured using a spectrum analyzer with a Bluetooth signaling test set (Agilent Model: N4010A) used only to maintain a Bluetooth link with the EUT. Peak power measurements are performed in the analyzers' swept spectrum mode using a peak detector with RBW = 3MHz and VBW ≥ RBW. Average power data is provided to determine the need for Bluetooth SAR testing according to KDB 447498 D01 v05r02. Average power measurements are performed using the analyzer's "burst power" function with RBW = 3MHz. The burst power function triggers on a single burst set to maximum power and measures the maximum average power over the on-time. ***The maximum permissible output power is 1 Watt.***

This unit was tested with all possible data rates and the highest peak power is reported with the unit transmitting at 1Mbps.

| Frequency [MHz] | Data Rate [Mbps] | Channel No. | Peak Conducted Power | | Avg Conducted Power | |
|---|---|---|---|---|---|---|
| | | | [dBm] | [mW] | [dBm] | [mW] |
| 2402 | 1.0 | 0 | 10.30 | 10.720 | 10.23 | 10.555 |
| 2441 | 1.0 | 39 | 11.11 | 12.924 | 11.02 | 12.643 |
| 2480 | 1.0 | 78 | 10.04 | 10.097 | 9.93 | 9.833 |
| 2402 | 2.0 | 0 | 8.92 | 7.797 | 6.69 | 4.666 |
| 2441 | 2.0 | 39 | 9.14 | 8.204 | 6.65 | 4.621 |
| 2480 | 2.0 | 78 | 8.16 | 6.548 | 5.64 | 3.662 |
| 2402 | 3.0 | 0 | 9.13 | 8.187 | 6.66 | 4.632 |
| 2441 | 3.0 | 39 | 9.41 | 8.722 | 6.78 | 4.770 |
| 2480 | 3.0 | 78 | 8.41 | 6.937 | 5.70 | 3.717 |

**Table 6-3. Conducted Output Power Measurements**

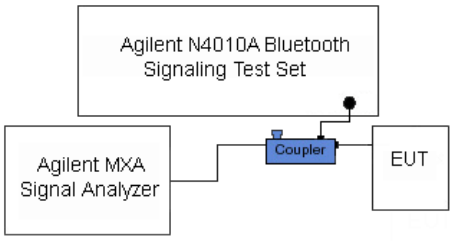


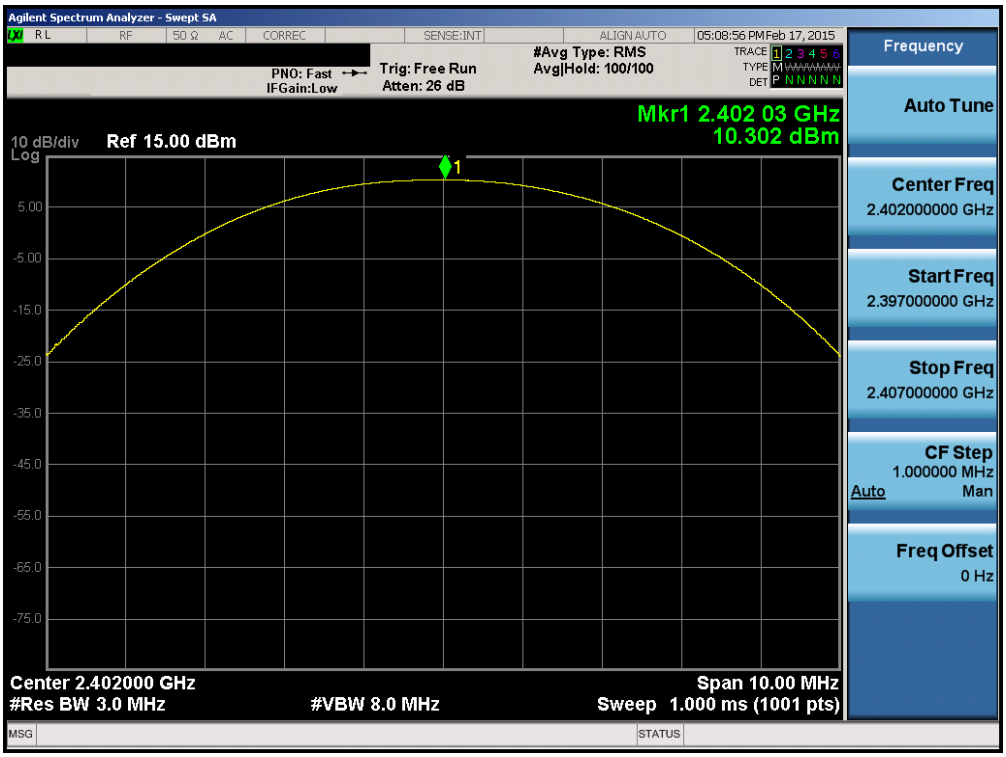

**Figure 6-2. Test Instrument & Measurement Setup**

**Note**

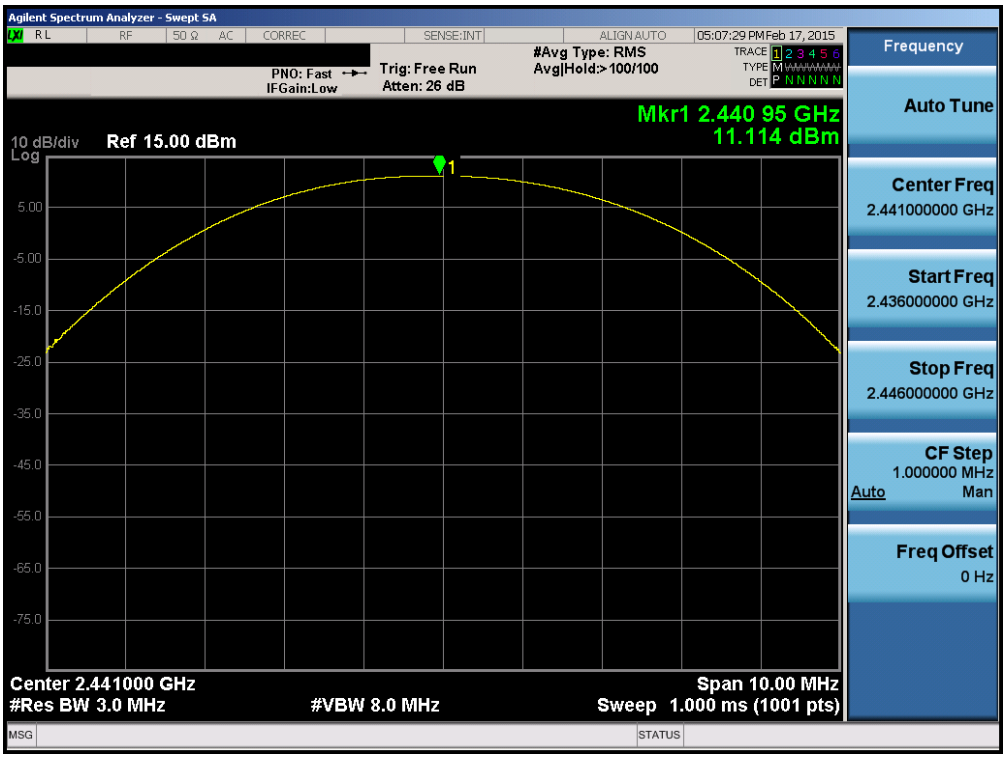
Final results were obtained using calibrated couplers, attenuators and cables. The following formula was used:

Output Power (dBm) = Raw Analyzer Level (dBm) + Cable Loss (dB) + Loss in Directional Coupler/Insertion Loss (dB)


© 2015 PCTEST Engineering Laboratory, Inc.

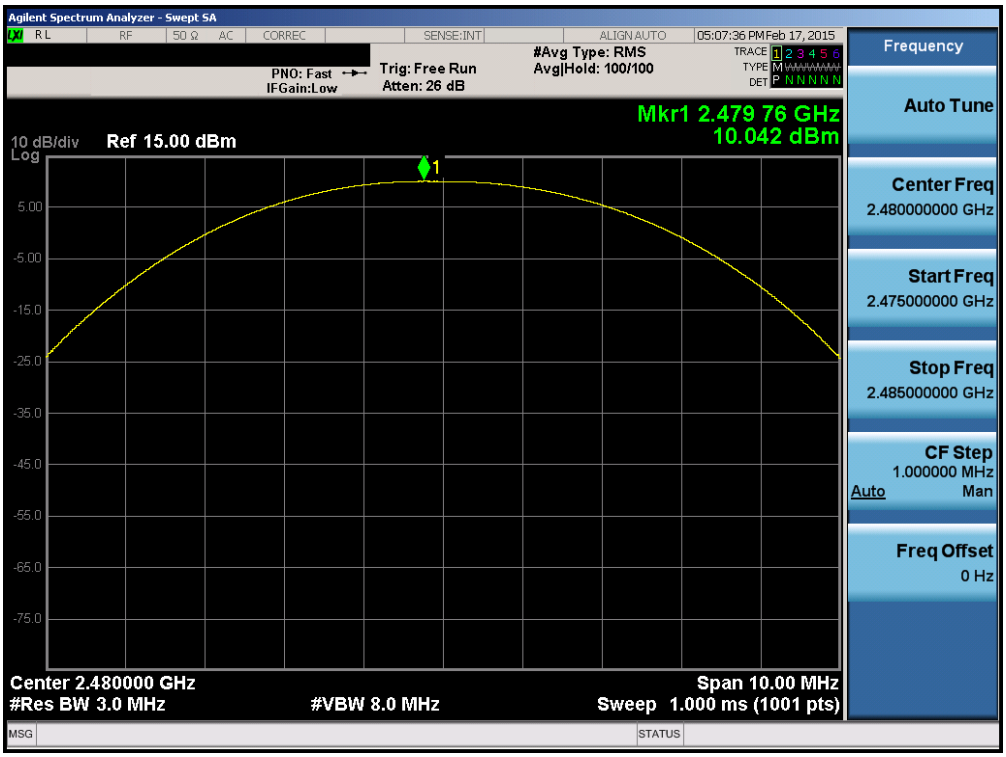



**Plot 6-10. Peak Conducted Power (1Mbps – Ch. 0)**

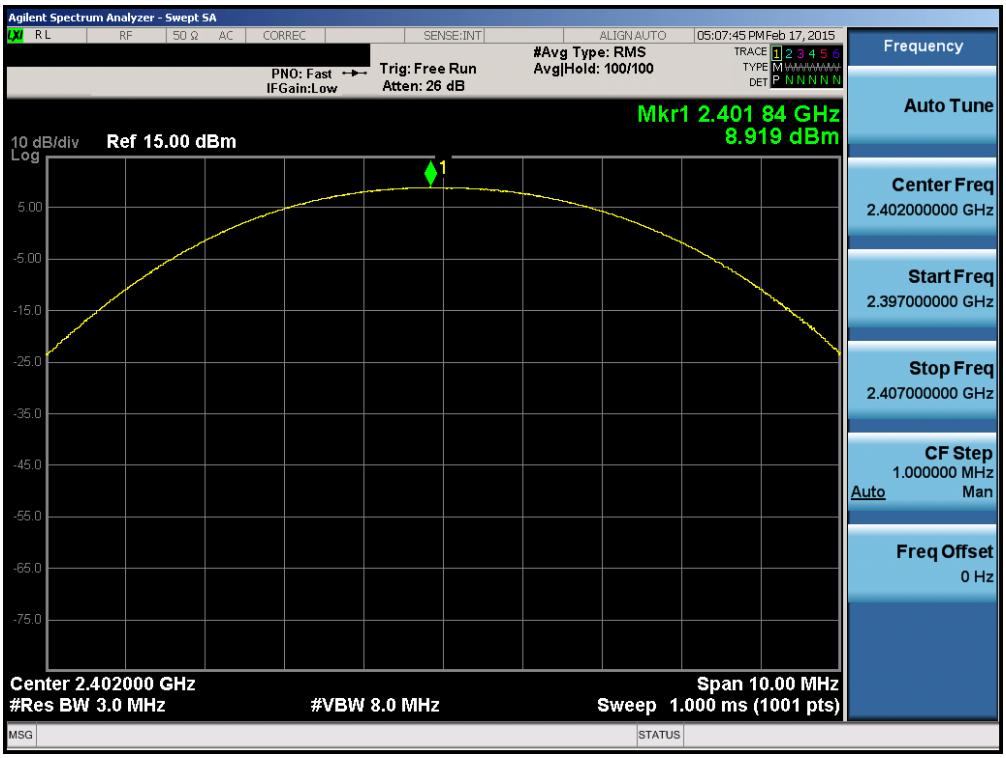



**Plot 6-11. Peak Conducted Power (1Mbps – Ch. 39)**


© 2015 PCTEST Engineering Laboratory, Inc.

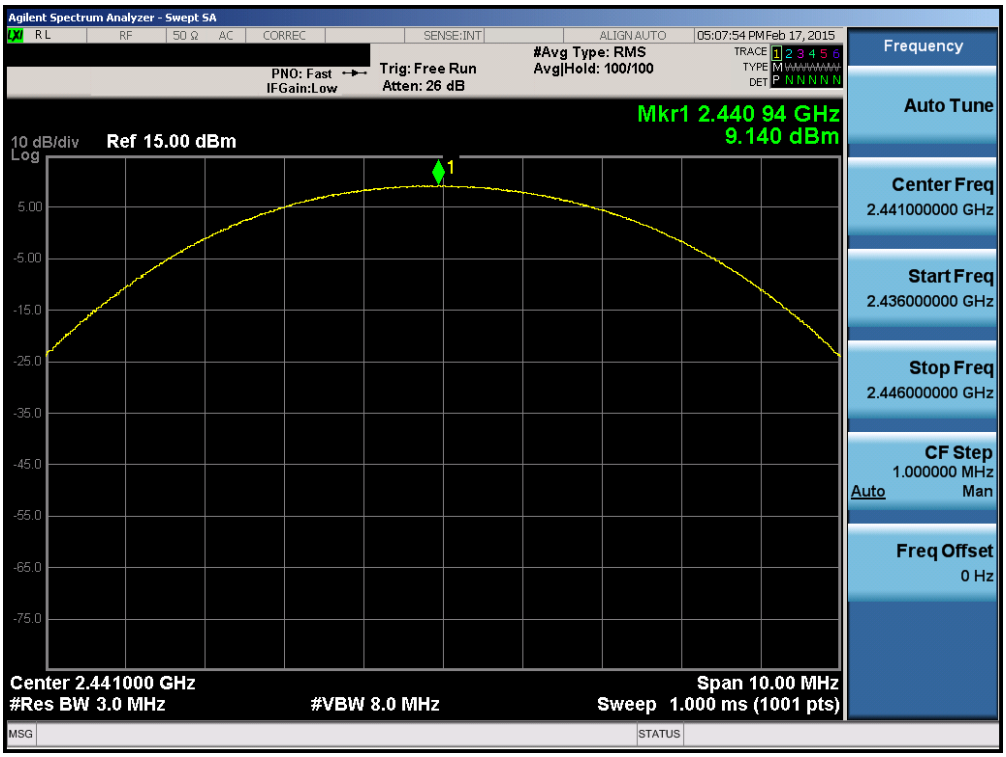



**Plot 6-12. Peak Conducted Power (1Mbps – Ch. 78)**

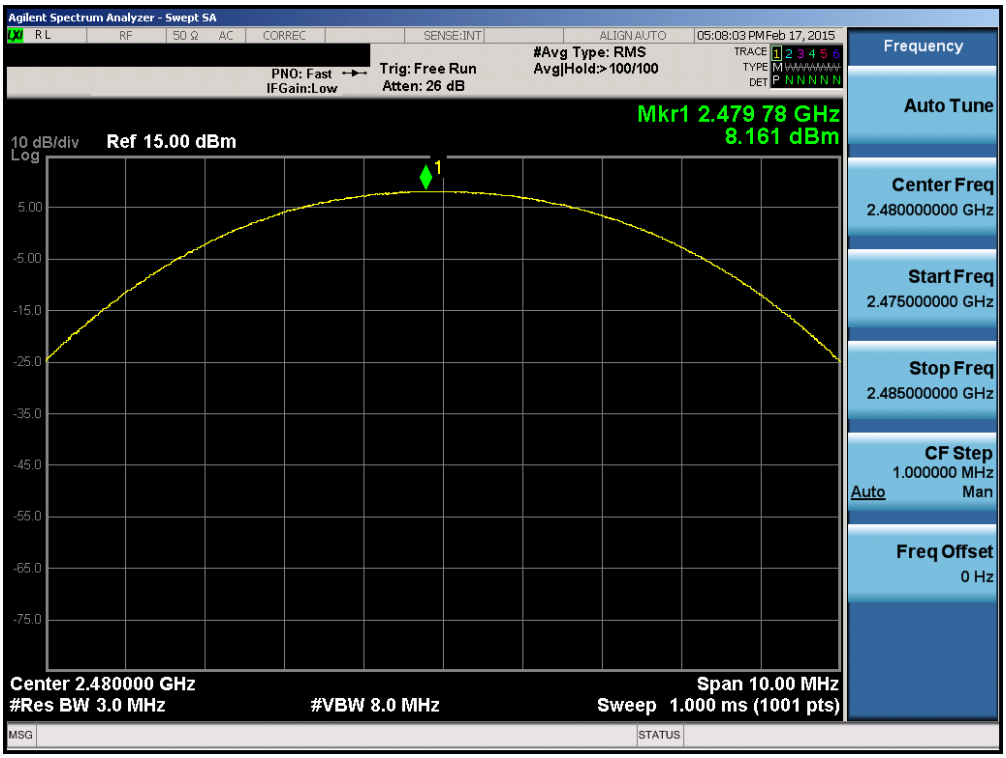



**Plot 6-13. Peak Conducted Power (2Mbps – Ch. 0)**


© 2015 PCTEST Engineering Laboratory, Inc.

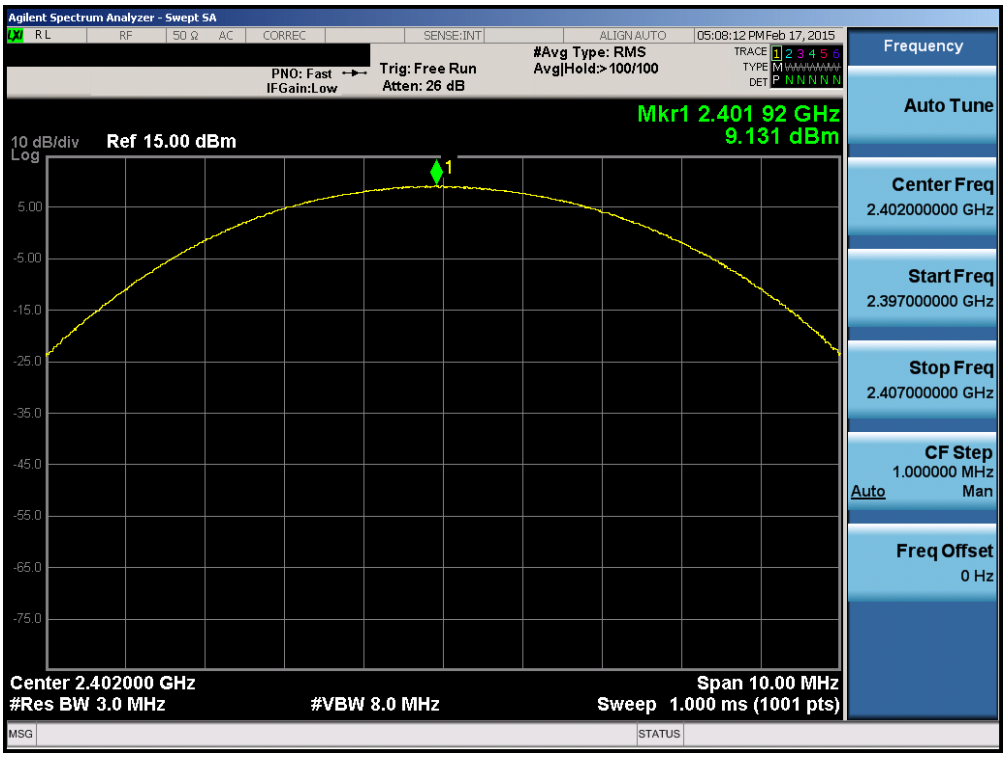



**Plot 6-14. Peak Conducted Power (2Mbps – Ch. 39)**

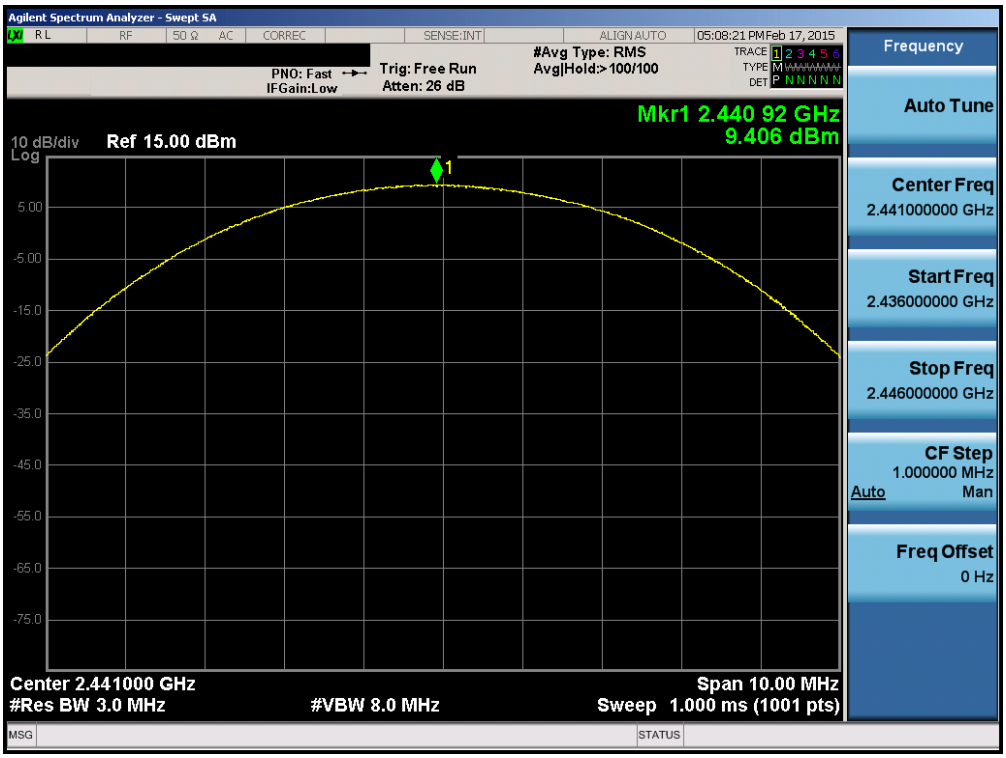



**Plot 6-15. Peak Conducted Power (2Mbps – Ch. 78)**


© 2015 PCTEST Engineering Laboratory, Inc.

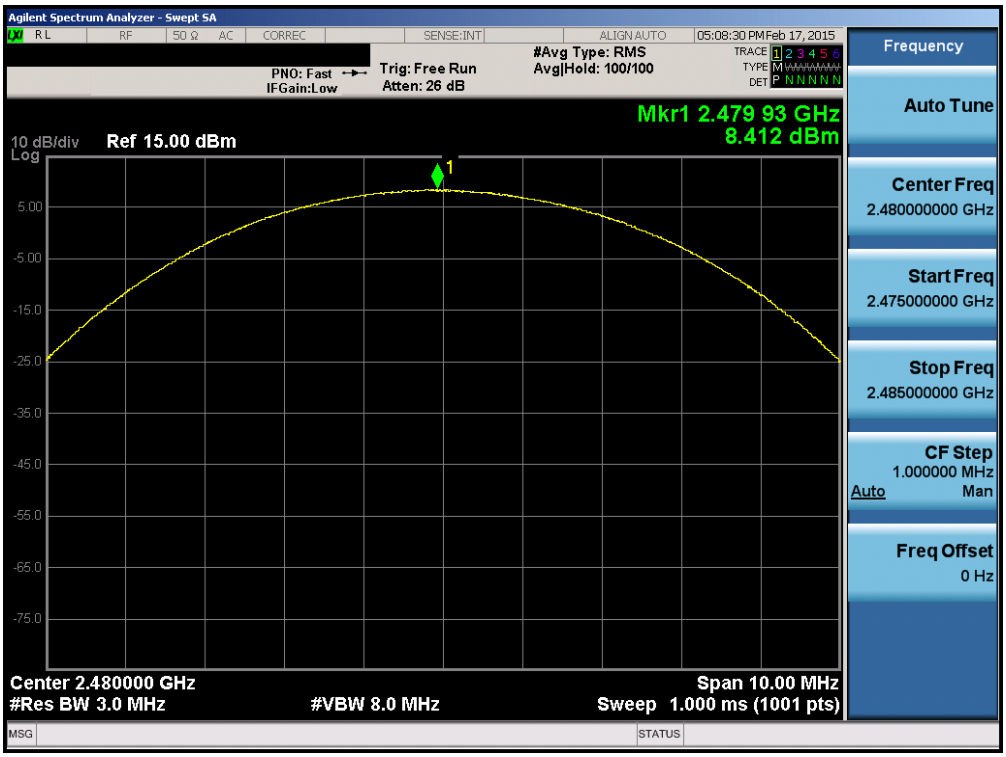



**Plot 6-16. Peak Conducted Power (3Mbps – Ch. 0)**

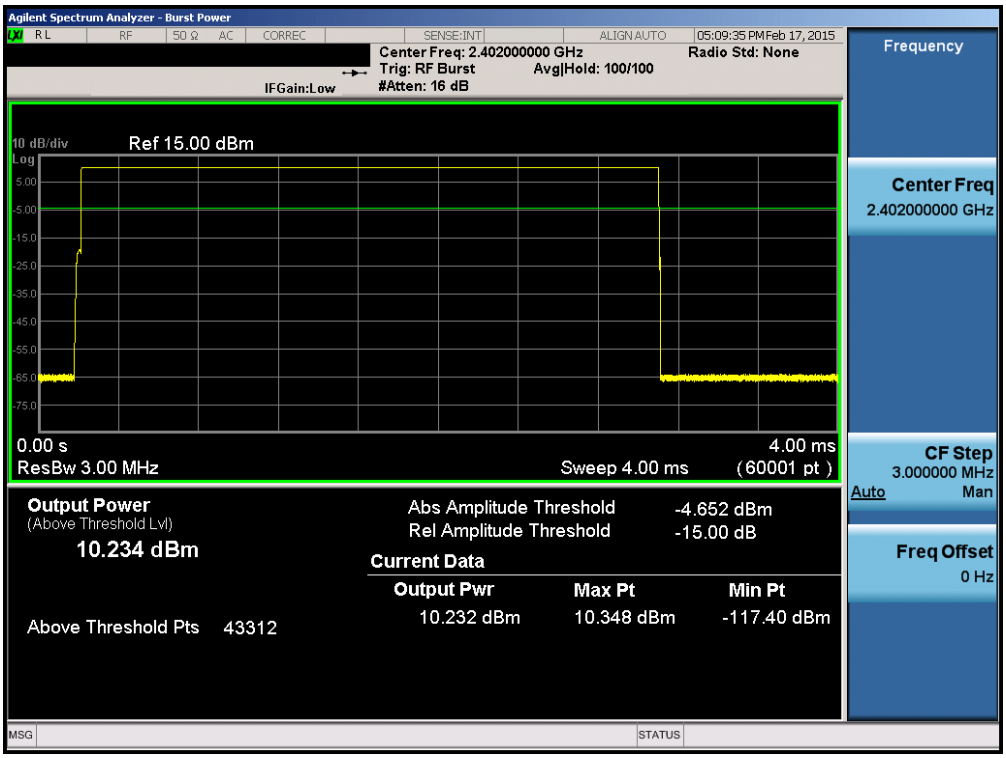



**Plot 6-17. Peak Conducted Power (3Mbps – Ch. 39)**


© 2015 PCTEST Engineering Laboratory, Inc.

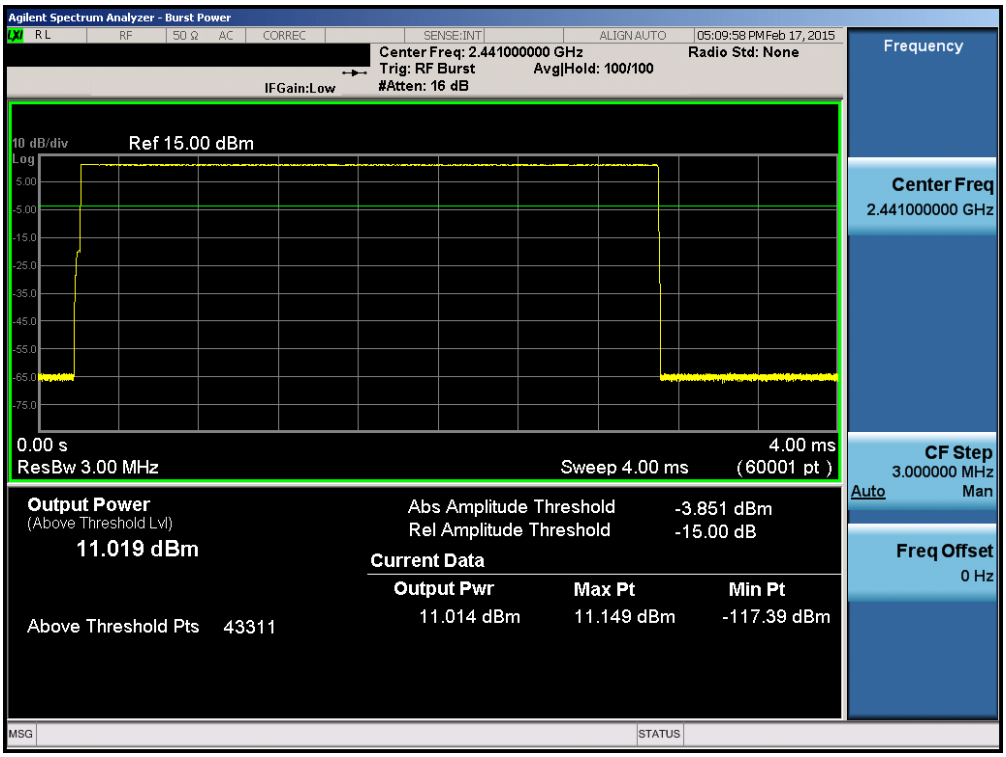



**Plot 6-18. Peak Conducted Power (3Mbps – Ch. 78)**

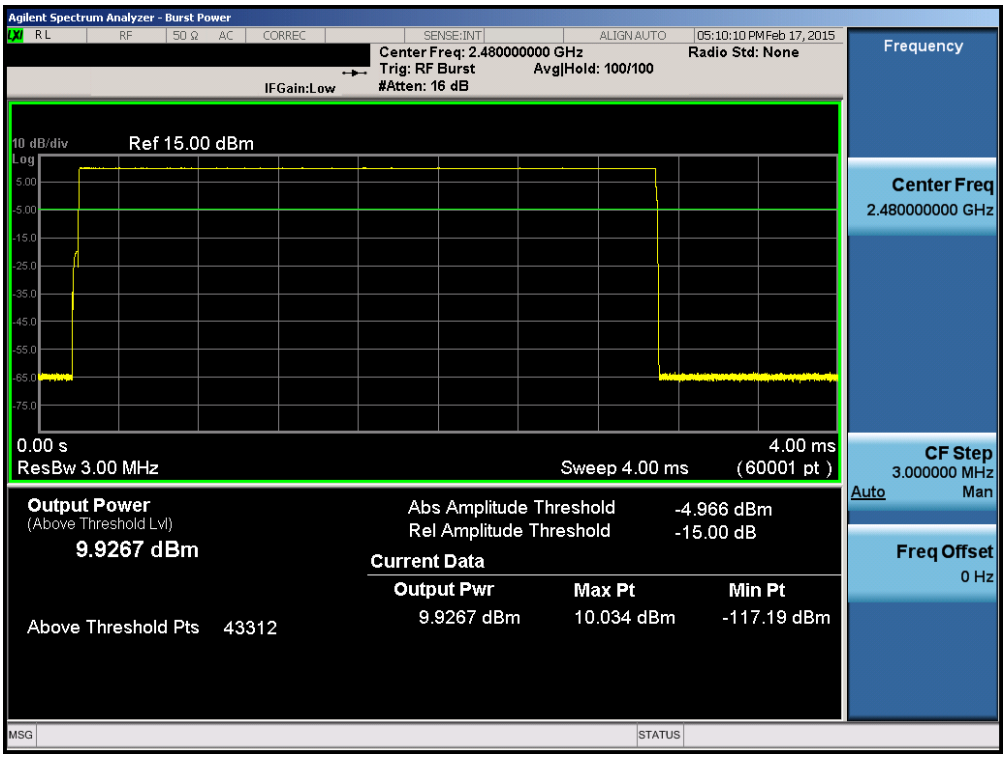



**Plot 6-19. Average Conducted Power (1Mbps – Ch. 0)**


© 2015 PCTEST Engineering Laboratory, Inc.

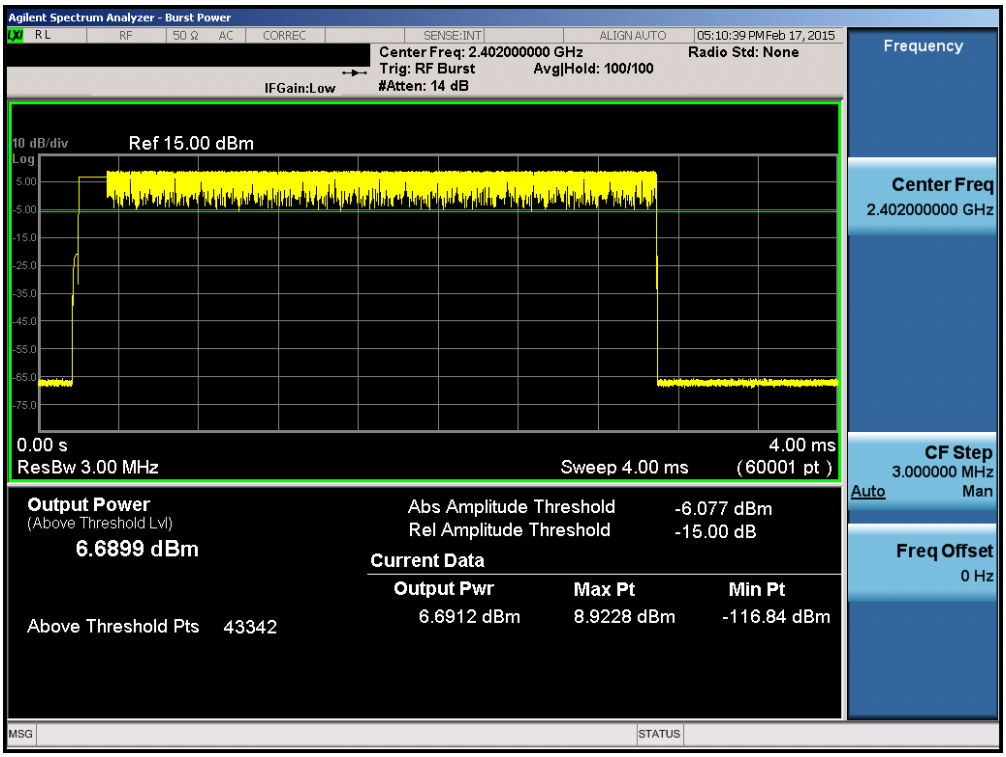



**Plot 6-20. Average Conducted Power (1Mbps – Ch. 39)**

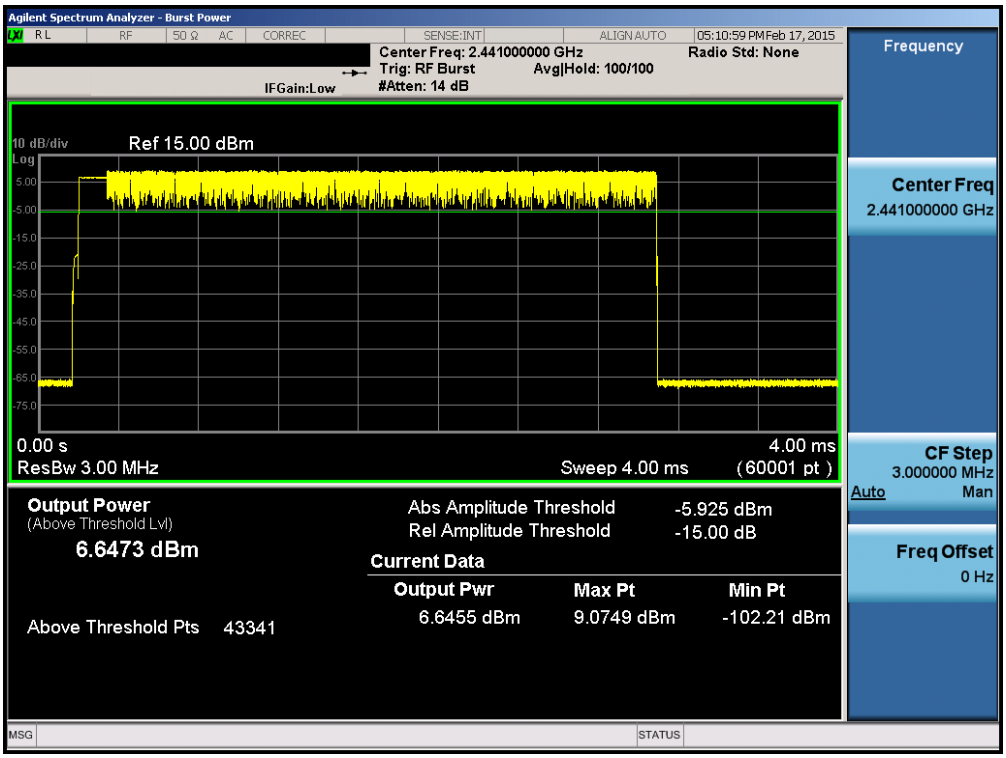



**Plot 6-21. Average Conducted Power (1Mbps – Ch. 78)**


© 2015 PCTEST Engineering Laboratory, Inc.

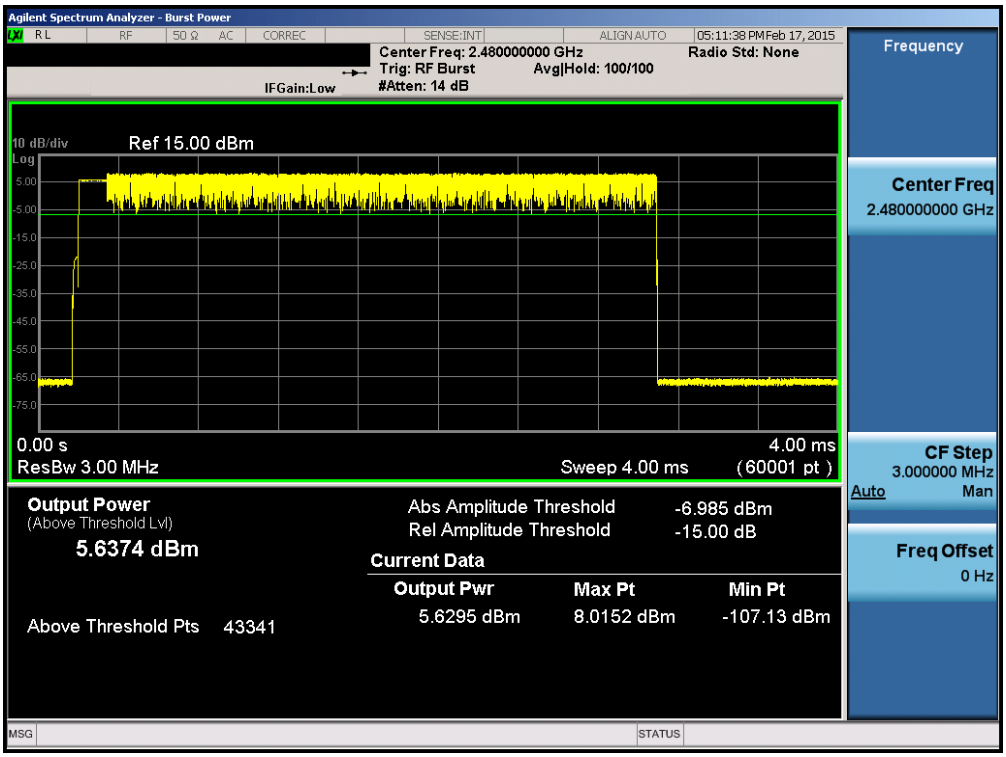



**Plot 6-22. Average Conducted Power (2Mbps – Ch. 0)**

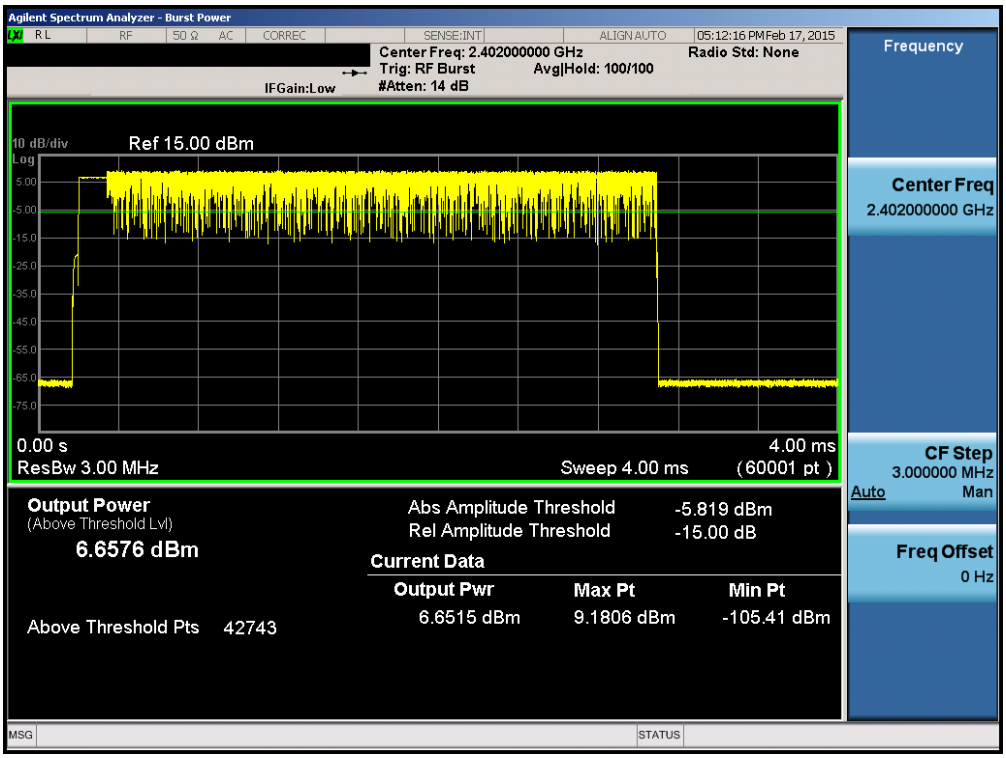



**Plot 6-23. Average Conducted Power (2Mbps – Ch. 39)**


© 2015 PCTEST Engineering Laboratory, Inc.

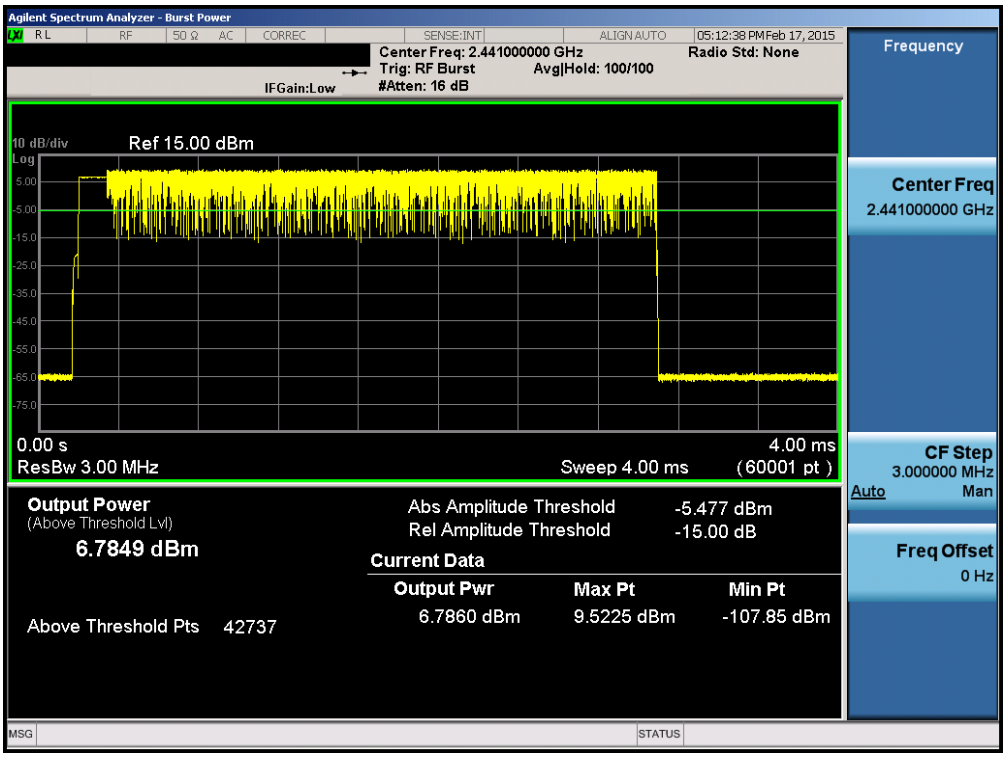



**Plot 6-24. Average Conducted Power (2Mbps – Ch. 78)**

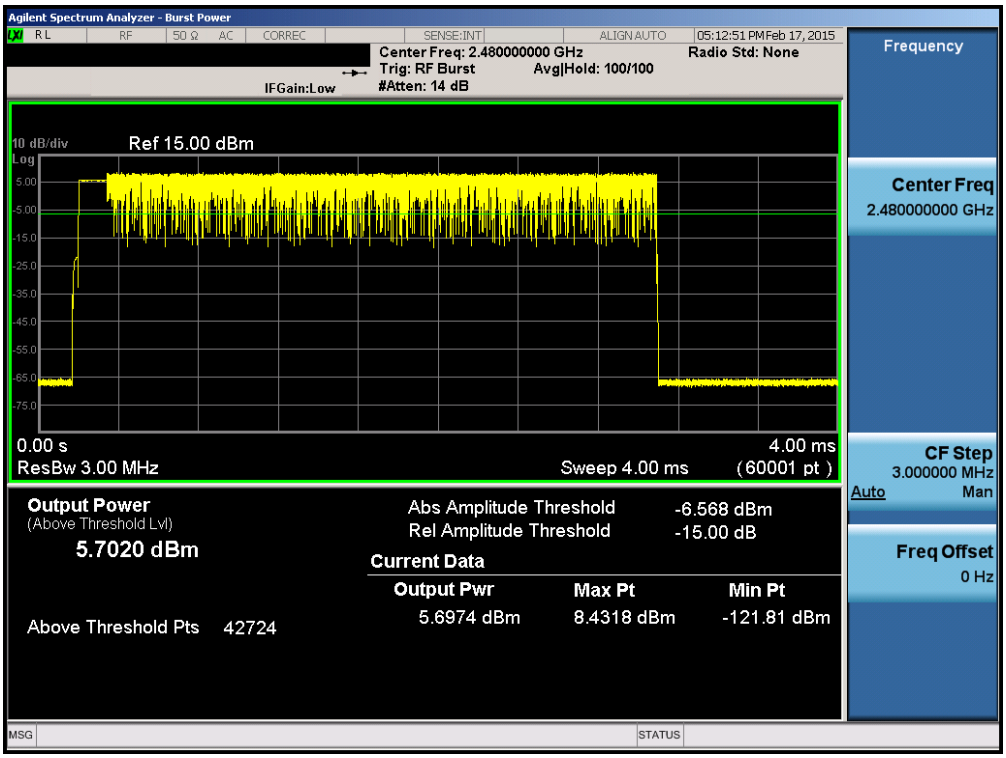



**Plot 6-25. Average Conducted Power (3Mbps – Ch. 0)**


© 2015 PCTEST Engineering Laboratory, Inc.




**Plot 6-26. Average Conducted Power (3Mbps – Ch. 39)**




**Plot 6-27. Average Conducted Power (3Mbps – Ch. 78)**

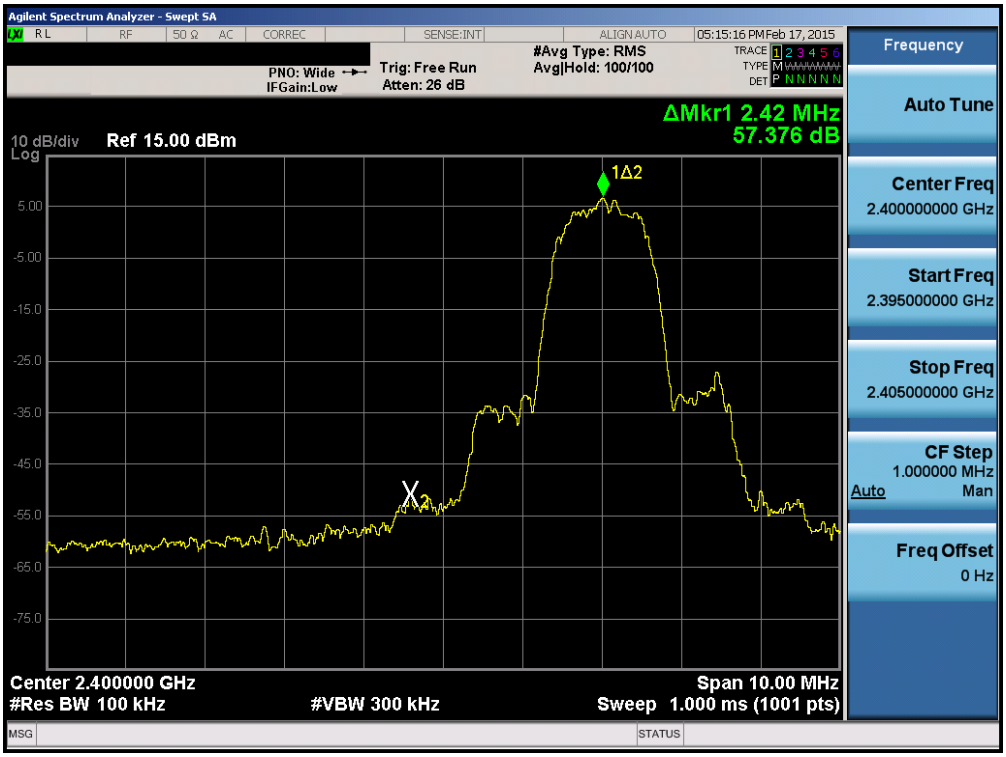

© 2015 PCTEST Engineering Laboratory, Inc.

## 6.4 Band Edge Compliance

**§15.247 (d)**

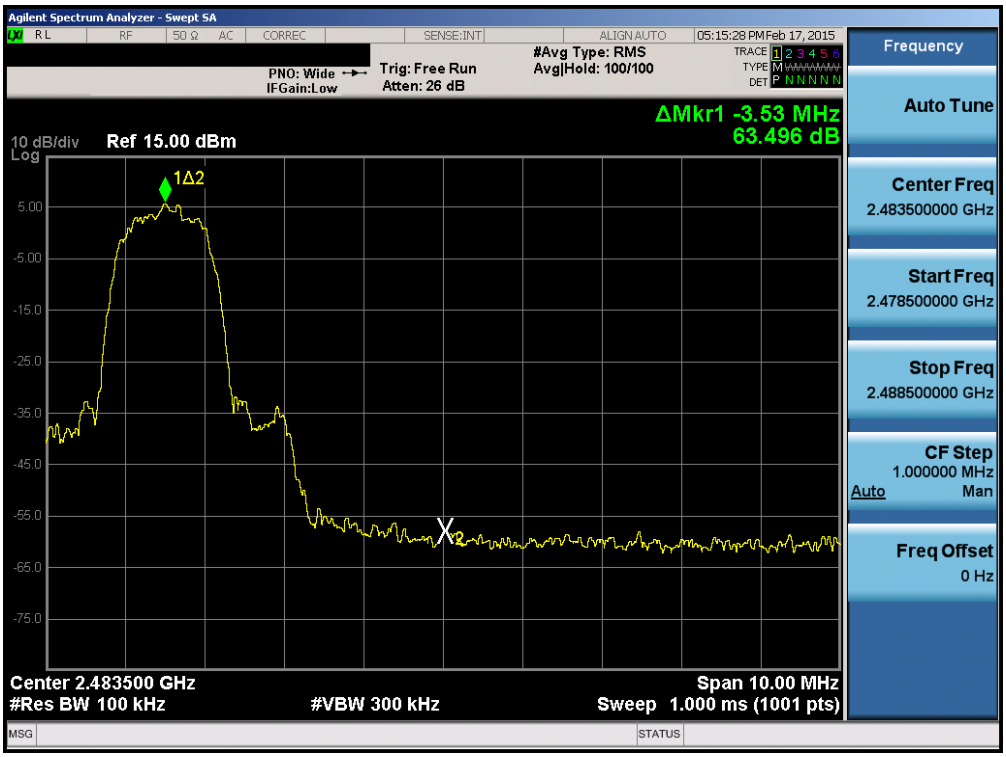
Measurement is taken at the highest point located outside of the emission bandwidth. ***The maximum permissible emission level is 20 dBc. Any emission lying outside of the emission bandwidth and in a restricted band is subject to a field strength limit specified in Section 15.209 of the Title 47 CFR.***

Out of band conducted spurious emissions at the band edge were investigated for all data rates and the worst case emissions were found with the EUT transmitting at 3 Mbps. Band edge emissions were also investigated with the EUT transmitting in all data rates. Plots of the worst case emissions are shown below.

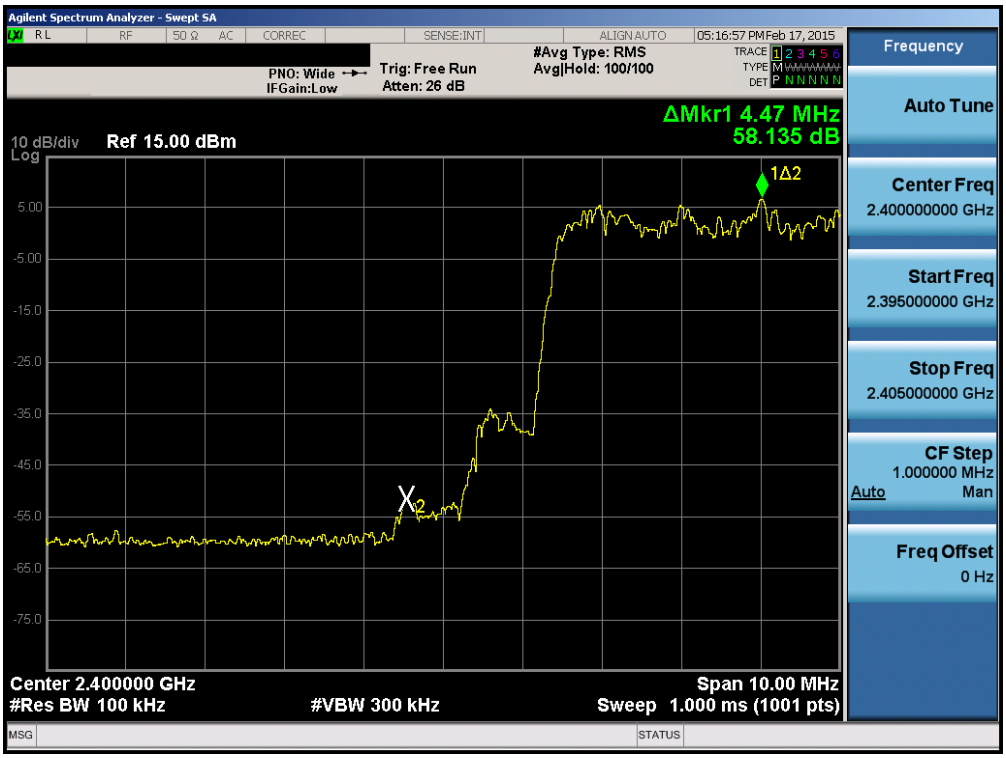



**Plot 6-28. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 0)**


© 2015 PCTEST Engineering Laboratory, Inc.

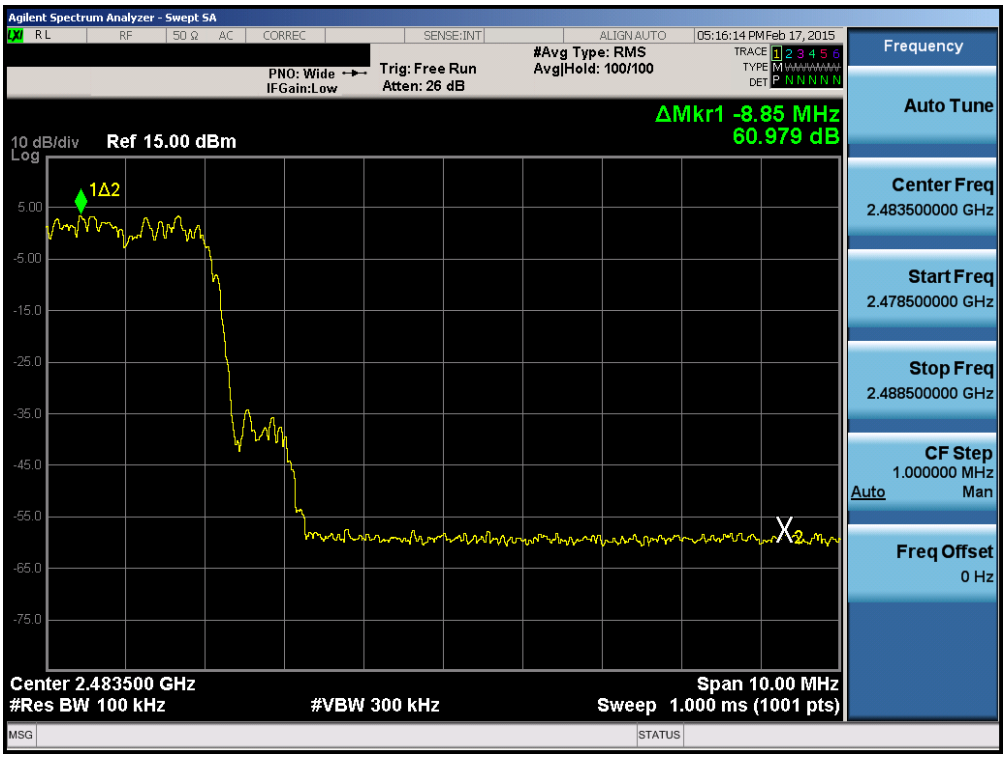



**Plot 6-29. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 78)**




**Plot 6-30. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)**


© 2015 PCTEST Engineering Laboratory, Inc.




**Plot 6-31. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps)**


© 2015 PCTEST Engineering Laboratory, Inc.

## 6.5 Carrier Frequency Separation

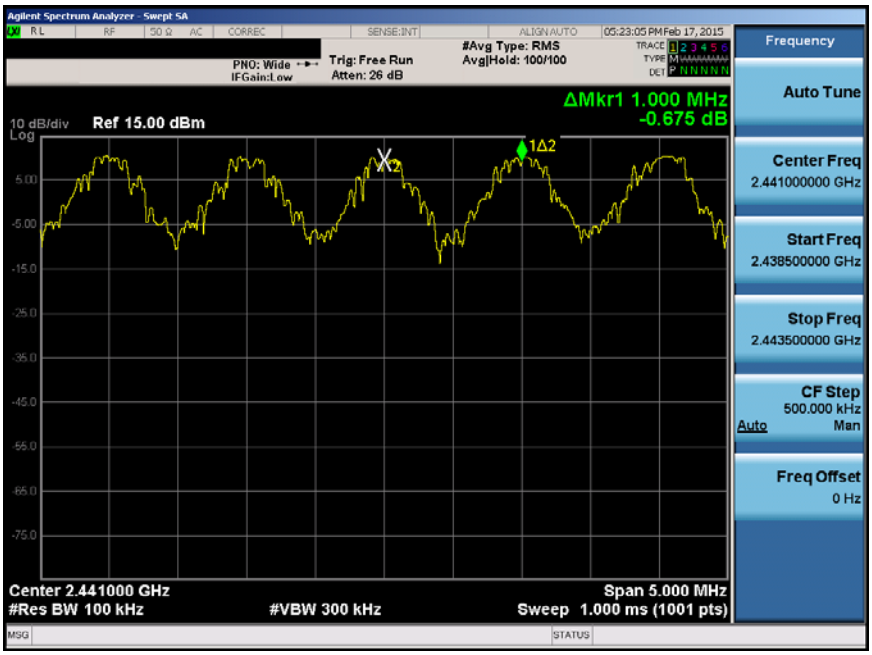
**§15.247 (a.1)**

Measurement is made with EUT operating in hopping mode. ***The minimum permissible channel separation for this system is 2/3 the value of the 20dB BW.***

The EUT complies with the minimum channel separation requirement when it is operating in 1x/EDR mode using 79 channels and when operating in AFH mode using 20 channels.

| Frequency [MHz] | Data Rate [Mbps] | Channel No. | Min. Channel Separation [MHz] |
|---|---|---|---|
| 2402 | 1.0 | 0 | 0.678 |
| 2441 | 1.0 | 39 | 0.587 |
| 2480 | 1.0 | 78 | 0.612 |
| 2402 | 2.0 | 0 | 0.895 |
| 2441 | 2.0 | 39 | 0.903 |
| 2480 | 2.0 | 78 | 0.893 |
| 2402 | 3.0 | 0 | 0.859 |
| 2441 | 3.0 | 39 | 0.912 |
| 2480 | 3.0 | 78 | 0.892 |

**Table 6-4. Minimum Channel Separation**



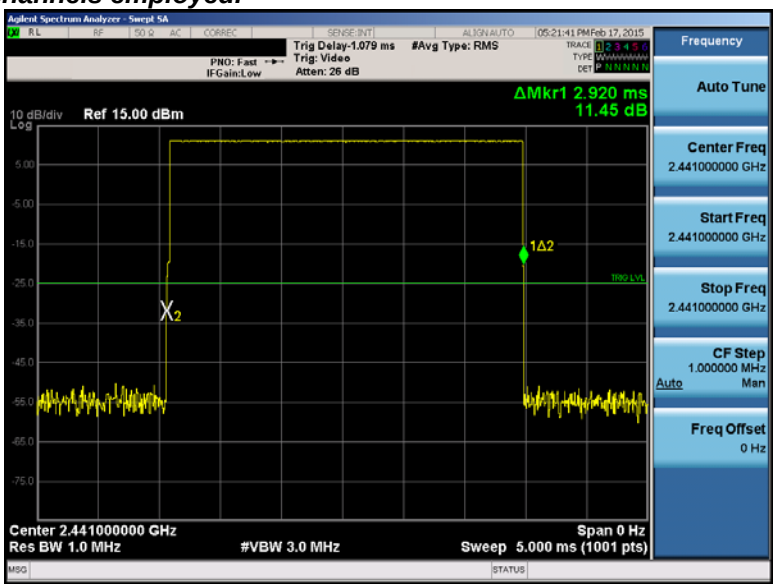

**Plot 6-32. Channel Spacing Plot (Bluetooth)**


© 2015 PCTEST Engineering Laboratory, Inc.

## 6.6 Time of Occupancy

**§15.247 (a.1.iii)**

Measurement is made while EUT is operating in hopping mode with the spectrum analyzer set to zero span. ***The maximum permissible time of occupancy is 400 ms within a period of 400ms multiplied by the number of hopping channels employed.***




**Plot 6-33. Time of Occupancy Plot (Bluetooth)**

**Bluetooth Time of Occupancy Calculation**

Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s. Since 1x/EDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of 1600 / 6 = 266.67 hops/s/slot

- 400ms x 79 hopping channels = 31.6 sec (Time of Occupancy Limit)
- Worst case BT has 266.67 hops/second (for 1x/EDR modes with DH5 operation)
- 266.67 hops/second / 79 channels = 3.38 hops/second (# of hops/second on one channel)
- 3.38 hops/second/channel x 31.6 seconds = 106.67 hops (# hops over a 31.6 second period)
- 106.67 hops x 2.920 ms/channel = 311.47 ms (worst case dwell time for one channel in 1x/EDR modes)

With AFH, the number of channels is reduced to a minimum of 20 channels and the channel hopping rate is reduced by 50% to 800 hops/s. AFH mode also uses 6 total slots so the Bluetooth transmitter hops at a rate of 800 / 6 = 133.3 hops/s/slot

- 400ms x 20 hopping channels = 8 sec (Time of Occupancy Limit)
- Worst case BT has 133.3 hops/second/slot (for AFH mode with DH5 operation)
- 133.3 hops/s / 20 channels = 6.67 hops/second (# of hops/second on one channel)
- 6.67 hops/s / channel x 8 seconds = 53.34 hops (# hops over a 8 second period)
- 53.34 hops x 2.920 ms/channel = 155.75 ms (worst case dwell time for one channel in AFH mode)

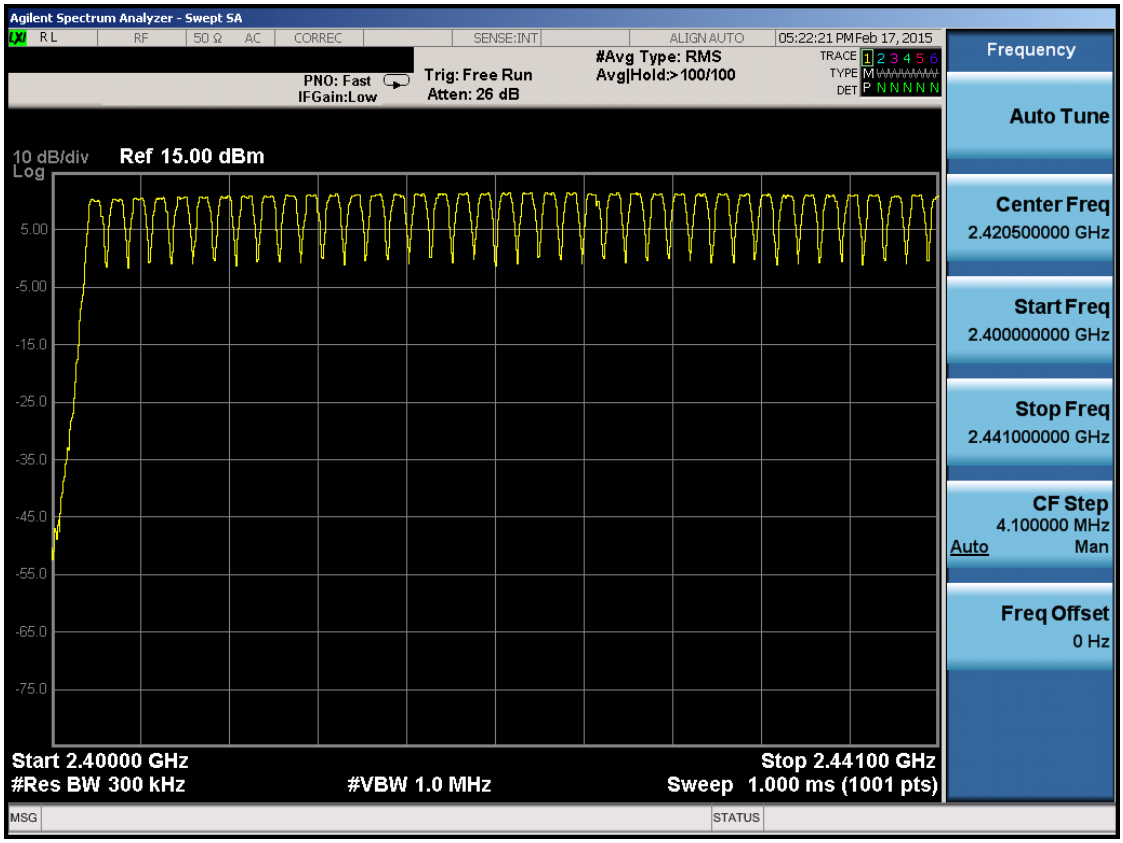

© 2015 PCTEST Engineering Laboratory, Inc.

## 6.7 Number of Hopping Channels

**§15.247 (a.1.iii)**

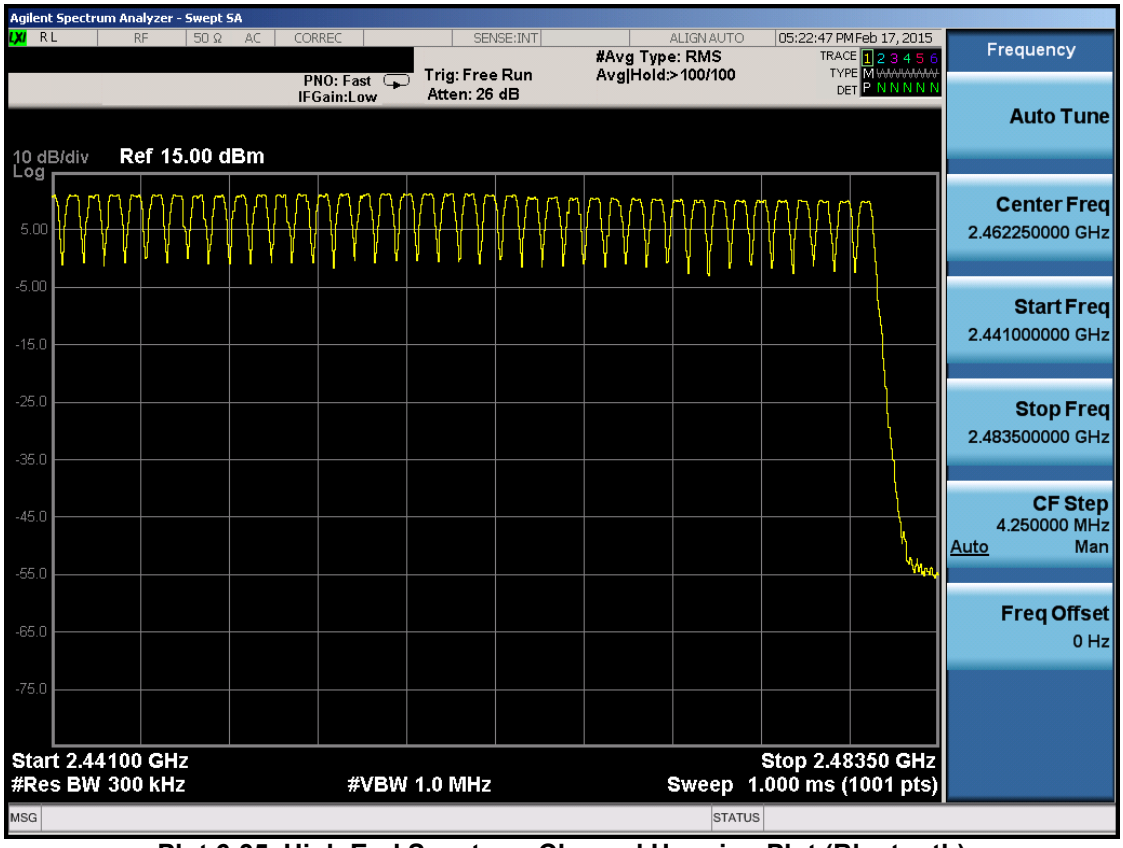
Measurement is made while EUT is operating in hopping mode. ***This frequency hopping system must employ a minimum of 15 hopping channels.***

In AFH mode, this device operates using 20 channels so the requirement for minimum number of hopping channels is satisfied.




**Plot 6-34. Low End Spectrum Channel Hopping Plot (Bluetooth)**


© 2015 PCTEST Engineering Laboratory, Inc.




**Plot 6-35. High End Spectrum Channel Hopping Plot (Bluetooth)**

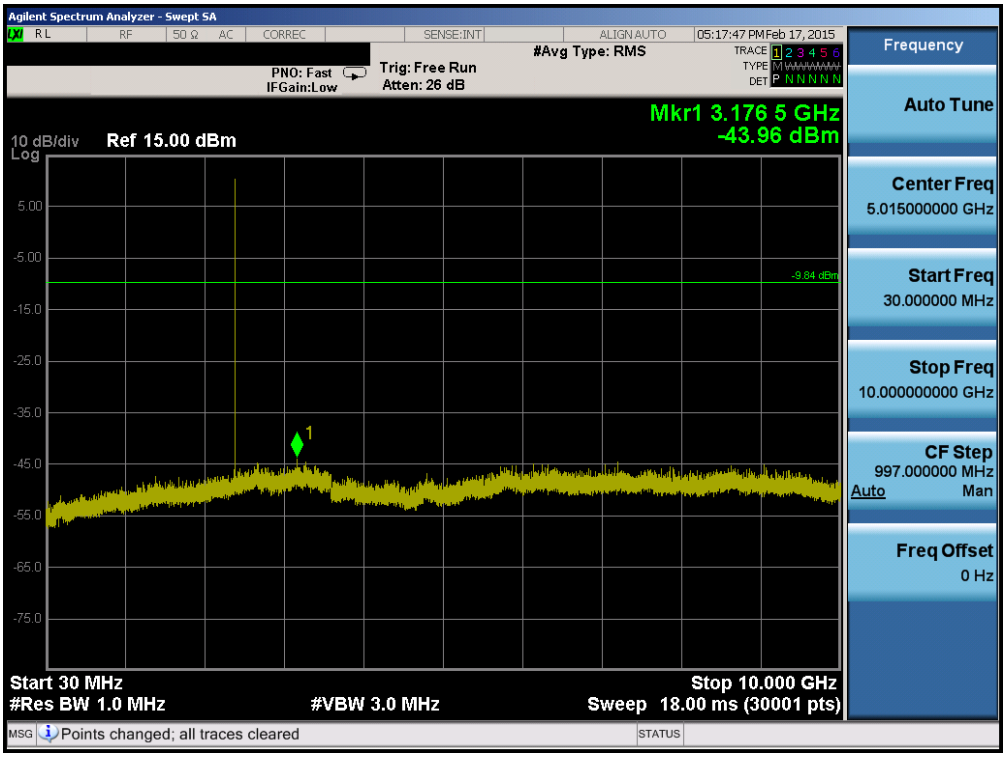

© 2015 PCTEST Engineering Laboratory, Inc.

## 6.8 Conducted Spurious Emissions

**§15.247 (d)**

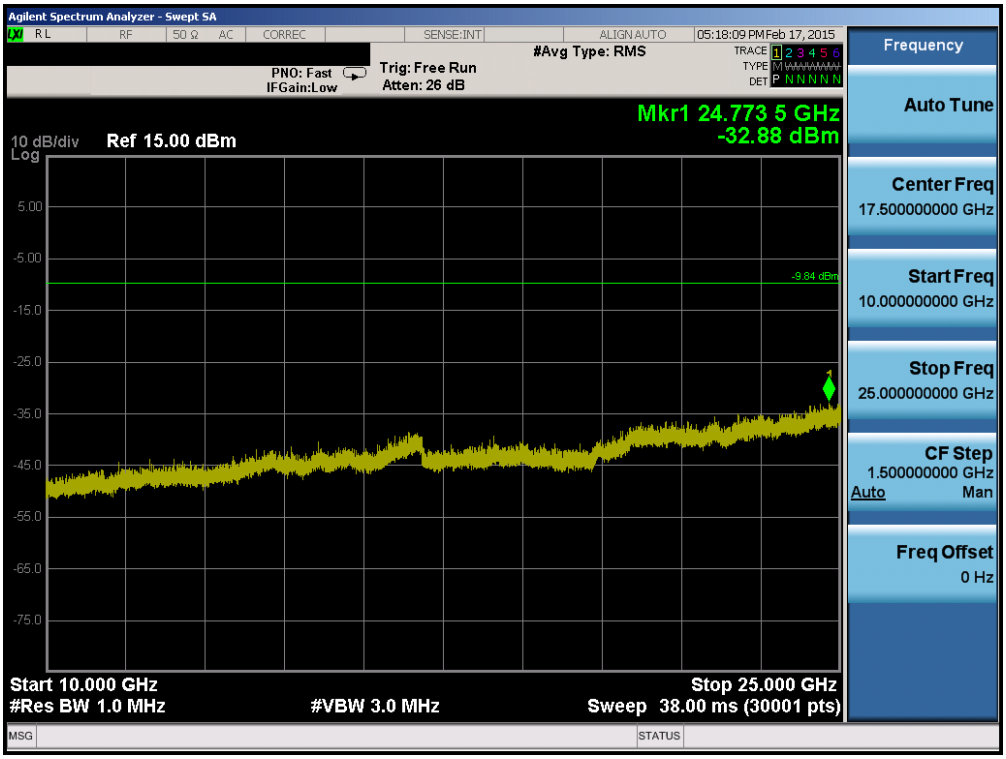
Out of band conducted spurious emissions were investigated for all data rates and the worst case emissions were found with the EUT transmitting at 1Mbps. Plots of the worst case emissions are shown below.

The display line shown in the following plots denotes the limit at 20dB below the fundamental emission level measured in a 100kHz bandwidth. However, since the traces in the following plots are measured with a 1MHz RBW, the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1MHz bandwidth.

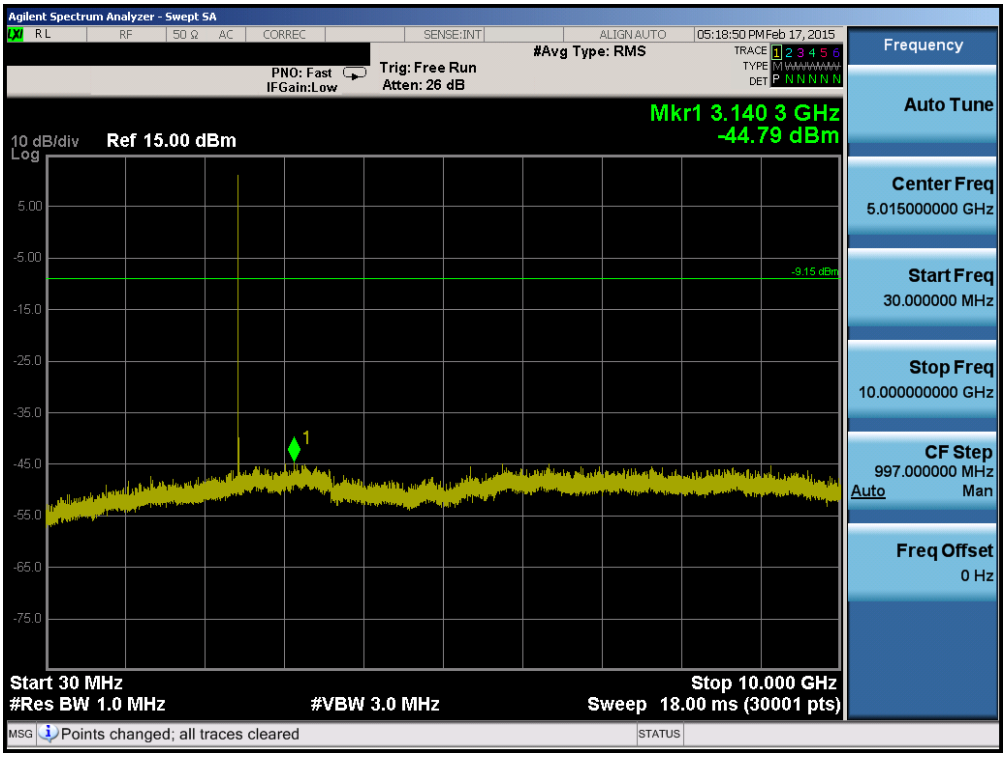



**Plot 6-36. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 0)**


© 2015 PCTEST Engineering Laboratory, Inc.

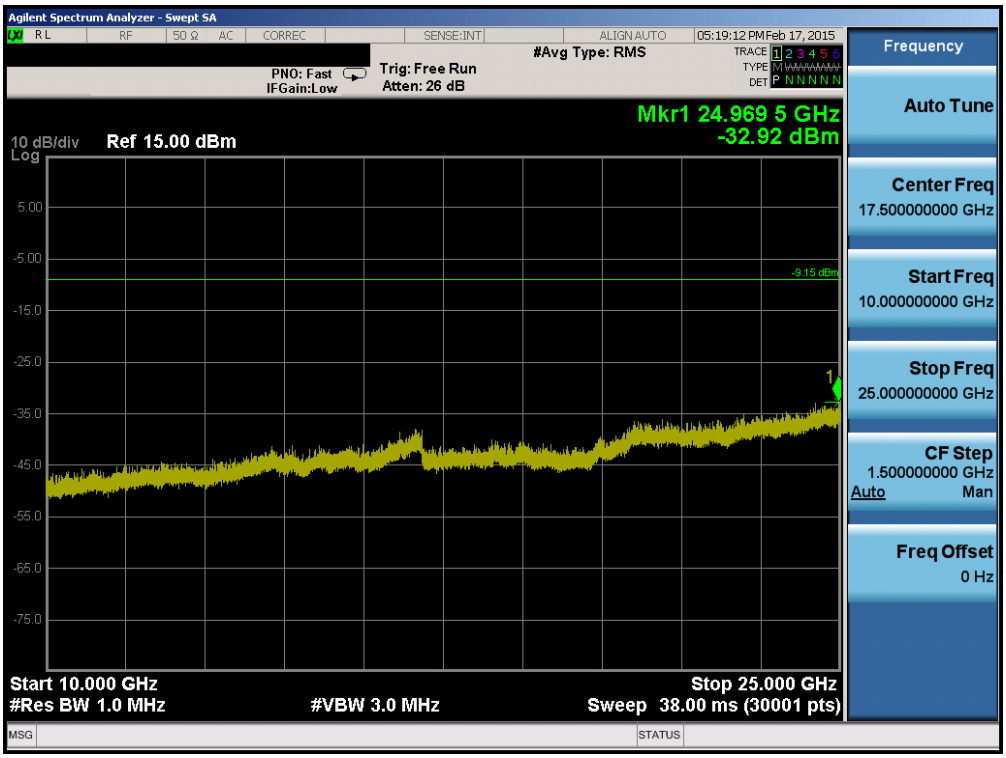



**Plot 6-37. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 0)**

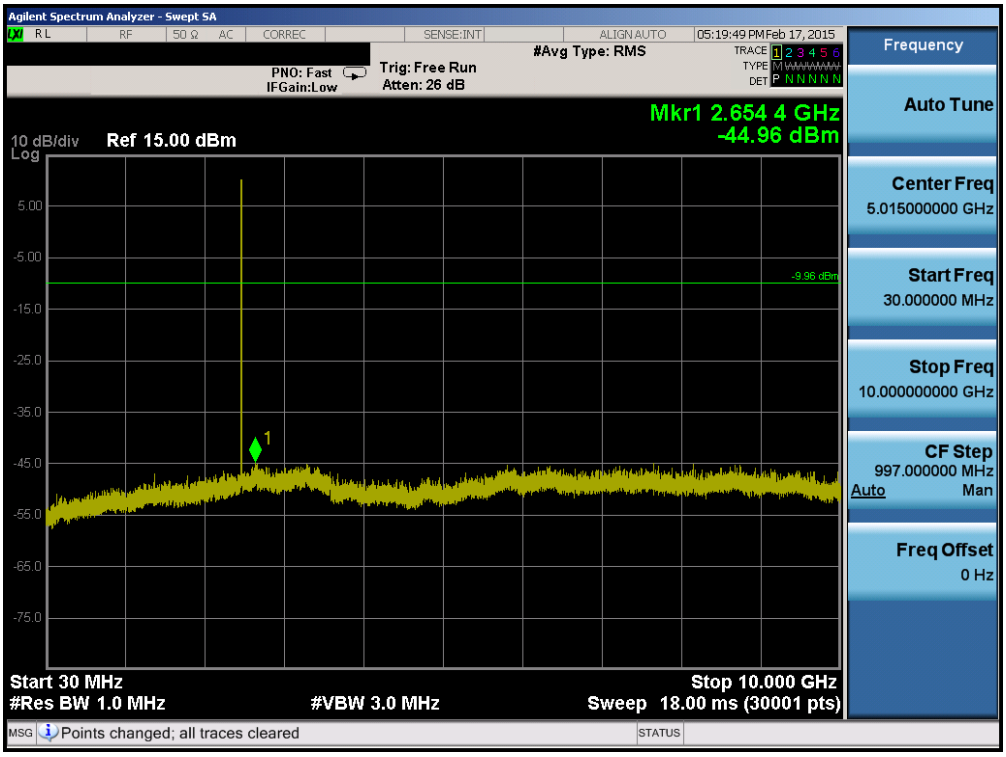



**Plot 6-38. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 39)**


© 2015 PCTEST Engineering Laboratory, Inc.

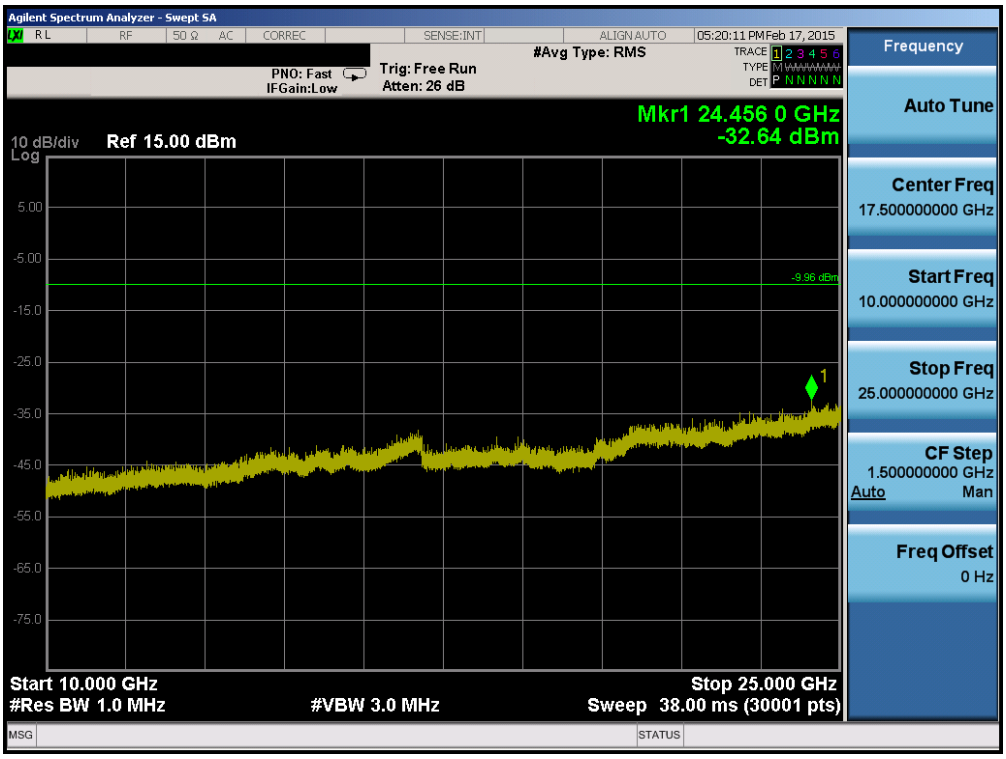



**Plot 6-39. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 39)**




**Plot 6-40. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 78)**


© 2015 PCTEST Engineering Laboratory, Inc.




**Plot 6-41. Conducted Spurious Plot (Bluetooth, 1Mbps – Ch. 78)**


© 2015 PCTEST Engineering Laboratory, Inc.

## 6.9 Radiated Spurious Emission Measurements – Above 1GHz

**§15.205 §15.209 §15.247 (d)**

| Frequency | Field Strength [μV/m] | Measured Distance [Meters] |
|---|---|---|
| Above 960.0 MHz | 500 | 3 |

**Table 6-5. Radiated Limits**

**Sample Calculation**

- Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$ + Duty Cycle Correction $_{[dB]}$
- AFCL $_{[dB/m]}$ = Antenna Factor $_{[dB/m]}$ + Cable Loss $_{[dB]}$
- Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

**Duty Cycle Correction Factor Calculation**

- Channel hop rate = 800 hops/second (AFH Mode)
- Adjusted channel hop rate for DH5 mode = 133.33 hops/second
- Time per channel hop = 1 / 133.33 hops/second = 7.50 ms
- Time to cycle through all channels = 7.50 x 20 channels = 150 ms
- Number of times transmitter hits on one channel = 100 ms / 150 ms = 1 time(s)
- Worst case dwell time = 7.5 ms
- Duty cycle correction factor = $20\log_{10}$(7.5ms/100ms) = -22.5 dB

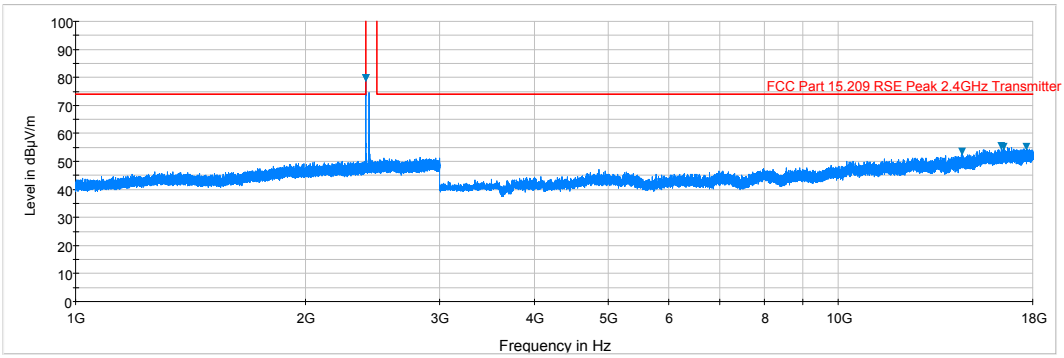
**Test Notes**

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 6-5.
2. No significant radiated emissions were found in the 2310 - 2390MHz restricted band.
3. Average measurements > 1GHz using RBW = 1MHz and VBW = 3kHz $\geq 1/\tau$ Hz, where $\tau$ = pulse width in seconds. Peak measurements > 1GHz using RBW = 1MHz and VBW = 3MHz. Both average and peak measurements were made using a peak detector.
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. This unit was tested with its standard battery.
6. The spectrum is measured from 9kHz to the 10$^{th}$ harmonic and the worst-case emissions are reported.
7. The duty cycle correction factor was not applied to noise floor measurements.
8. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.

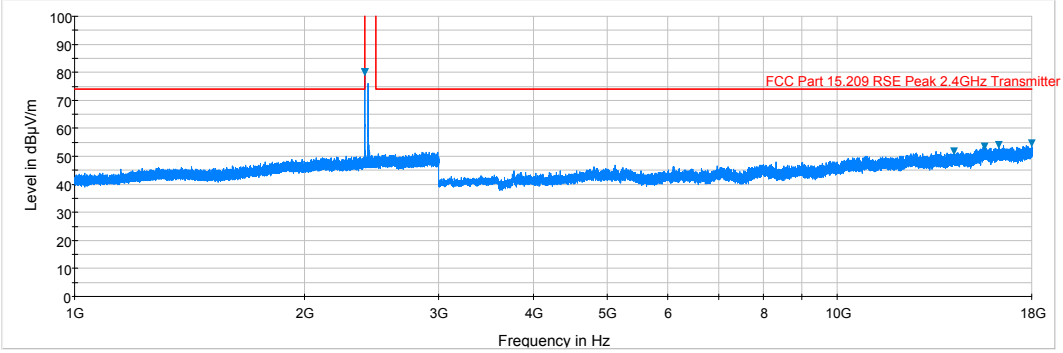

© 2015 PCTEST Engineering Laboratory, Inc.

# Radiated Spurious Emission Measurements

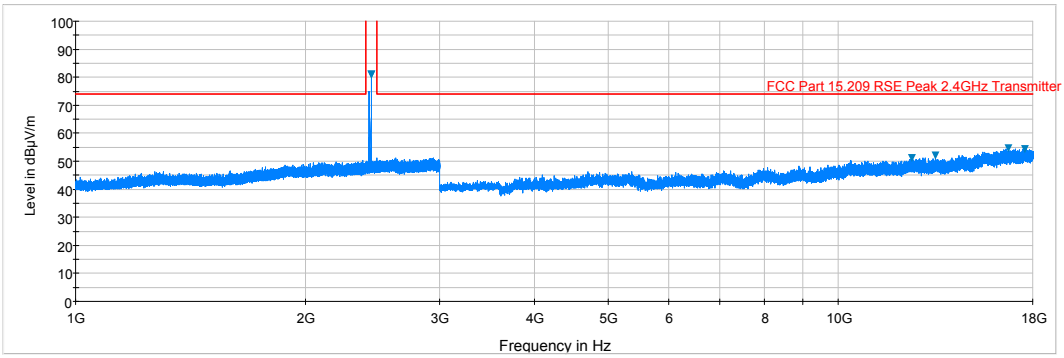
**§15.205 §15.209 §15.247 (d)**




**Plot 6-42. Radiated Spurious Plot above 1GHz (BT – Ch. 0, Ant. Pol. H)**



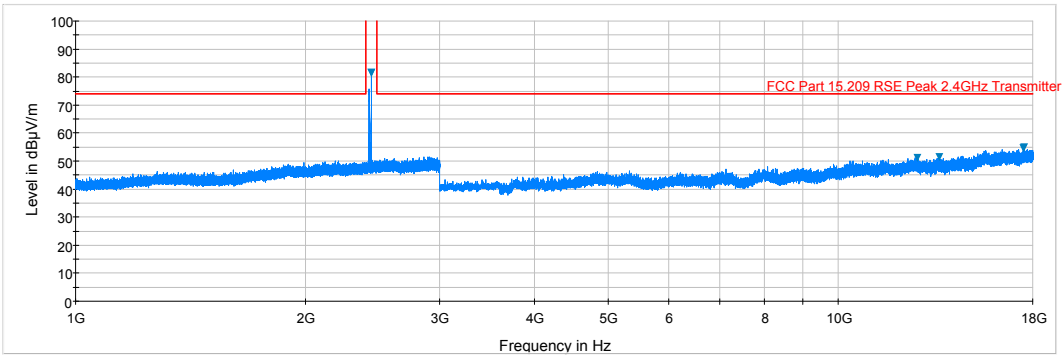

**Plot 6-43. Radiated Spurious Plot above 1GHz (BT – Ch. 0, Ant. Pol. V)**



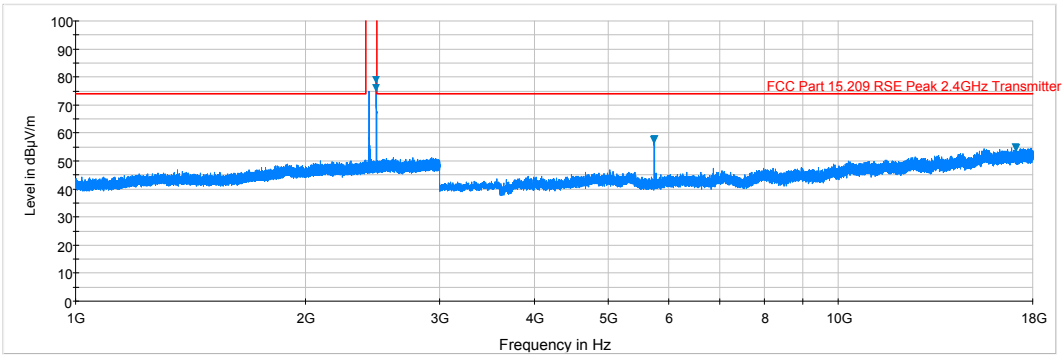

**Plot 6-44. Radiated Spurious Plot above 1GHz (BT – Ch. 39, Ant. Pol. H)**



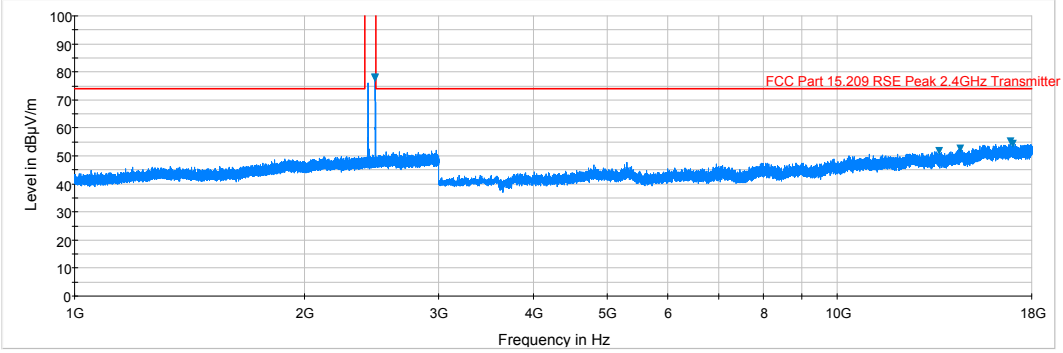
© 2015 PCTEST Engineering Laboratory, Inc.




**Plot 6-45. Radiated Spurious Plot above 1GHz (BT – Ch. 39, Ant. Pol. V)**




**Plot 6-46. Radiated Spurious Plot above 1GHz (BT – Ch. 78, Ant. Pol. H)**

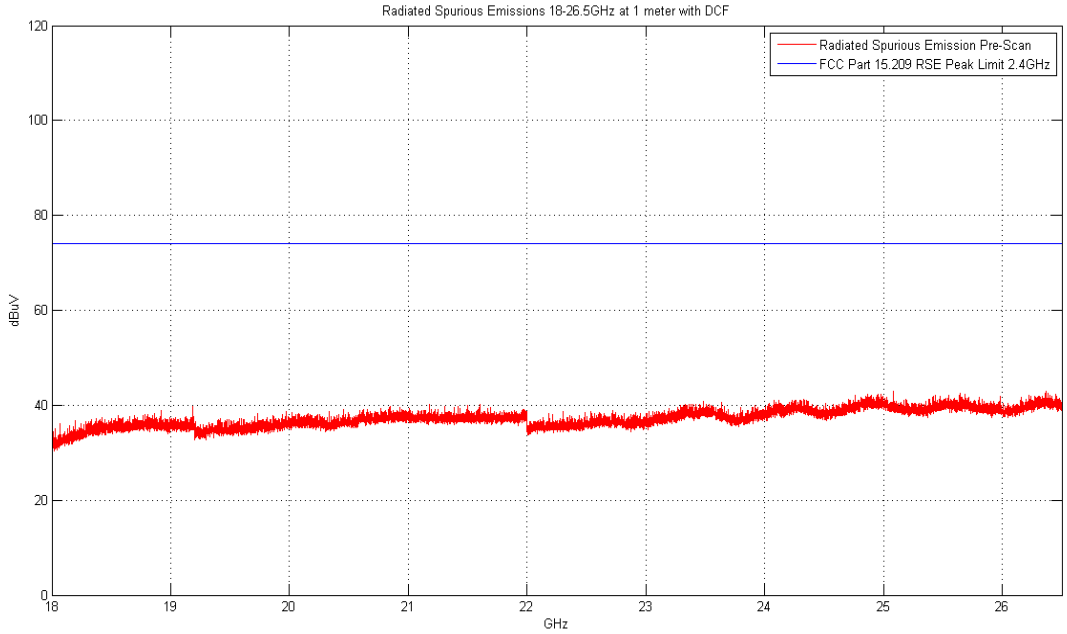



**Plot 6-47. Radiated Spurious Plot above 1GHz (BT – Ch. 78, Ant. Pol. V)**

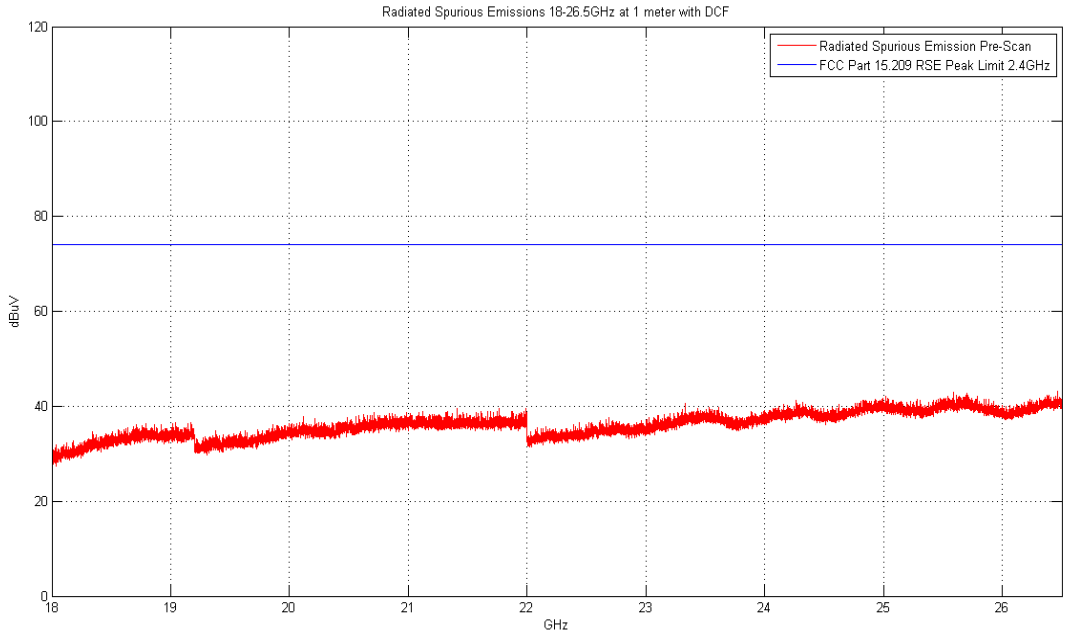

© 2015 PCTEST Engineering Laboratory, Inc.

# Radiated Spurious Emissions Measurements (Above 18GHz)

**§15.209**




**Plot 6-48. Radiated Spurious Plot above 18GHz (Pol. H)**




**Plot 6-49. Radiated Spurious Plot above 18GHz (Pol. V)**



© 2015 PCTEST Engineering Laboratory, Inc.

## Radiated Spurious Emission Measurements
§15.205 §15.209 §15.247 (d)

Worst Case Mode: Bluetooth
Worst Case Data Rate: 1 Mbps
Measurement Distance: 3 Meters
Operating Frequency: 2402MHz
Channel: 0

| Frequency [MHz] | Analyzer Level [dBm] | Detector | Ant. Pol. [H/V] | AFCL [dB] | Duty Cycle Correction [dB] | Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|
| 4804.00 | -105.94 | Avg | H | 40.39 | -22.50 | 18.95 | 53.98 | -35.03 |
| 4804.00 | -97.86 | Peak | H | 40.39 | 0.00 | 49.52 | 73.98 | -24.45 |
| 12010.00 | -111.58 | Avg | H | 46.53 | 0.00 | 41.95 | 53.98 | -12.03 |
| 12010.00 | -97.79 | Peak | H | 46.53 | 0.00 | 55.74 | 73.98 | -18.24 |

**Table 6-6. Radiated Measurements**

Worst Case Mode: Bluetooth
Worst Case Data Rate: 1 Mbps
Measurement Distance: 3 Meters
Operating Frequency: 2441MHz
Channel: 39

| Frequency [MHz] | Analyzer Level [dBm] | Detector | Ant. Pol. [H/V] | AFCL [dB] | Duty Cycle Correction [dB] | Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|
| 4882.00 | -105.22 | Avg | H | 40.45 | -22.50 | 19.73 | 53.98 | -34.25 |
| 4882.00 | -96.74 | Peak | H | 40.45 | 0.00 | 50.71 | 73.98 | -23.27 |
| 7323.00 | -107.52 | Avg | H | 42.87 | -22.50 | 19.85 | 53.98 | -34.13 |
| 7323.00 | -98.21 | Peak | H | 42.87 | 0.00 | 51.66 | 73.98 | -22.32 |
| 12205.00 | -112.11 | Avg | H | 46.67 | 0.00 | 41.56 | 53.98 | -12.42 |
| 12205.00 | -99.09 | Peak | H | 46.67 | 0.00 | 54.58 | 73.98 | -19.40 |

**Table 6-7. Radiated Measurements**


© 2015 PCTEST Engineering Laboratory, Inc.

## Radiated Spurious Emission Measurements
§15.205 §15.209 §15.247 (d)

Worst Case Mode: Bluetooth
Worst Case Data Rate: 1 Mbps
Measurement Distance: 3 Meters
Operating Frequency: 2480MHz
Channel: 78

| Frequency [MHz] | Analyzer Level [dBm] | Detector | Ant. Pol. [H/V] | AFCL [dB] | Duty Cycle Correction [dB] | Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|
| 4960.00 | -108.38 | Avg | H | 40.49 | -22.50 | 16.61 | 53.98 | -37.37 |
| 4960.00 | -98.27 | Peak | H | 40.49 | 0.00 | 49.22 | 73.98 | -24.76 |
| 7440.00 | -104.90 | Avg | H | 42.92 | -22.50 | 22.52 | 53.98 | -31.46 |
| 7440.00 | -96.10 | Peak | H | 42.92 | 0.00 | 53.82 | 73.98 | -20.16 |
| 12400.00 | -111.44 | Avg | H | 46.90 | 0.00 | 42.46 | 53.98 | -11.51 |
| 12400.00 | -98.38 | Peak | H | 46.90 | 0.00 | 55.52 | 73.98 | -18.45 |

**Table 6-8. Radiated Measurements**

Worst Case Mode: Bluetooth
Worst Case Data Rate: 1 Mbps
Measurement Distance: 3 Meters
Operating Frequency: 2441MHz
Channel: 39

| Frequency [MHz] | Analyzer Level [dBm] | Detector | Ant. Pol. [H/V] | AFCL [dB] | Duty Cycle Correction [dB] | Field Strength [dBµV/m] | Limit [dBµV/m] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|
| 4882.00 | -105.51 | Avg | H | 40.45 | -22.50 | 19.44 | 53.98 | -34.54 |
| 4882.00 | -96.98 | Peak | H | 40.45 | 0.00 | 50.47 | 73.98 | -23.51 |
| 7323.00 | -107.28 | Avg | H | 42.87 | -22.50 | 20.09 | 53.98 | -33.89 |
| 7323.00 | -97.78 | Peak | H | 42.87 | 0.00 | 52.09 | 73.98 | -21.89 |
| 12205.00 | -111.86 | Avg | H | 46.67 | 0.00 | 41.81 | 53.98 | -12.17 |
| 12205.00 | -98.85 | Peak | H | 46.67 | 0.00 | 54.82 | 73.98 | -19.16 |

**Table 6-9. Radiated Measurements with WCP**


© 2015 PCTEST Engineering Laboratory, Inc.

## 6.10 Radiated Restricted Band Edge Measurements

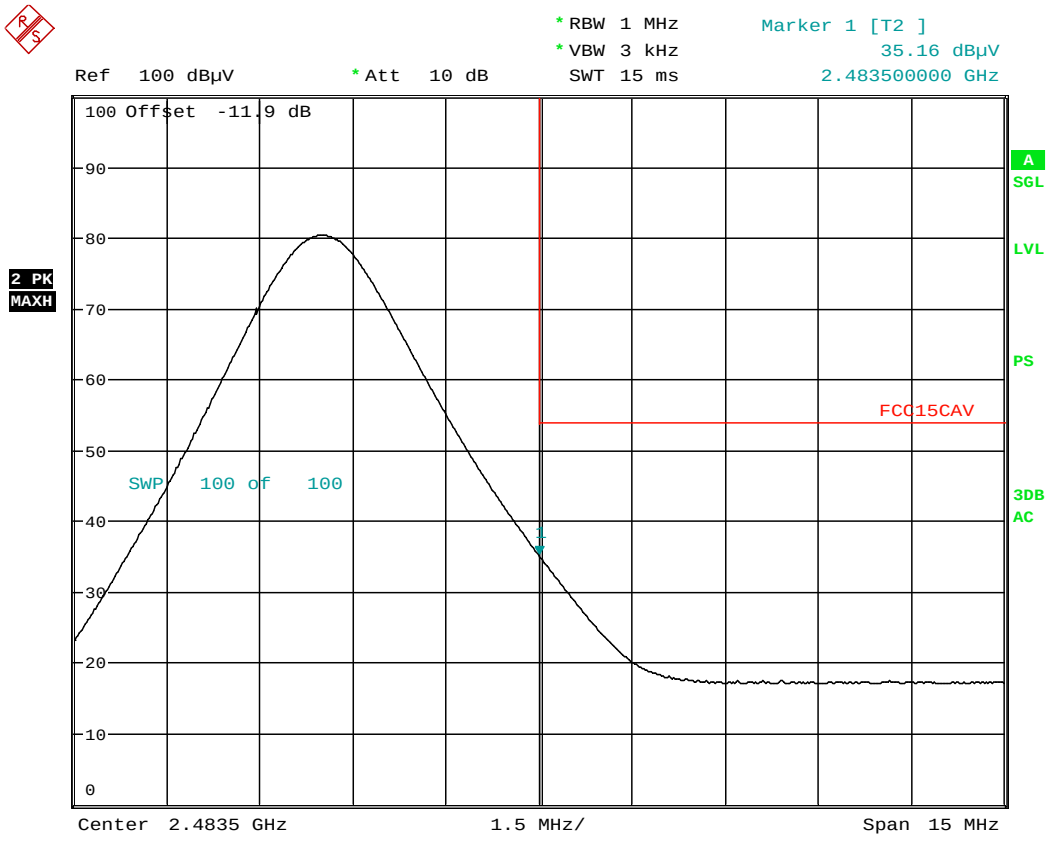
**§15.205 §15.209 §15.247 (d)**

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting. Two different amplitude offsets were used depending on whether peak or average measurements were measured. The average measurements use a duty cycle correction factor (DCCF).

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + 10 dB Attenuator) – Preamplifier Gain + DCCF

| | |
|---|---|
| Worst Case Mode: | Bluetooth |
| Worst Case Data Rate: | 1 Mbps |
| Measurement Distance: | 3 Meters |
| Operating Frequency: | 2480MHz |
| Channel: | 78 |




Date: 25.FEB.2015 16:37:51

**Plot 6-50. Radiated Restricted Upper Band Edge Measurement (Average)**

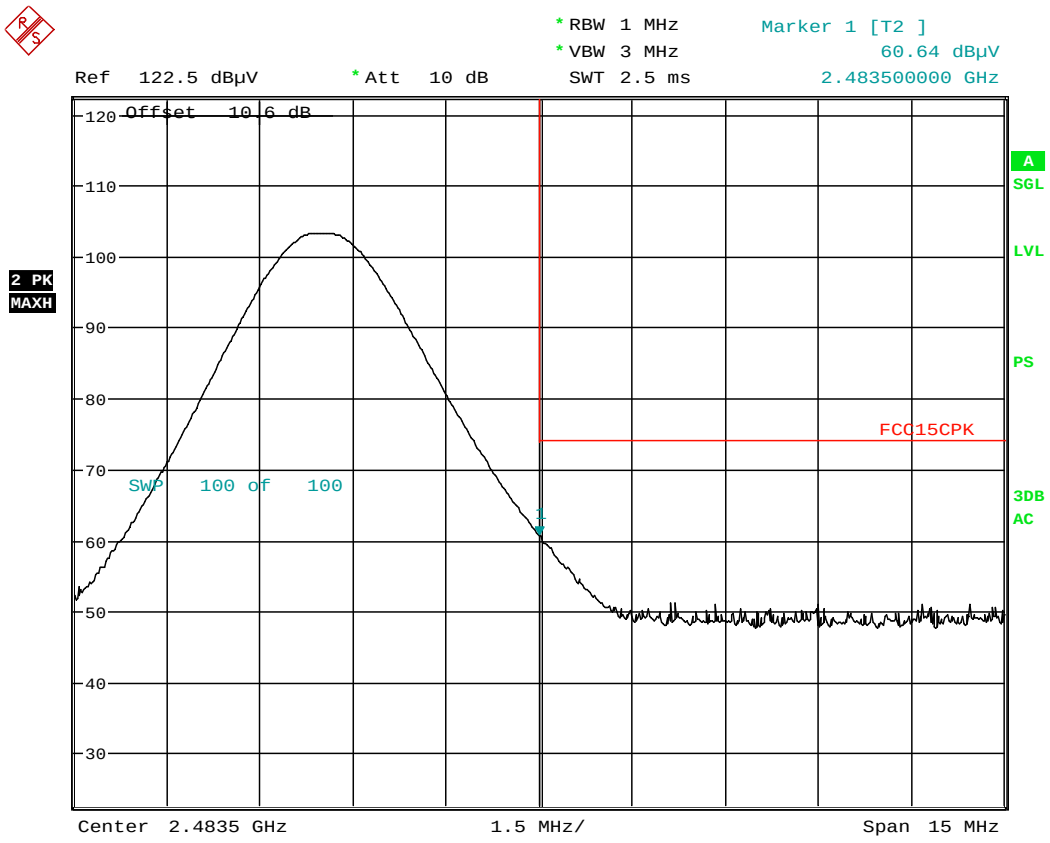


© 2015 PCTEST Engineering Laboratory, Inc.

## Radiated Restricted Band Edge Measurements
**§15.205 §15.209 §15.247 (d)**

The amplitude offset shown in the following plots for peak measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + 10 dB Attenuator) – Preamplifier Gain




Date: 25.FEB.2015 16:38:55

**Plot 6-51. Radiated Restricted Upper Band Edge Measurement (Peak)**


© 2015 PCTEST Engineering Laboratory, Inc.

## 6.11 Radiated Spurious Emissions Measurements – Below 1GHz

**§15.209**

**Test Overview and Limit**

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

***All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 6-10 per Section 15.209.***

| Frequency | Field Strength [μV/m] | Measured Distance [Meters] |
|---|---|---|
| 0.009 – 0.490 MHz | 2400/F (kHz) | 300 |
| 0.490 – 1.705 MHz | 24000/F (kHz) | 30 |
| 1.705 – 30.00 MHz | 30 | 30 |
| 30.00 – 88.00 MHz | 100 | 3 |
| 88.00 – 216.0 MHz | 150 | 3 |
| 216.0 – 960.0 MHz | 200 | 3 |
| Above 960.0 MHz | 500 | 3 |

**Table 6-10. Radiated Limits**

**Test Procedures Used**

ANSI C63.4-2009

**Test Settings**

**Quasi-Peak Field Strength Measurements**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize


© 2015 PCTEST Engineering Laboratory, Inc.

## Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

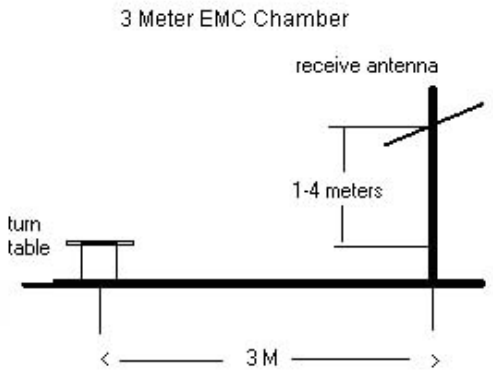



**Figure 6-3. Test Instrument & Measurement Setup**

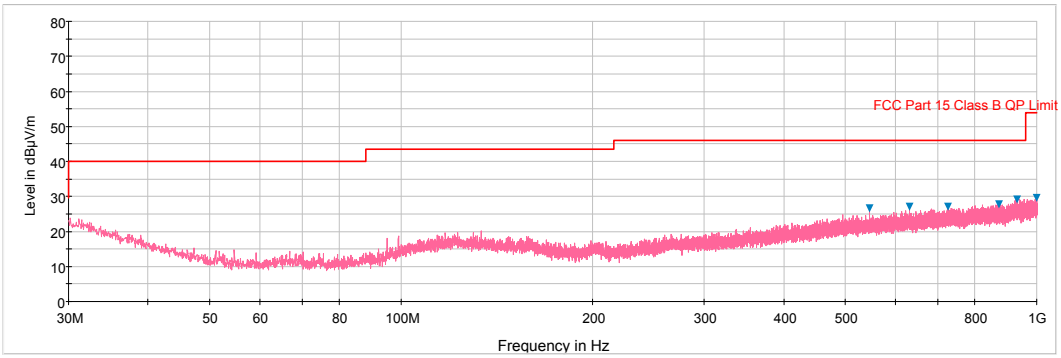
## Test Notes

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 6-10.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested with its standard battery.
4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
5. Emissions were measured at a 3 meter test distance.
6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
7. No spurious emissions were detected within 20dB of the limit below 30MHz.
8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
9. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

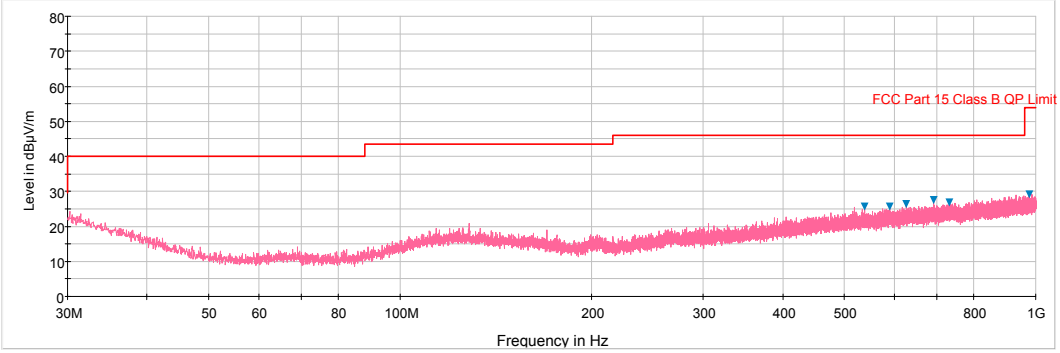

© 2015 PCTEST Engineering Laboratory, Inc.

# Radiated Spurious Emissions Measurements (Below 1GHz)

**§15.209**




**Plot 6-52. Radiated Spurious Plot below 1GHz (Pol. H)**



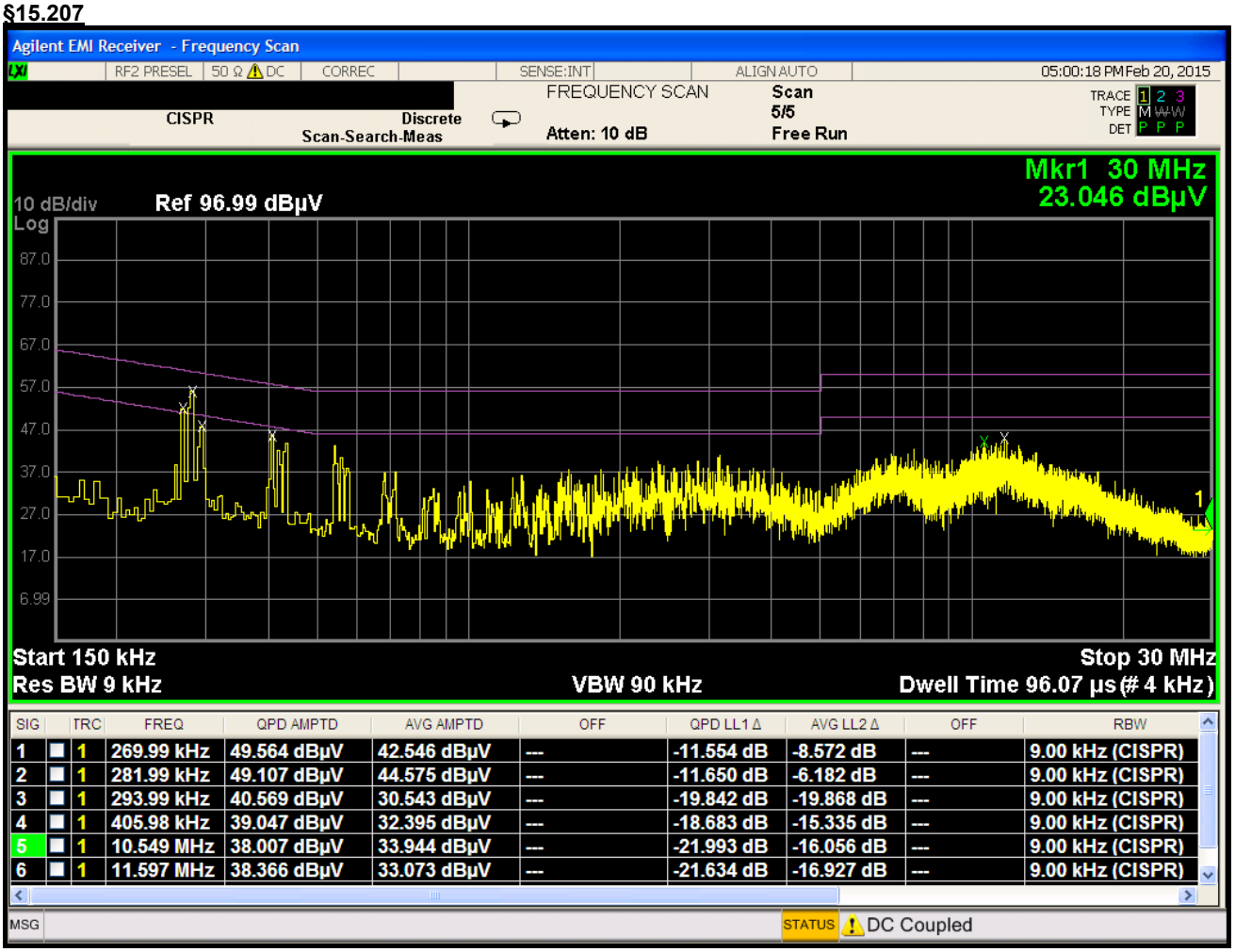

**Plot 6-53. Radiated Spurious Plot below 1GHz (Pol. V)**



© 2015 PCTEST Engineering Laboratory, Inc.

## 6.12 Line Conducted Measurement Data

§15.207




| SIG | TRC | FREQ | QPD AMPTD | AVG AMPTD | OFF | QPD LL1 Δ | AVG LL2 Δ | OFF | RBW |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 269.99 kHz | 49.564 dBµV | 42.546 dBµV | --- | -11.554 dB | -8.572 dB | --- | 9.00 kHz (CISPR) |
| 2 | 1 | 281.99 kHz | 49.107 dBµV | 44.575 dBµV | --- | -11.650 dB | -6.182 dB | --- | 9.00 kHz (CISPR) |
| 3 | 1 | 293.99 kHz | 40.569 dBµV | 30.543 dBµV | --- | -19.842 dB | -19.868 dB | --- | 9.00 kHz (CISPR) |
| 4 | 1 | 405.98 kHz | 39.047 dBµV | 32.395 dBµV | --- | -18.683 dB | -15.335 dB | --- | 9.00 kHz (CISPR) |
| 5 | 1 | 10.549 MHz | 38.007 dBµV | 33.944 dBµV | --- | -21.993 dB | -16.056 dB | --- | 9.00 kHz (CISPR) |
| 6 | 1 | 11.597 MHz | 38.366 dBµV | 33.073 dBµV | --- | -21.634 dB | -16.927 dB | --- | 9.00 kHz (CISPR) |

**Plot 6-54. Line-Conducted Test Plot (L1)**

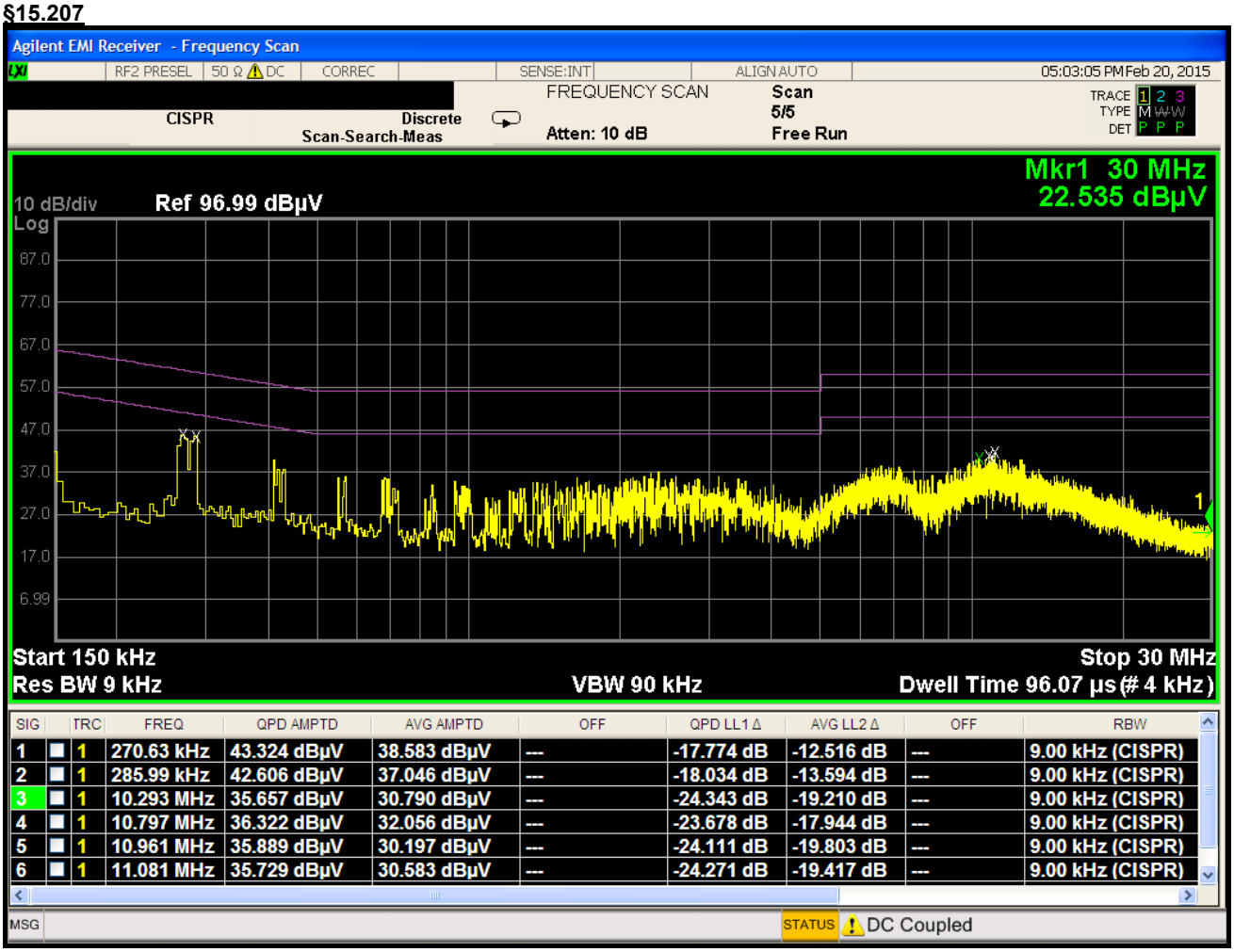
**Notes:**

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in BT BDR mode using 1Mbps on Channel 39. The emissions found were not affected by the choice of channel used during testing.
2. The limit for an intentional radiator from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
5. Margin (dB) = QP/AV Limit (dBµV) - QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.


© 2015 PCTEST Engineering Laboratory, Inc.

# Line Conducted Measurement Data

**§15.207**




| SIG | TRC | FREQ | QPD AMPTD | AVG AMPTD | OFF | QPD LL1 Δ | AVG LL2 Δ | OFF | RBW |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 270.63 kHz | 43.324 dBµV | 38.583 dBµV | --- | -17.774 dB | -12.516 dB | --- | 9.00 kHz (CISPR) |
| 2 | 1 | 285.99 kHz | 42.606 dBµV | 37.046 dBµV | --- | -18.034 dB | -13.594 dB | --- | 9.00 kHz (CISPR) |
| 3 | 1 | 10.293 MHz | 35.657 dBµV | 30.790 dBµV | --- | -24.343 dB | -19.210 dB | --- | 9.00 kHz (CISPR) |
| 4 | 1 | 10.797 MHz | 36.322 dBµV | 32.056 dBµV | --- | -23.678 dB | -17.944 dB | --- | 9.00 kHz (CISPR) |
| 5 | 1 | 10.961 MHz | 35.889 dBµV | 30.197 dBµV | --- | -24.111 dB | -19.803 dB | --- | 9.00 kHz (CISPR) |
| 6 | 1 | 11.081 MHz | 35.729 dBµV | 30.583 dBµV | --- | -24.271 dB | -19.417 dB | --- | 9.00 kHz (CISPR) |

**Plot 6-55. Line-Conducted Test Plot (N)**

**Notes:**

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in BT BDR mode using 1Mbps on Channel 39. The emissions found were not affected by the choice of channel used during testing.
2. The limit for an intentional radiator from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
5. Margin (dB) = QP/AV Limit (dBµV) - QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.



© 2015 PCTEST Engineering Laboratory, Inc.

# 7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSC04G** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules.


© 2015 PCTEST Engineering Laboratory, Inc.