# EMI Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Part 15 Subpart C

# RIM Testing Services (RTS)

## A division of Research In Motion Limited

**REPORT NO.:** RTS-0428-0606-08

**PRODUCT MODEL NO.**: RBE41GW
**TYPE NAME**: BlackBerry
**FCC ID**: L6ARBE40GW
**IC**: 2503A-RBE40GW

**DATE**: 25 July 2006

## Statement of Performance:

The BlackBerry Wireless Handheld, model RBA41GW, ASY-11454-xyz Rev P_ASY-11509-001 Rev L, and accessories when configured and operated per RIM's operation instructions, performs within the requirements of the test standards.

## Declaration:

We hereby certify that:
The test data reported herein is an accurate record of the performance of the sample(s) tested.
The test results are valid for the tested unit (s) only.
The test equipment used was suitable for the tests performed and within manufacturer's published specifications and operating parameters.
The test methods were consistent with the methods described in the relevant standards.

Tested by:

Edward A. Davidian
Compliance Specialist
Date: 25 July 2006

Maurice Battler
Compliance Specialist
Date: 25 July 2006

Masud S. Attayi, P.Eng.
Senior Compliance Engineer,
Date: July 25, 2006

Approved by:

Paul G. Cardinal, Ph.D.
Manager
Date: 26 July 2006

## Table of Contents

## A. Scope

This report details the results of compliance tests which were performed in accordance to the requirements of:

- FCC CFR 15 Subpart C, Dec. 8, 2003
- Industry Canada, RSS-210, Issue 6, September 2005, Low Power Licence-Exempt Radiocommunication Devices

## B. Associated Documents

Test report number RTS-0428-0606-07.

## C. Product Identification

The equipment under test (EUT) was tested at the RIM Testing Services (RTS) EMI test facility, located at:

305 Phillip Street
Waterloo, Ontario
Canada, N2L 3W8
Phone: 519 888 7465
Fax: 519 888 6906

The testing was performed on June 23-26, and July 10-18, 2006. The sample EUT included:

1a. BlackBerry model RBE41GW, part number ASY-11454-xyz Rev K_ASY-11509-001 Rev K, PIN 204803C1.

1b. BlackBerry model RBE41GW, part number ASY-11454-xyz Rev P_ASY-11509-001 Rev L, PIN 2048D170, LCD part number LCD-10294-003/004.

1c. BlackBerry model RBE41GW, part number ASY-11454-xyz Rev P_ASY-11509-001 Rev L, PIN 2048F610, LCD part number LCD-10294-002/004

2. BlackBerry model RBE41GW, part number ASY-11454-xyz Rev H_ASY-11509-001 Rev H, PIN 204426B4.

Sample numbers 1a, 1b, and 1c were used for radiated emission and radiated band edge testing. Sample 2 was used for conducted tests.

Only the differences that maybe impacted by the changes from ASY-11454-xyz Rev H_ASY-11509-001 Rev H and ASY-11454-xyz Rev P_ASY-11509-001 Rev L were re-measured.

The transmit frequency bands operating in North America for the Handheld are: GSM 824 to 849 MHz, PCS 1850 to 1910 MHz and Bluetooth 2402 to 2480 MHz.

## D. Support Equipment Used for the Testing of the EUT

1) Communication Tester, Rohde & Schwarz, model CMU 200, serial number 837493/073
2) DC Power Supply, H/P, model 6632B, serial number US37472178
3) Bluetooth Tester, Rohde & Schwarz, model CBT, serial number 100133

## E. Test Voltage

The ac input voltage was 120 volts, 60 Hz where applicable. This configuration was per RIM's specifications.

## F. Test Results Chart

| SPECIFICATION | TEST TYPE | MEETS REQUIREMENTS | PERFORMED BY |
|---|---|---|---|
| FCC CFR 47 Part 15.207<br>IC RSS-210 | AC Line Conducted Emissions | See test report RTS-0428-0606-07 | - |
| FCC CFR 47 Part 15.209, 15.247<br>IC RSS-210 | Radiated Emissions<br>Radiated Band Edge Compliance | Yes | Masud Attayi<br>and<br>Edward Davidian |
| FCC CFR 47 Part 15.247(a), (b), and (c)<br>IC RSS-210 | 20 dB Bandwidth<br>Carrier Freq. Separation<br>Number of Hopping freq.<br>Dwell Time<br>Max. Peak Output Power<br>Band Edge Compliance<br>Spurious RF Conducted Emissions | Yes | Maurice Battler |

## G. Modifications to EUT

No modifications were required on the EUT.

## H. Summary of Results

1) AC LINE CONDUCTED EMISSIONS

To view the test results, see test report number RTS-0428-0606-07.

2) RADIATED EMISSIONS

a) Radiated Spurious and Harmonic Emissions

The radiated emissions from the EUT were measured as per FCC Part 15.247 and IC RSS-210. The EUT was placed on a nonconductive styrofoam table, 100 cm high that was positioned on a remotely controlled turntable. The test distance used between the EUT and the receiving antenna was three metres. The turntable was rotated to determine the azimuth of the peak emissions. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emission level was recorded. The frequency range measured was from 30 MHz to 25.0 GHz. Both the horizontal and vertical polarisations of the emissions were measured.

The measurements were performed in a semi-anechoic chamber. The semi-anechoic chamber's FCC registration number is **778487** and the Industry Canada file number is **IC4240**.

The EUT was configured and operated to produce the maximum radiated emissions while still keeping within RIM's specifications.

The Handheld was measured in standalone configuration with Bluetooth transmitting in single frequency mode at low channel (0), middle channel (39) and high channel (78) and frequency hopping mode.

The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15, Subpart C, 15.247 and RSS-210.

The Bluetooth harmonics were investigated up to the 10th harmonic. The sample EUT had a worse case test margin of 10.5 dB using the peak detector and a worse case test margin of 1.6 dB at 4960.0 MHz using the average detector.

b) Band-Edge Compliance of RF Radiated Emissions

The Band-Edge Compliance of RF Radiated Emissions met the requirements as per 15.209.

See APPENDIX 1 for the test data. The results include both normal data rate and EDR.

**Sample Calculation:**

Field Strength (dBµV/M) is calculated as follows:
FS = Measured Level (dBµV) + A.F. (dB/m) + Cable Loss (dB) - Preamp (dB) + Filter Loss (dB)

**Measurement Uncertainty ±4.0 dB**

3) BLUETOOTH RF CONDUCTED EMISSIONS

a) 20 dB Bandwidth
The EUT met the requirements of the 20 dB bandwidth as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. The result includes both normal data rate and EDR.
See APPENDIX 2 for the test data.

b) Carrier Frequency Separation
The EUT met the requirements of the carrier frequency separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured. The result includes both normal data rate and EDR.
See APPENDIX 2 for the test data.

c) Number of Hopping Frequencies
The EUT met the requirements of the number of hopping frequencies as per 47 CFR 15.247(a) and RSS-210. The number of hopping channels measured was 79.
See APPENDIX 2 for the test data.

d) Time of Occupancy (Dwell Time)
The EUT met the requirements of the dwell time as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured in DH1, DH3 and DH5 modes. Bluetooth was operating in frequency hopping (Euro/US) mode during the measurements.
See APPENDIX 2 for the test data.

e) Maximum Peak Conducted Output Power
The EUT met the requirements of the maximum peak conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. The result includes both normal data rate and EDR.
See APPENDIX 2 for the test data.

f) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of the band-edge compliance of RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 0 and 78 were measured in frequency hopping (Euro/US) mode and single frequency mode.
See APPENDIX 2 for the test data. The result includes both normal data rate and EDR.

g) Spurious RF Conducted Emissions
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 10 MHz to 26 GHz. Low channel (0), middle channel (39) and high channel (78) were measured in single frequency mode and frequency hopping (Euro/US) mode. The result includes both normal data rate and EDR.
See APPENDIX 2 for the test data.

# I. Compliance Test Equipment Used

| UNIT | MANUFACTURER | MODEL | SERIAL NUMBER | CAL DUE DATE (YY MM DD) | USE |
|---|---|---|---|---|---|
| Preamplifier | Sonoma | 310N/11909A | 185831 | 06-11-27 | Radiated Emissions |
| Preamplifier system | TDK RF Solutions | PA-02 | 080010 | 06-11-25 | Radiated Emissions |
| Hybrid Log Antenna | TDK | HLP-3003C | 017401 | 06-07-21 | Radiated Emissions |
| Horn Antenna | TDK | HRN-0118 | 130092 | 06-09-24 | Radiated Emissions |
| Horn Antenna | TDK | HRN-0118 | 30101 | 06-07-21 | Radiated Emissions |
| Horn Antenna | Emco | 3116 | 2538 | 06-09-27 | Radiated Emissions |
| Preamplifier | TDK | 18-26 | 3002 | 06-11-28 | Radiated Emissions |
| Dipole Antenna | Schwarzbeck | UHAP | 973 | 06-12-13 | Radiated Emissions |
| Dipole Antenna | Schwarzbeck | UHAP | 974 | 06-09-21 | Radiated Emissions |
| Universal Radio Communication Tester | Rohde & Schwarz | CMU 200 | 837493/073 | 07-03-20 | Radiated Emissions |
| EMI Receiver | Rohde & Schwarz | ESIB-40 | 100255 | 07-05-11 | Radiated Emissions |
| Universal Radio Communication Tester | Rohde & Schwarz | CMU 200 | 100251 | 07-04-23 | Conducted Emissions |
| Spectrum Analyzer | HP | 8563E | 3745A08112 | 06-09-10 | RF Conducted Emissions |
| DC Power Supply | HP | 6632B | US37472178 | 07-09-14 | RF Conducted Emissions |
| Environment Monitor | Control Company | 1870 | 230355190 | 06-12-23 | Radiated Emissions |
| Environment Monitor | Control Company | 1870 | 230355189 | 06-12-23 | RF Conducted Emissions |
| Temperature Probe | Hart Scientific | 61161-302 | 21352860 | 06-09-28 | Frequency Stability |
| Environmental Chamber | ESPEC Corp. | SH-240S1 | 91005607 | N/R | Frequency Stability |
| Bluetooth Tester | Rohde & Schwarz | CBT | 100133 | 07-04-11 | Radiated Emissions |

# APPENDIX 1 – RADIATED EMISSIONS TEST DATA

## Radiated Emissions Test Results

Test Distance was 3.0 metres. Bluetooth Band

The measurements were performed in single frequency and hopping mode (channels 0 to 78) at maximum output power.
Using Pattern type "Static PRBS" and packet type "DH5" during the measurements.

| Type | Channel | Frequency | Antenna | | Reading (Peak) | Corrected Reading | Detector | Peak Limit | Diff. To Limit |
|---|---|---|---|---|---|---|---|---|---|
| | | (MHz) | Type | Pol | (dBuV) | (dBuV) | AVE/PK | (dBuV/m) | (dB) |
| Handheld Standalone, USB side down<br>Single frequency mode Low Channel | | | | | | | | | |
| 2nd | 0 | 4804.0 | Horn | V | 40.6 | 60.2 | PK. | 74 | -13.8 |
| 2nd | 0 | 4804.0 | Horn | H | NF | | | | |
| 2nd | 0 | 4804.0 | Horn | V | 28.5 | 48.1 | AVE. | 54 | -5.9 |
| 2nd | 0 | 4804.0 | Horn | H | NF | | | | |
| The harmonics were investigated up to the 10th harmonic.<br>Emissions above the 2nd harmonic were in the noise floor (NF) | | | | | | | | | |
| Single frequency mode Middle Channel | | | | | | | | | |
| 2nd | 39 | 4882.0 | Horn | V | 43.3 | 62.9 | PK. | 74 | -11.1 |
| 2nd | 39 | 4882.0 | Horn | H | NF | | | | |
| 2nd | 39 | 4882.0 | Horn | V | 32.4 | 52.0 | AVE. | 54 | -2.0 |
| 2nd | 39 | 4882.0 | Horn | H | NF | | | | |
| The harmonics were investigated up to the 10th harmonic.<br>Emissions above the 2nd harmonic were in the NF | | | | | | | | | |
| Single frequency mode High Channel | | | | | | | | | |
| 2nd | 78 | 4960.0 | Horn | V | 43.9 | 63.5 | PK. | 74 | **-10.5** |
| 2nd | 78 | 4960.0 | Horn | H | NF | | | | |
| 2nd | 78 | 4960.0 | Horn | V | 32.8 | 52.4 | AVE. | 54 | **-1.6** |
| 2nd | 78 | 4960.0 | Horn | H | NF | | | | |
| The harmonics were investigated up to the 10th harmonic.<br>Emissions above the 2nd harmonic were in the NF | | | | | | | | | |

## Radiated Emissions Test Results con't

Using Pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

### Bluetooth Band

| Type | Channel | Frequency | Antenna | | Reading (Peak) | Corrected Reading | Detector | Peak Limit | Diff. To Limit |
|---|---|---|---|---|---|---|---|---|---|
| | | (MHz) | Type | Pol | (dBuV) | (dBuV) | AVE/PK | (dBuV/m) | (dB) |
| Handheld Standalone, USB side down<br>Hopping mode. | | | | | | | | | |
| 2nd | 0-78 | 4960.0 | Horn | V | 43.3 | 62.9 | PK. | 74 | -11.1 |
| 2nd | 0-78 | 4960.0 | Horn | H | NF | | | | |
| 2nd | 0-78 | 4960.0 | Horn | V | 29.6 | 49.2 | AVE. | 54 | -4.8 |
| 2nd | 0-78 | 4960.0 | Horn | H | NF | | | | |
| The harmonics were investigated up to the 10th harmonic.<br>Emissions above the 2nd harmonic were in the noise floor (NF) | | | | | | | | | |

### Bluetooth Band-Edge Compliance of RF Radiated Emissions

Handheld standalone, vertical, Bluetooth in single frequency mode, channel 78.
Using Pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

The test distance was 3 metres.

| Channel | Freq. (MHz) | Rx Antenna Type | POL. | Detector (PK, AVE.) | VBW (MHz) | Corrected Reading (dBuV/m) | Delta Marker (dB) | Corrected Band edge (dBuV/m) | Limit (dBuV/m) | Diff. To Limit (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 2480.00 | Horn | V | PK | 1.0 MHz | 88.05 | 36.7 | 51.35 | 74 | -22.65 |
| 78 | 2480.00 | Horn | H | PK | 1.0 MHz | 89.35 | 35.2 | 54.15 | 74 | -19.85 |
| 78 | 2480.00 | Horn | V | AVE. | 10 Hz | 78.35 | 36.7 | 41.65 | 54 | -12.35 |
| 78 | 2480.00 | Horn | H | AVE. | 10 Hz | 79.45 | 35.2 | 44.25 | 54 | -9.75 |

The environmental test conditions were: Temperature 22ºC
Pressure 1013 mb
Relative Humidity 36%

# APPENDIX 2 – BLUETOOTH CONDUCTED EMISSIONS TEST DATA/PLOTS

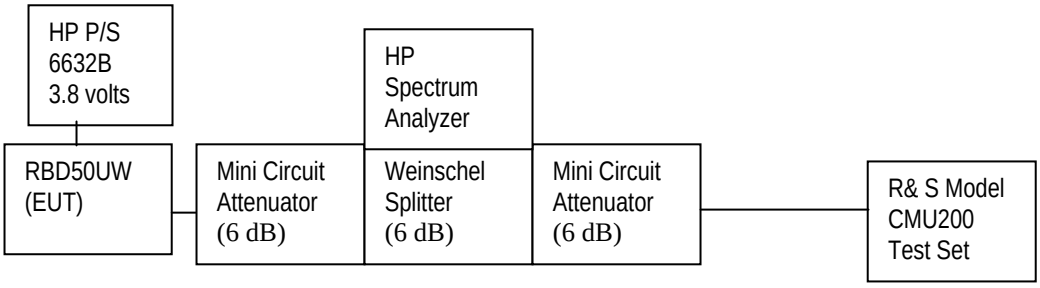
Bluetooth RF Conducted Emission Test Results

## Test Equipment List

| Test Instruments | Manufacturer | Model No. | Serial No. | Frequency Range |
|---|---|---|---|---|
| Spectrum Analyzer | HP | 8563E | 3745A08112 | 30 Hz – 26.5 GHz |
| Splitter | Weinschel | 1515 | ME092 | DC – 18 GHz |
| Attenuator | Mini Circuit | MCL BW-S20W2 | - | DC – 18 GHz |
| Attenuator | Mini Circuit | MCL BW-S6W2 | - | DC – 18 GHz |
| Attenuator | Mini Circuit | MCL BW-S6W2 | - | DC – 18 GHz |
| DC Power Supply | HP | 6632B | US37472178 | - |
| Bluetooth Tester | Rohde & Schwarz | CBT | 100133 | - |

Bluetooth power output was at maximum for all the recorded measurements shown below.

### Test Setup Diagram




A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Bluetooth RF Conducted Emission Test Results cont'd

**20 dB Bandwidth**

The EUT met the requirements of the 20 dB bandwidth as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency mod.

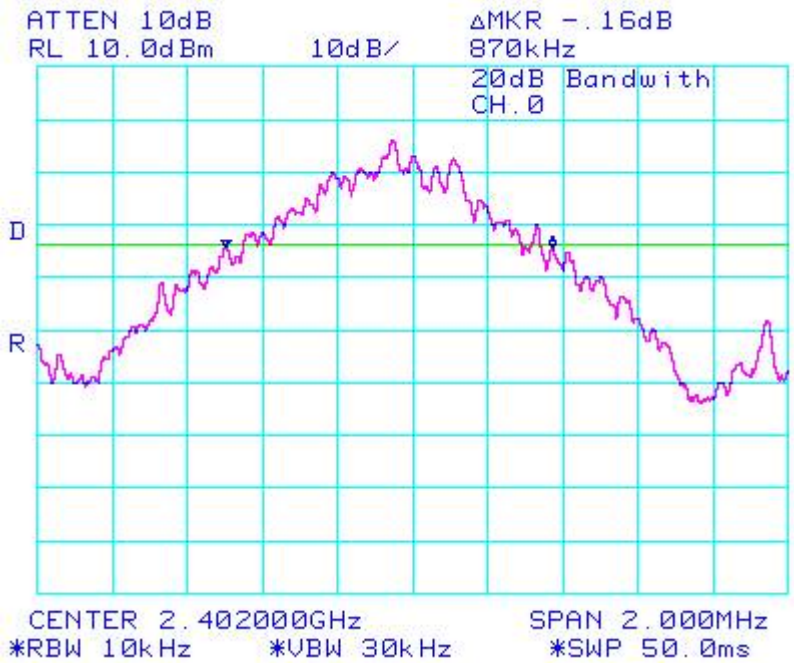
Using pattern type Static PRBS and packet type DH5 during the measurements.

| Bluetooth Channel | Limit (MHz) | Measured Level (MHz) |
|---|---|---|
| 0 | <=1.0 | 0.870 |
| 39 | <=1.0 | 0.870 |
| 78 | <=1.0 | 0.870 |

See figures 1 to 3 for the plots of the 20 dB bandwidth measurements.

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 41%

**Figure 1: 20 dB Bandwidth, channel 0**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 2: 20 dB Bandwidth, channel 39**

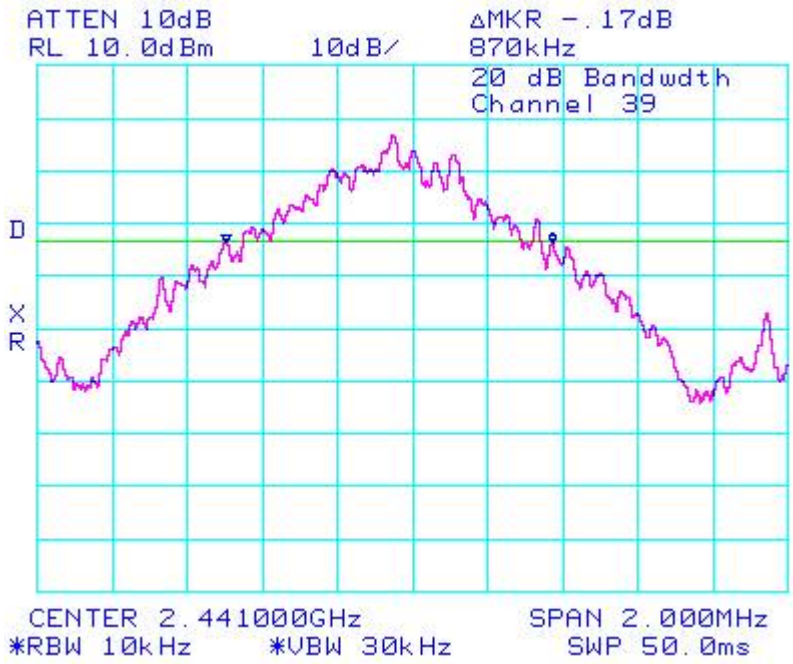
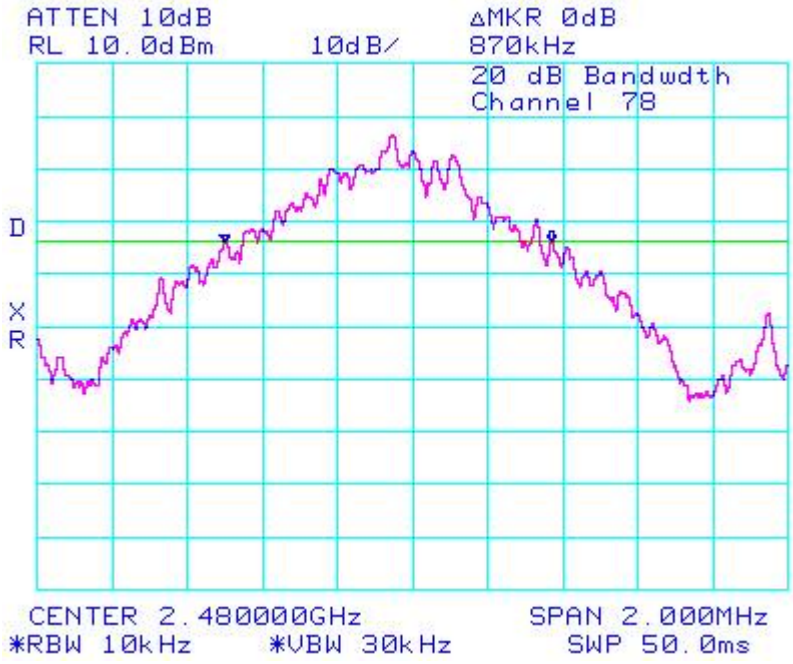



**Figure 3: 20 dB Bandwidth, channel 78**



Bluetooth RF Conducted Emission Test Results cont'd

Using Pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

| Bluetooth Channel | Limit (MHz) | Measured Level (MHz) |
|---|---|---|
| 0 | <=1.5 | 1.247 |
| 39 | <=1.5 | 1.247 |
| 78 | <=1.5 | 1.233 |

See figures 4 to 6 for the plots of the 20 dB bandwidth measurements.

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 41%

**Figure 4: 20 dB Bandwidth, channel 0**

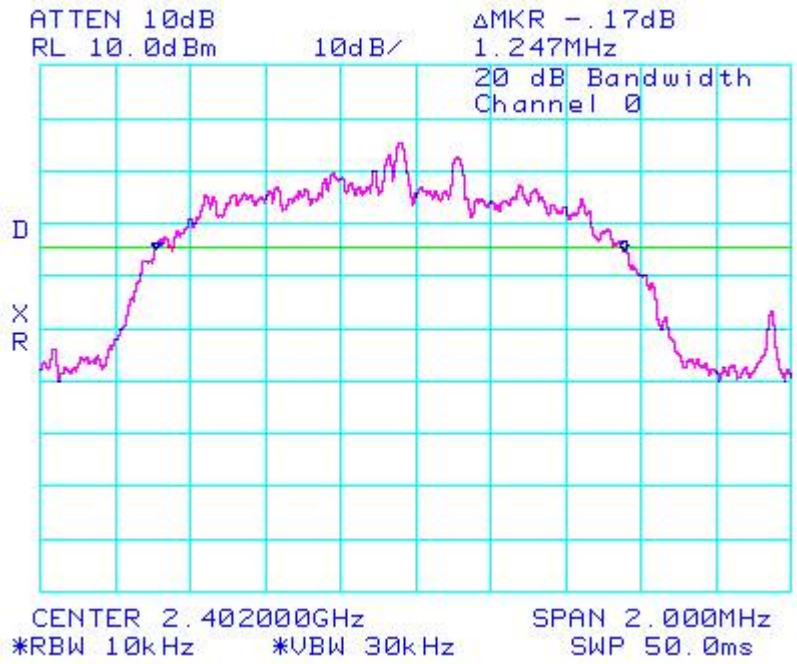


**Figure 5: 20 dB Bandwidth, channel 39**

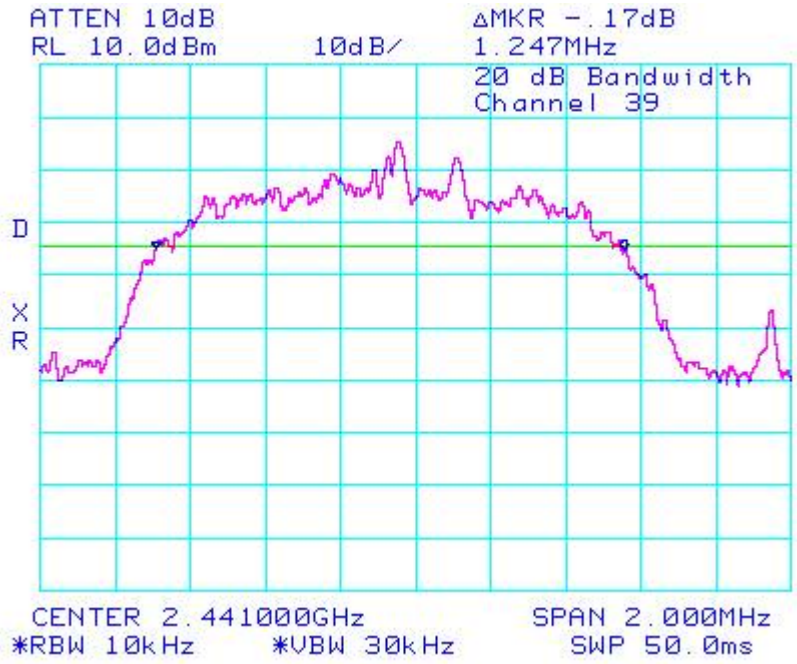
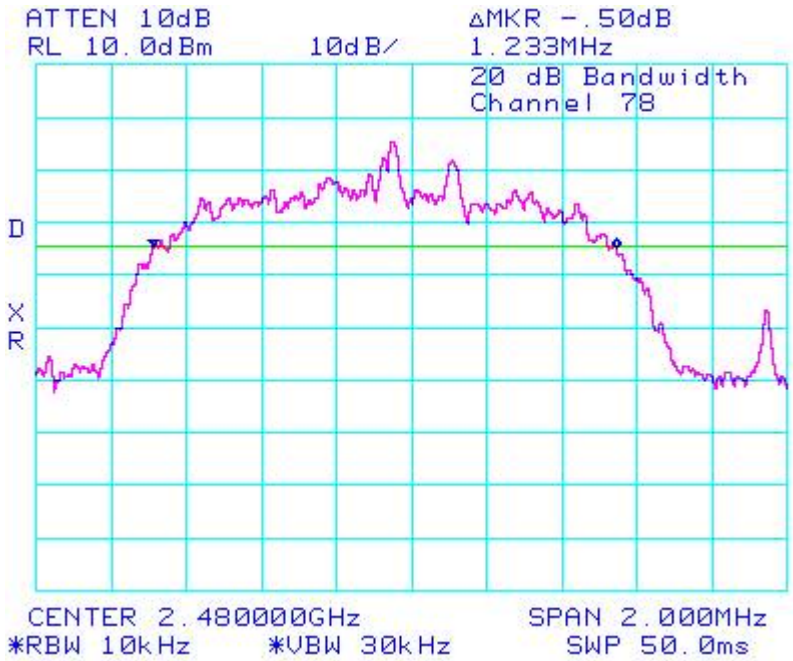



**Figure 6: 20 dB Bandwidth, channel 78**



## Carrier Frequency Separation

The EUT met the requirements of the Carrier Frequency Separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured. Bluetooth was operating in frequency hopping (Euro/US) mode.

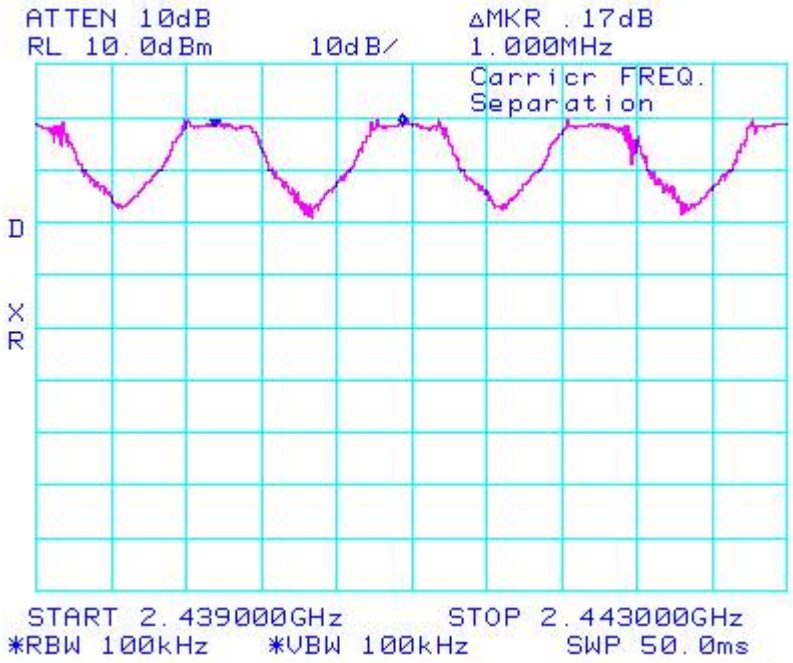
Using pattern type Static PRBS and packet type DH5 during the measurements.

| Bluetooth Channels | Limit (MHz) | Measured Level (MHz) |
|---|---|---|
| 38 to 39 | >= 0.025 or 20 dB bandwidth | 1.000 |

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 41%

See figure 7 for the plot of the Carrier Frequency Separation measurement.

**Figure 7: Carrier Frequency Separation, channel 38 to 39**



Using Pattern type “Static PRBS” and packet type “3-DH5” during the measurements.

| Bluetooth Channels | Limit (MHz) | Measured Level (MHz) |
|---|---|---|
| 38 to 39 | >= 0.025 or 20 dB bandwidth | 1.000 |

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 41%

See figure 8 for the plot of the Carrier Frequency Separation measurement.

**Figure 8: Carrier Frequency Separation, channel 38 to 39**

Bluetooth RF Conducted Emission Test Results cont'd

**Number of Hopping Frequencies**

The EUT met the requirements of the number of hopping frequencies as per 47 CFR 15.247(a) and RSS-210.

Bluetooth was operating in frequency hopping (Euro/US) mode.

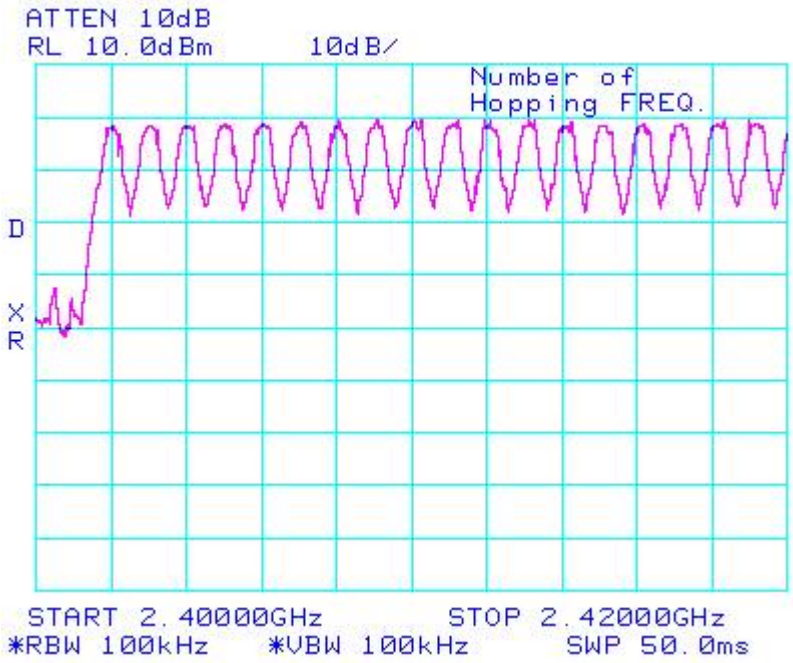
Using pattern type Static PRBS and packet type DH5 during the measurements.

| Limit (CH) | Number of Hopping Frequencies (CH) |
|---|---|
| >= 75 | 79 |

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 36%

See figures 9 to 12 for the plots of the number of hopping frequencies.

**Figure 9: Number of Hopping Frequencies**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 10: Number of Hopping Frequencies**

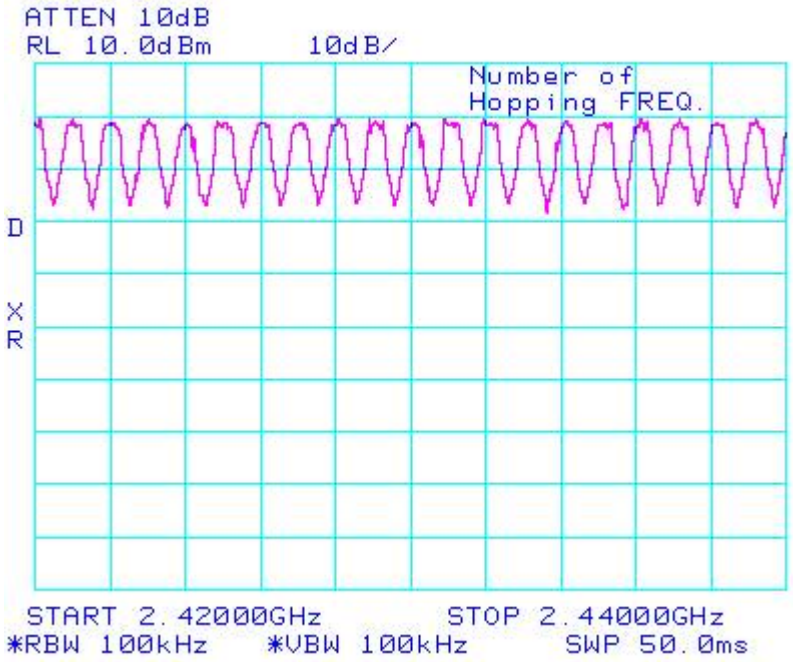
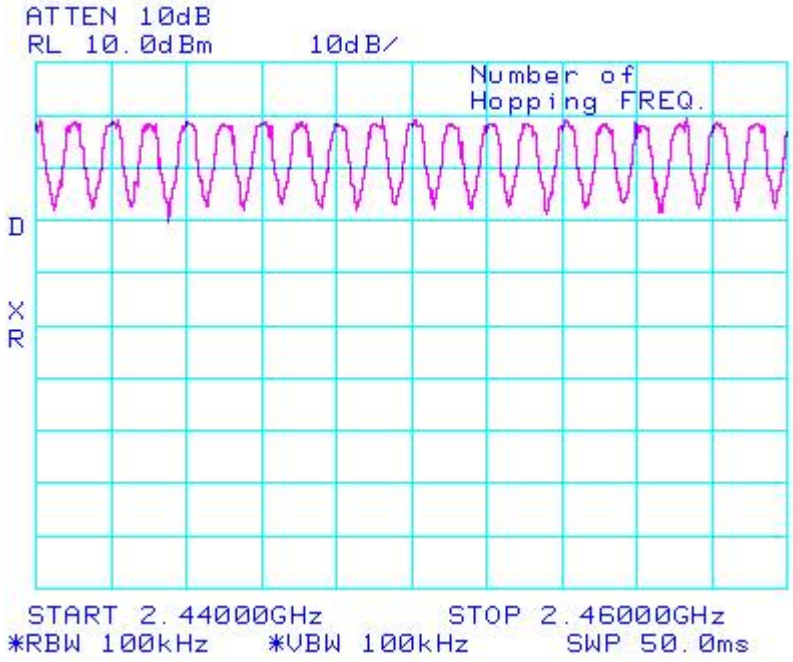
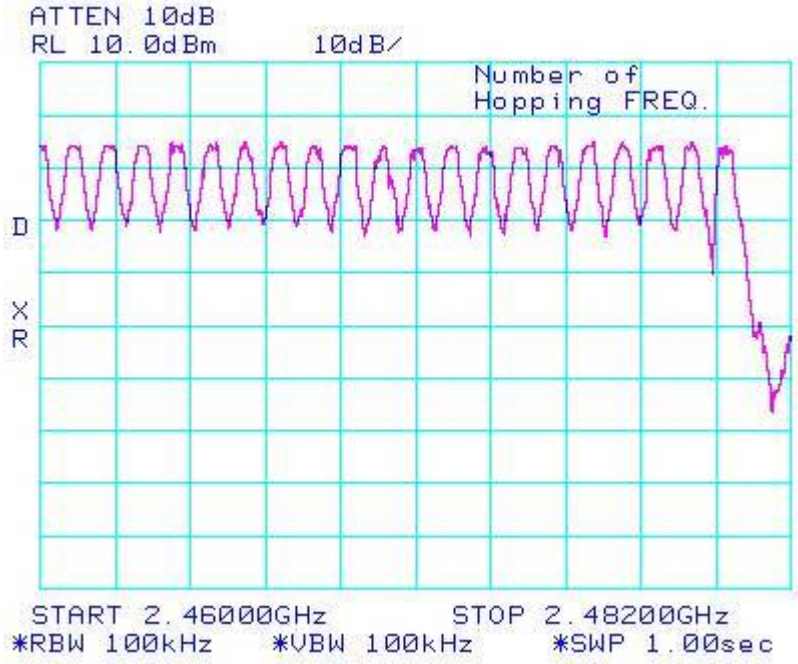



**Figure 11: Number of Hopping Frequencies**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 12**: **Number of Hopping Frequencies**



Bluetooth RF Conducted Emission Test Results cont'd

**Time of Occupancy (Dwell Time)**

The EUT met the requirements of the time of occupancy (dwell time) as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured in packet types DH1, DH3 and DH5. Bluetooth was operating in frequency hopping (Euro/US) mode during the measurements.

The frequency hopping is 1600 hops per second for a dwell time of 625 µsec for 79 channels.

A DH1 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 800 hops per second with 79 channels which is 10.127 times per second. As per 15.247(a) (iii) "The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed". Therefore for 31.6 seconds (79x0.4) there are 320.0 times of appearance.

A DH3 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 400 hops per second with 79 channels which is 5.06 times per second. Therefore for 31.6 seconds there are 159.9 times of appearance.

A DH5 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 266.7 hops per second with 79 channels which is 3.38 times per second. Therefore for 31.6 seconds there are 106.8 times of appearance.

| Bluetooth Channel | Mode | Tx Time (ms) | Dwell Time/31.6 sec. (msec.) | Limit (msec.) | Margin (msec.) |
|---|---|---|---|---|---|
| 0 | DH1 | 0.529 | . 529 x 320.0 = 169.28 | 400 | 230.72 |
| 39 | DH1 | 0.537 | . 537 x 320.0 = 171.84 | 400 | 228.16 |
| 78 | DH1 | 0.520 | . 520 x 320.0 = 166.40 | 400 | 233.60 |
| 0 | DH3 | 1.768 | 1.768 x 159.9 = 282.70 | 400 | 117.30 |
| 39 | DH3 | 1.785 | 1.785 x 159.9 = 285.42 | 400 | 114.58 |
| 78 | DH3 | 1.785 | 1.785 x 159.9 = 285.42 | 400 | 114.58 |
| 0 | DH5 | 3.007 | 3.007 x 106.8 = 321.15 | 400 | 78.85 |
| 39 | DH5 | 3.007 | 3.007 x 106.8 = 321.15 | 400 | 78.85 |
| 78 | DH5 | 3.007 | 3.007 x 106.8 = 321.15 | 400 | 78.85 |

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 41%

See figures 13 to 21 for the plots of the dwell time.

Bluetooth RF Conducted Emission Test Results cont'd

**Figure 13: Dwell Time, Low Channel, Packet Type DH1**

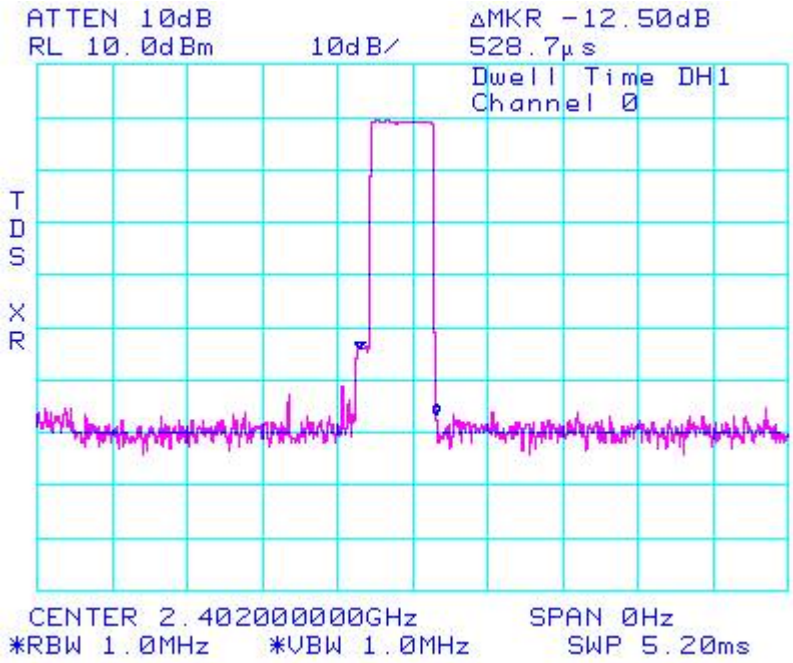
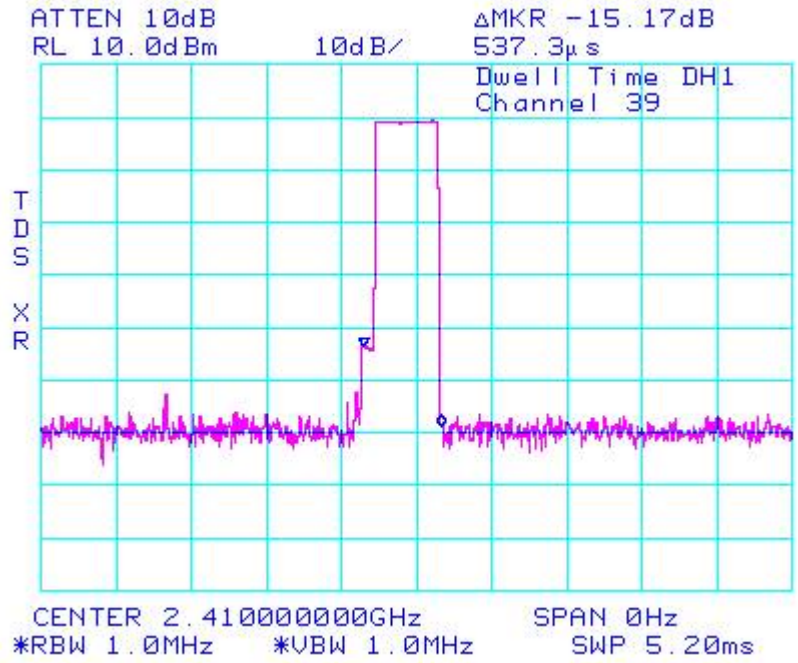



**Figure 14: Dwell Time, Middle Channel, Packet Type DH1**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 15: Dwell Time, High Channel, Packet Type DH1**

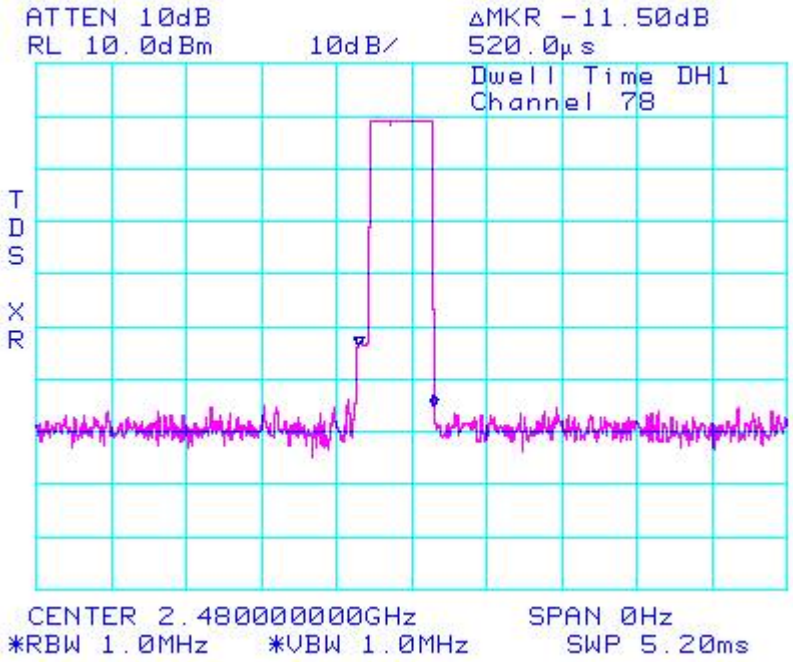
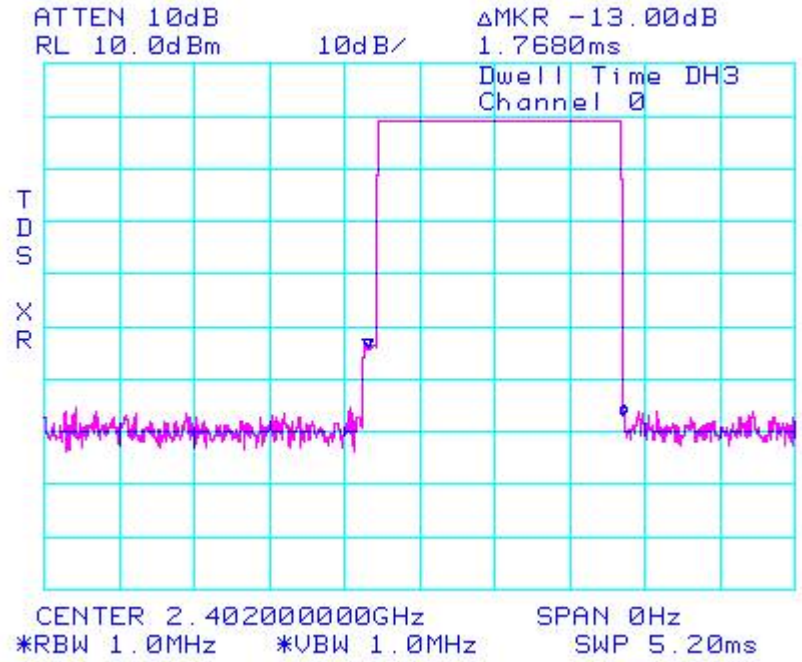



**Figure 16: Dwell Time, Low Channel, Packet Type DH3**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 17: Dwell Time, Middle Channel, Packet Type DH3**

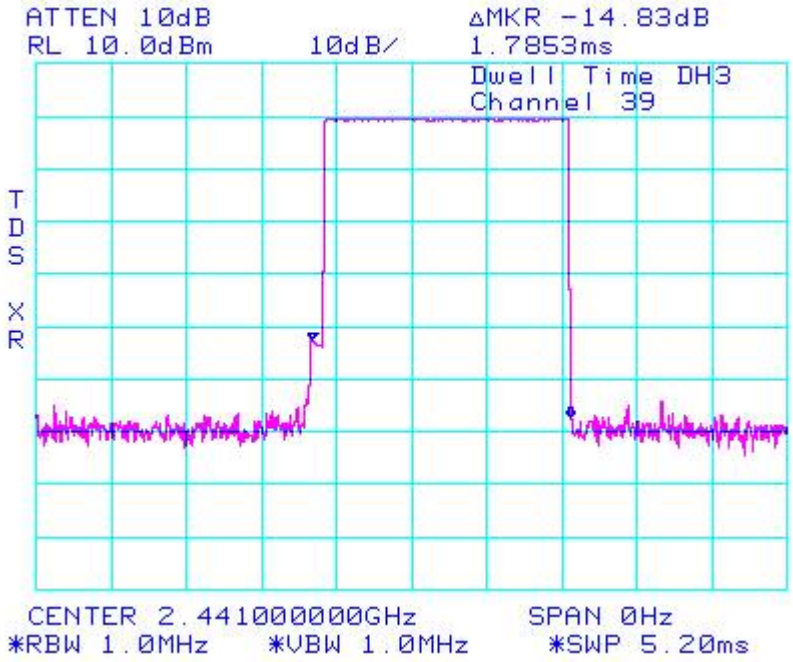
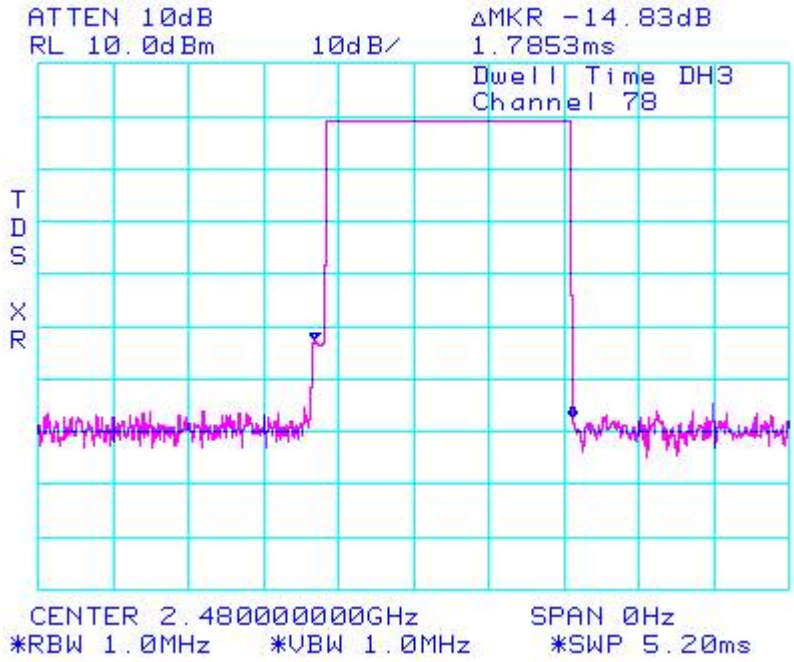



**Figure 18: Dwell Time, High Channel, Packet Type DH3**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 19: Dwell Time, Low Channel, Packet Type DH5**

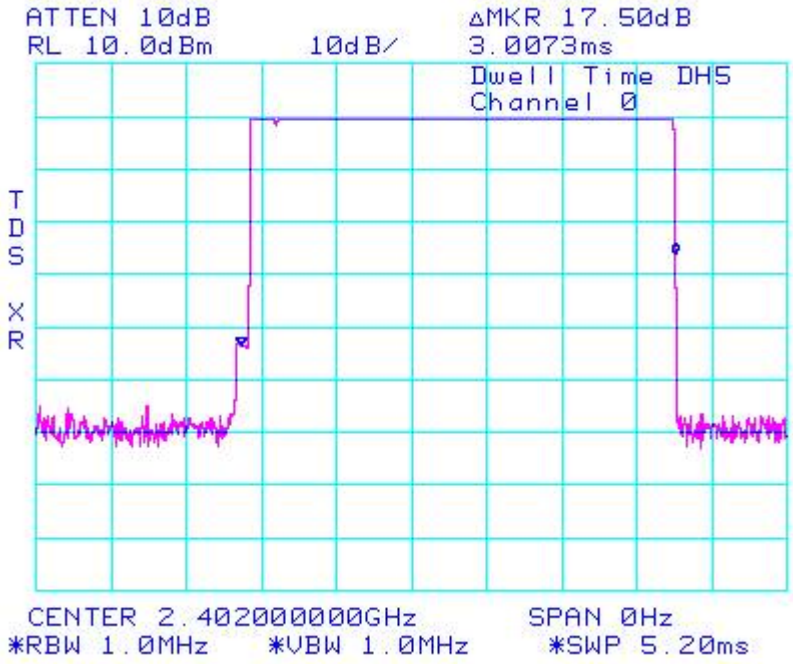
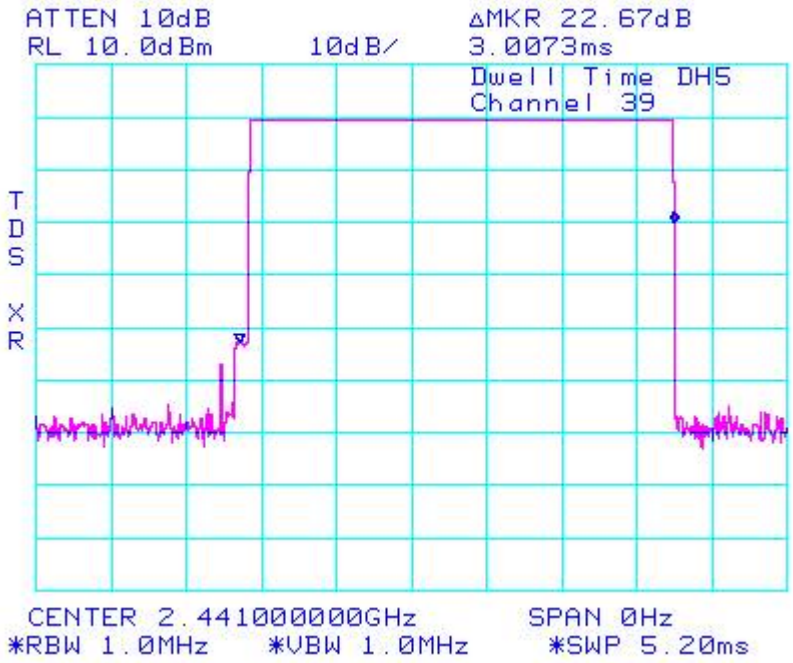
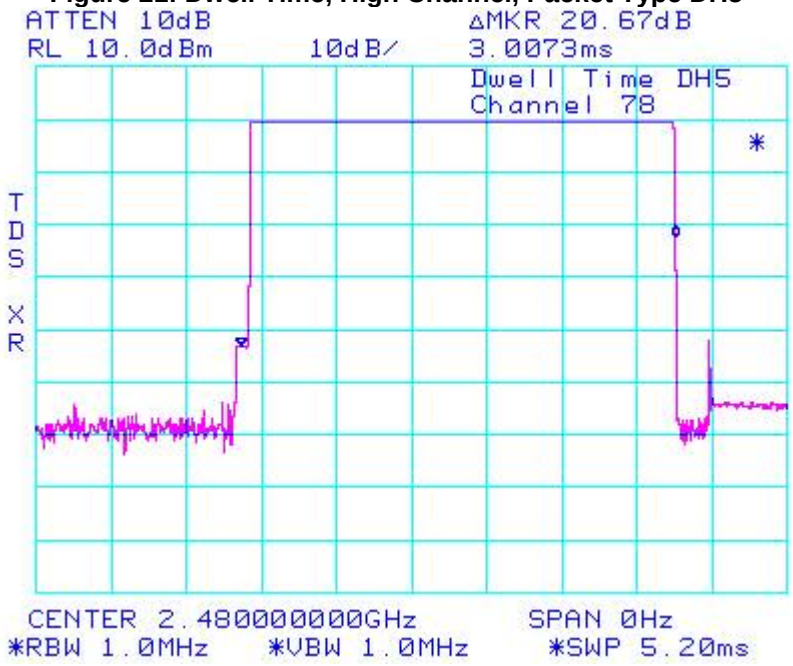



**Figure 20: Dwell Time, Middle Channel, Packet Type DH5**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 21: Dwell Time, High Channel, Packet Type DH5**



Bluetooth RF Conducted Emission Test Results cont'd

**Maximum Peak Conducted Output Power**

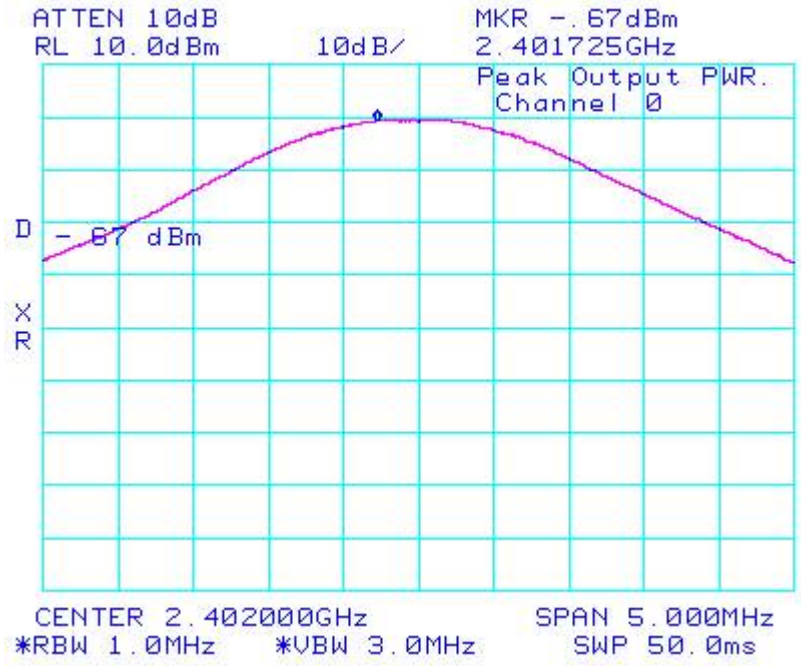
The EUT met the requirements of the maximum peak conducted output power of class 2 as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency mode during the measurements. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the coaxial cable loss and attenuators in the test circuit.
Using pattern type Static PRBS and packet type DH5 during the measurements.

| Bluetooth Channel | Measured Level (dBm) | Class 2 Limit (dBm) |
|---|---|---|
| 0 | -0.67 | -6.0 to 4.0 |
| 39 | -0.50 | -6.0 to 4.0 |
| 78 | -0.67 | -6.0 to 4.0 |

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 41%

See figures 22 to 24 for the plots of the maximum peak conducted output power.

**Figure 22: Maximum Peak Conducted Output Power**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 23: Maximum Peak Conducted Output Power**

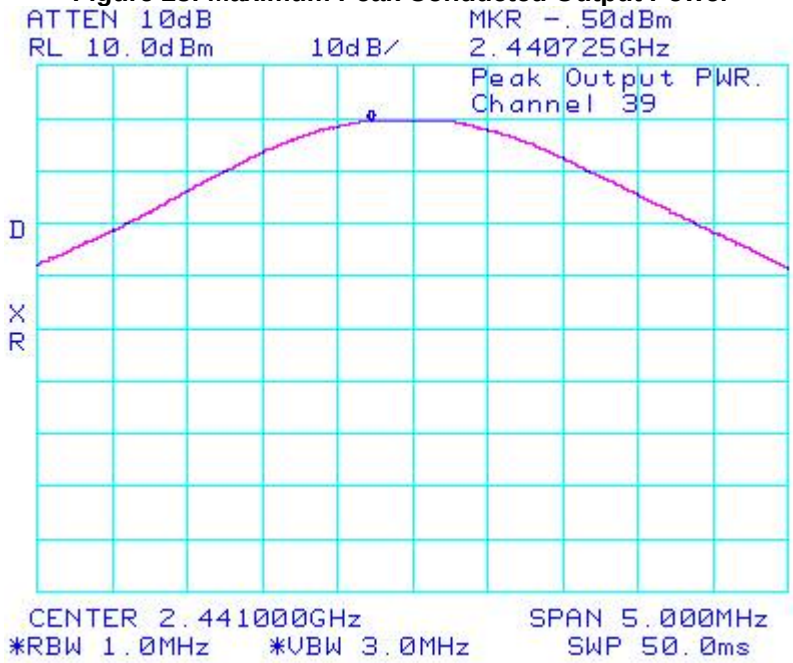
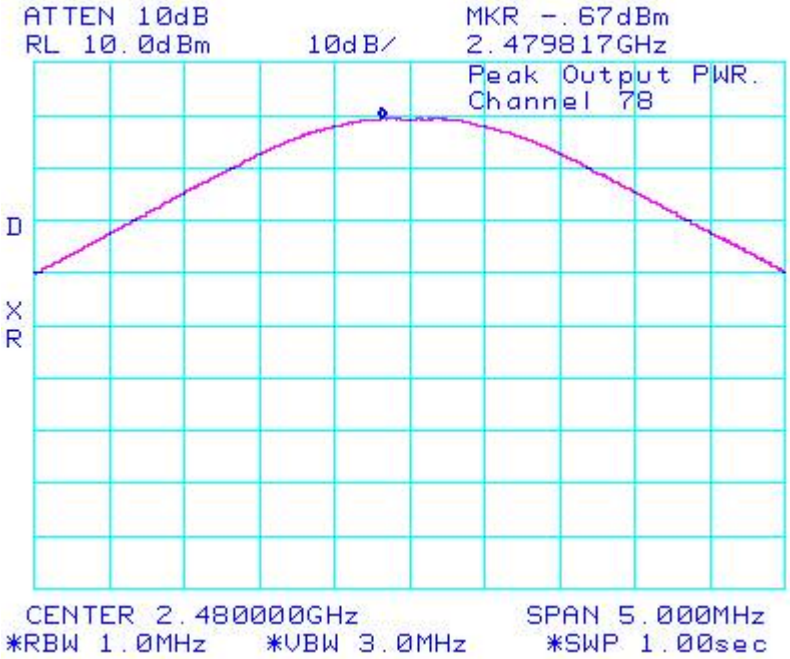



**Figure 24: Maximum Peak Conducted Output Power**



Using Pattern type “Static PRBS” and packet type “3-DH5” during the measurements.

| Bluetooth Channel | Measured Level (dBm) | Class 2 Limit (dBm) |
|---|---|---|
| 0 | -0.17 | -6.0 to 4.0 |
| 39 | -0.50 | -6.0 to 4.0 |
| 78 | -1.17 | -6.0 to 4.0 |

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 41%

See figures 25 to 27 for the plots of the maximum peak conducted output power.

**Figure 25: Maximum Peak Conducted Output Power**

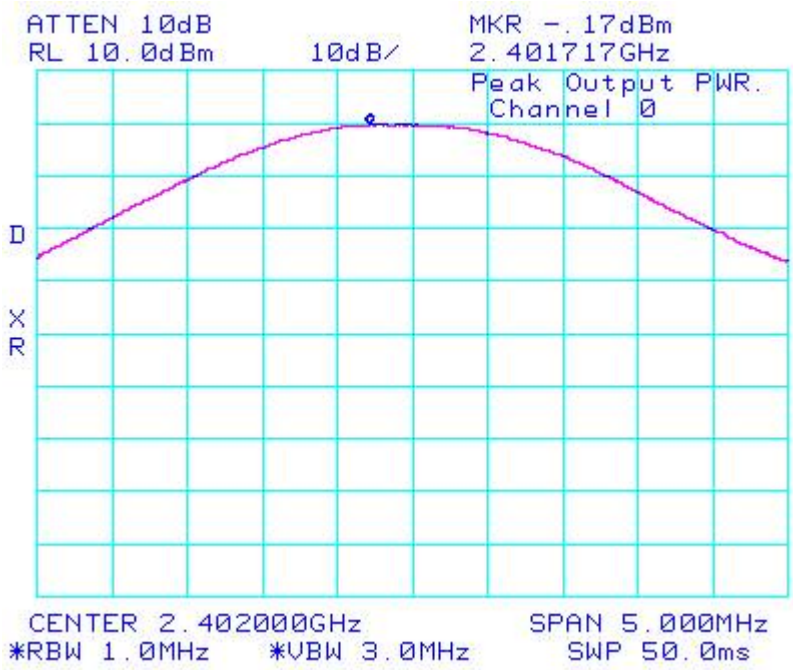


**Figure 26: Maximum Peak Conducted Output Power**

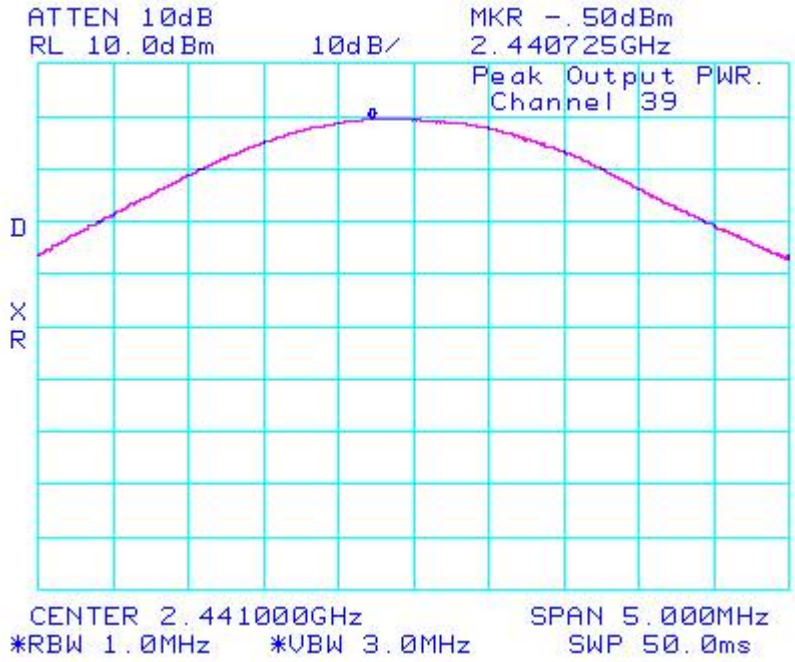
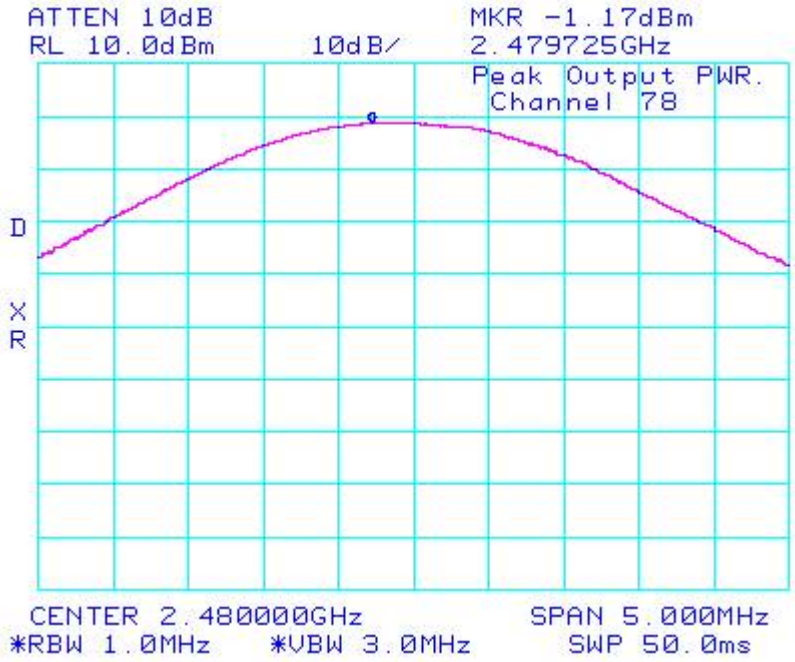



**Figure 27: Maximum Peak Conducted Output Power**



Bluetooth RF Conducted Emission Test Results cont'd

**Band Edge Compliance**

The EUT met the requirements of the band edge compliance as per 47 CFR 15.247(c) and RSS-210. Low channel (0) and high channel (78) were measured. Bluetooth was operating in single frequency and hopping mode.

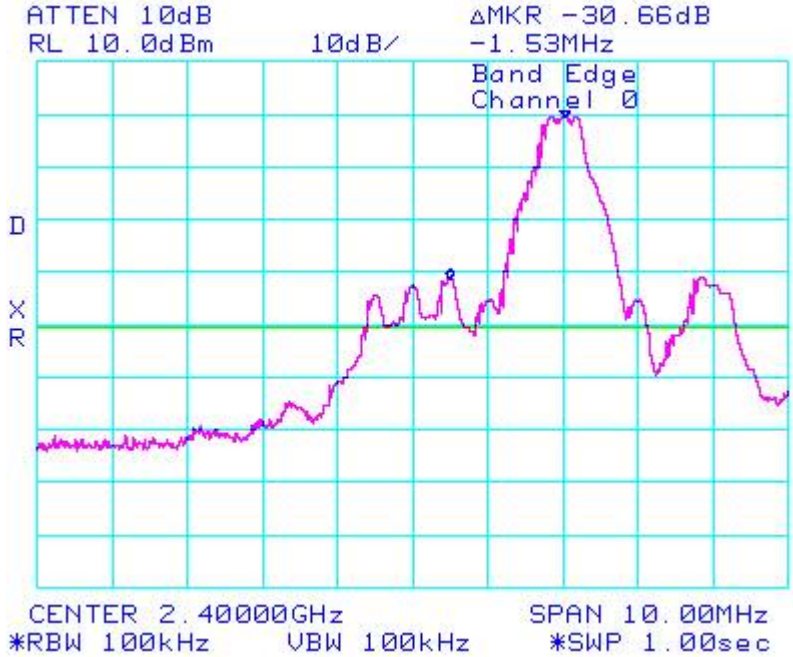
Using pattern type Static PRBS and packet type DH5 during the measurements.

| Bluetooth Channel | Operating Mode | Measured Level (dBc) | Limit (dBc) | Margin (dB) |
|---|---|---|---|---|
| 0 | Single Frequency | -30.66 | -20 | -10.66 |
| 0 - 78 | Hopping | -29.16 | -20 | - 9.16 |
| 78 | Single Frequency | -33.30 | -20 | -13.30 |
| 0 - 78 | Hopping | -32.50 | -20 | -12.5 |

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 41%

See figures 28 to 31 for the plots of the band edge compliance measurements.

**Figure 28: Band Edge Compliance, Single Frequency Mode, Channel 0**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 29: Band Edge Compliance, Hopping Frequency Mode, Channel 0**

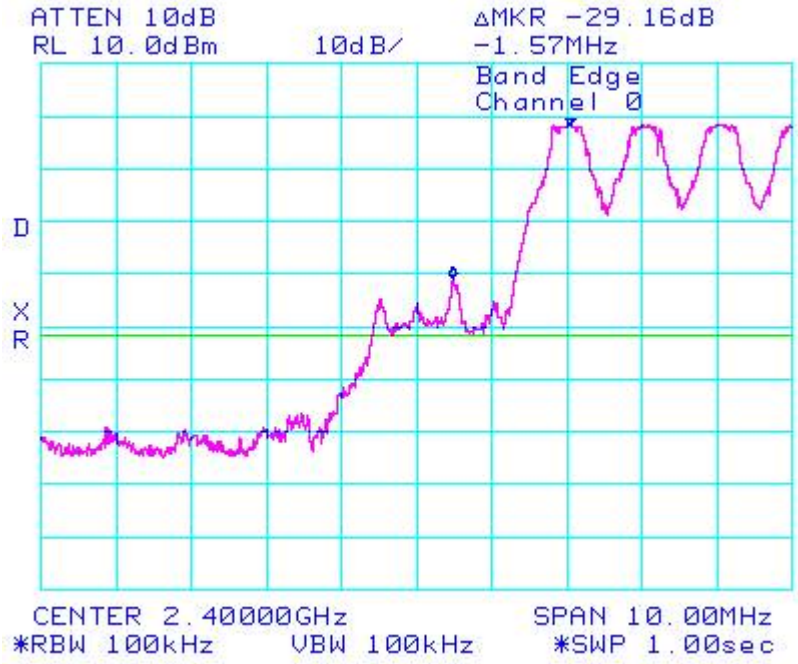
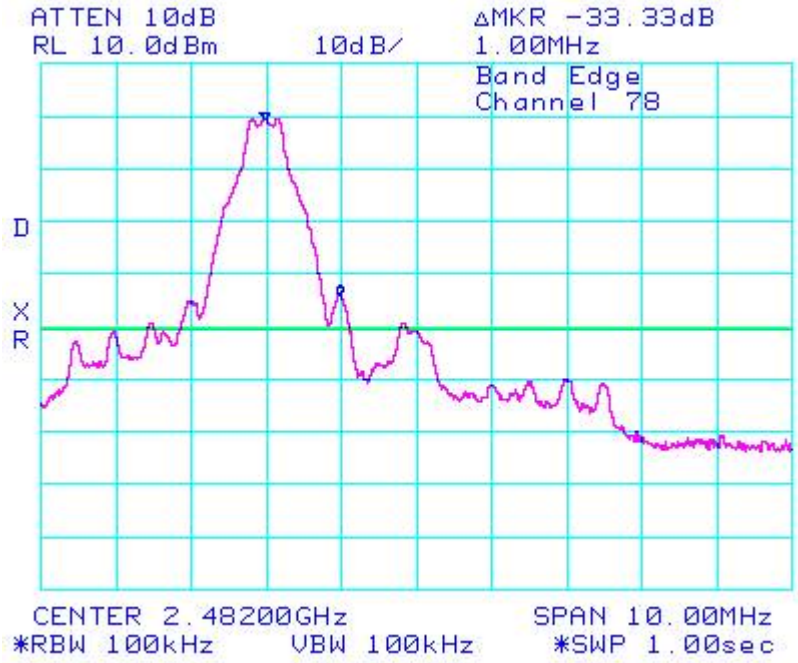
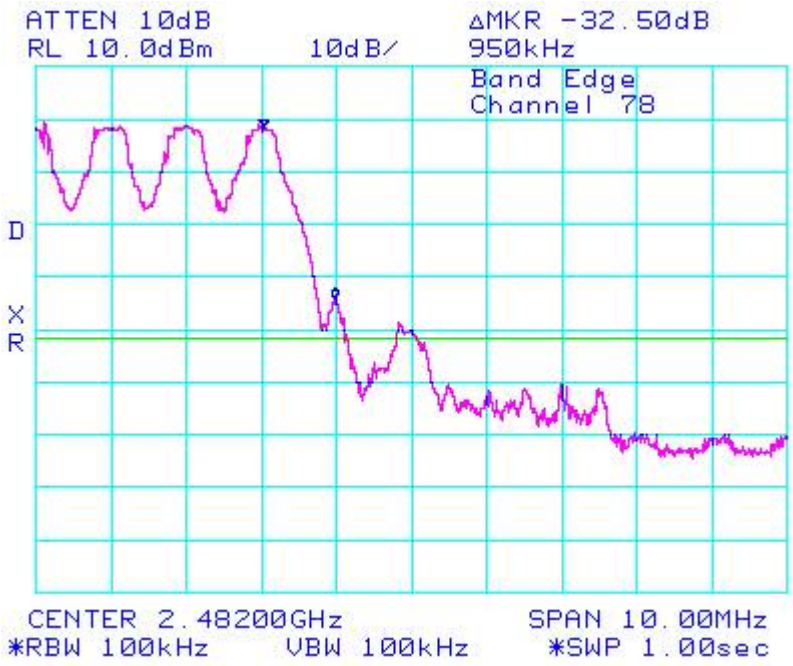



**Figure 30: Band Edge Compliance, Single Frequency Mode, Channel 78**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 31: Band Edge Compliance, Hopping Frequency Mode, Channel 78**




Using Pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

| Bluetooth Channel | Operating Mode | Measured Level (dBc) | Limit (dBc) | Margin (dB) |
|---|---|---|---|---|
| 0 | Single Frequency | -33.00 | -20 | -13.00 |
| 0 - 78 | Hopping | -29.84 | -20 | - 9.84 |
| 78 | Single Frequency | -32.34 | -20 | -12.34 |
| 0 - 78 | Hopping | -28.67 | -20 | - 8.67 |

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 41%

See figures 32 to 35 for the plots of the band edge compliance measurements.

**Figure 32: Band Edge Compliance, Single Frequency Mode, Channel 0**

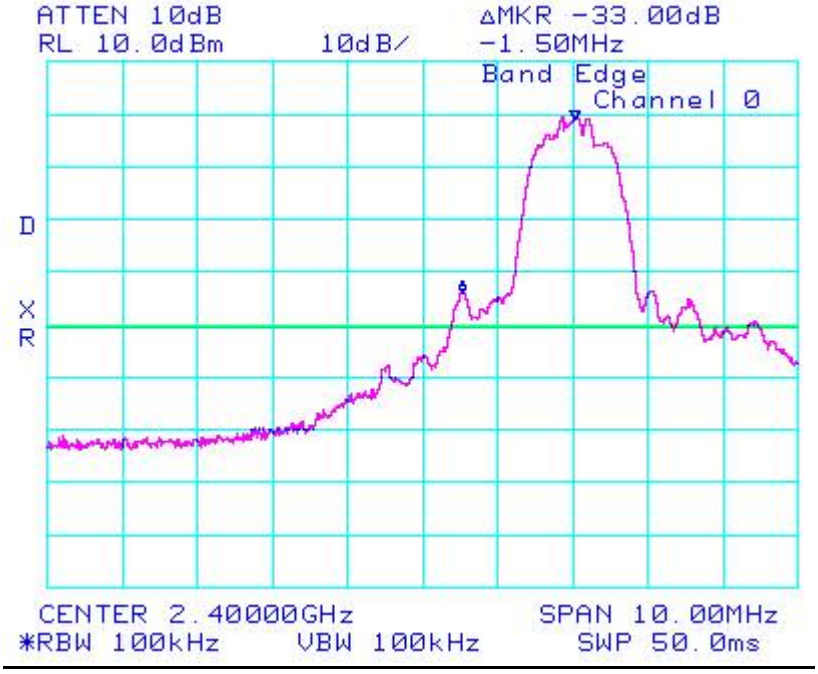



**Figure 33: Band Edge Compliance, Hopping Frequency Mode, Channel 0**

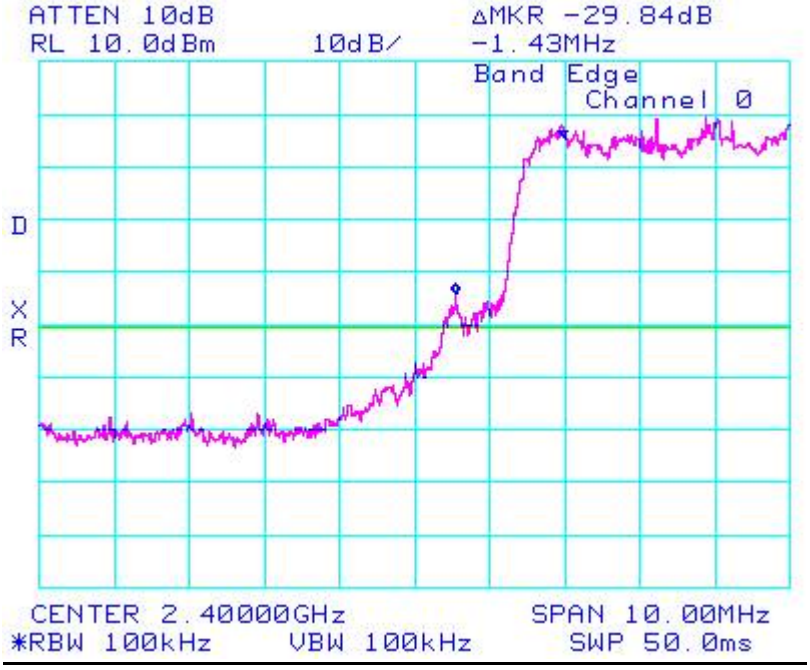


**Figure 34: Band Edge Compliance, Single Frequency Mode, Channel 78**

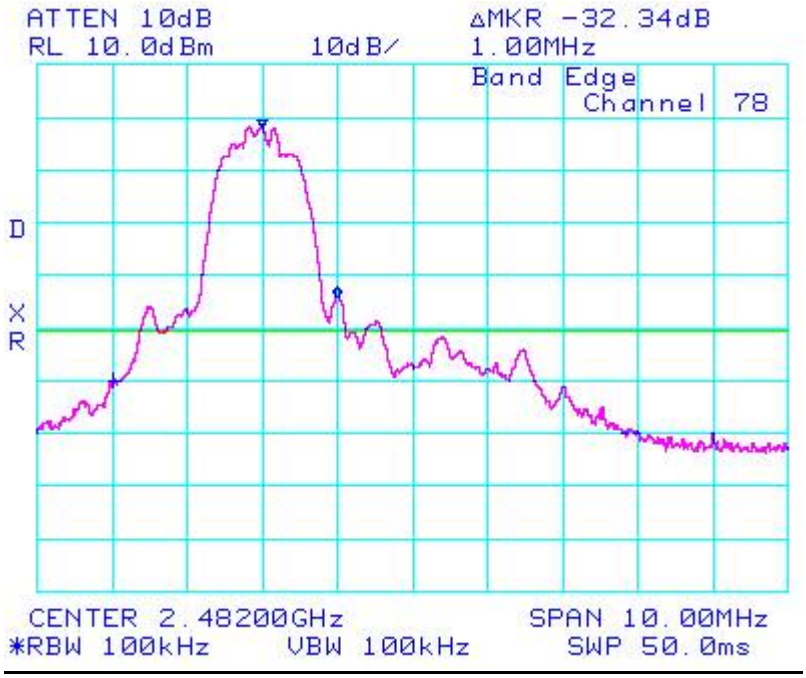
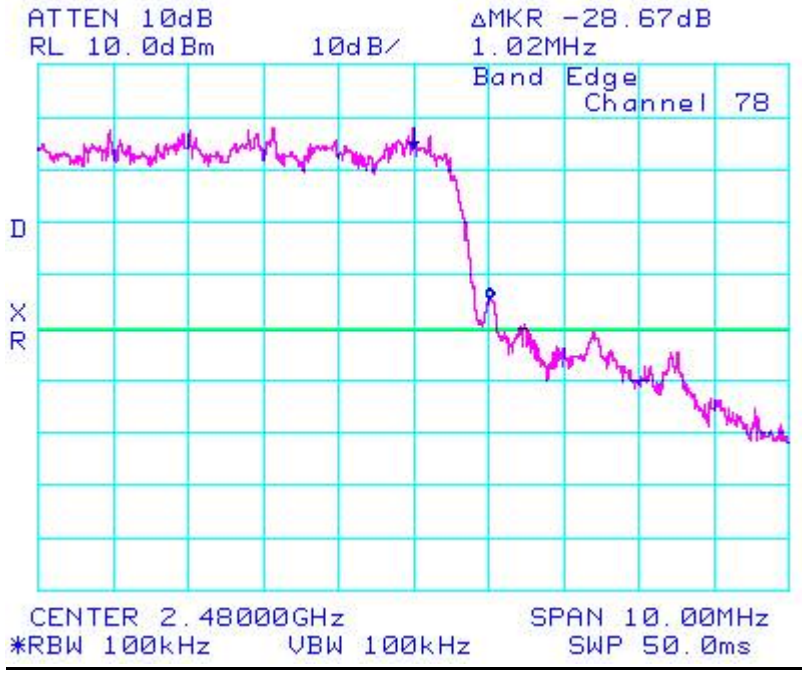



**Figure 35: Band Edge Compliance, Hopping Frequency Mode, Channel 78**



## Spurious RF Conducted Emissions

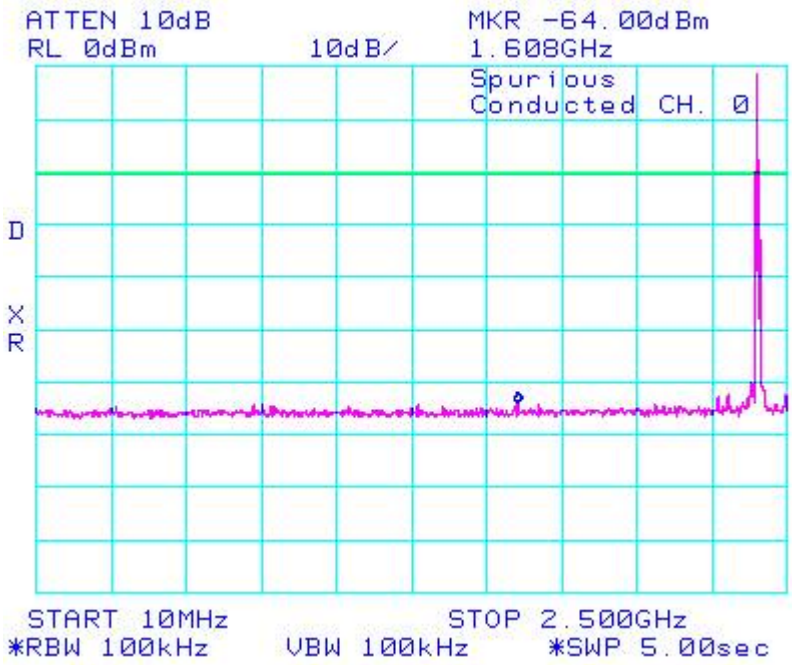
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Low channel (0) and high channel (78) were measured. Bluetooth was operating in single frequency mode.
Using pattern type Static PRBS and packet type DH5 during the measurements. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

| Bluetooth Channel | Channel Power (dBm) | Max. Measured Level (dBm) | Max. Measured Level from carrier (dBc) | Limit (dBc) |
|---|---|---|---|---|
| 0 | -0.67 | -48.00 | -47.33 | -20 |
| 39 | -0.50 | -50.33 | -49.83 | -20 |
| 78 | -0.67 | -48.67 | -48.00 | -20 |
| Hopping mode | -0.50 | -49.50 | -49.00 | -20 |

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
Relative Humidity 41%

See figures 36 to 43 for the plots of the Spurious RF Conducted Emissions.

**Figure 36**: **Spurious RF Conducted Emissions, Channel 0**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 37: Spurious RF Conducted Emissions, Channel 0**

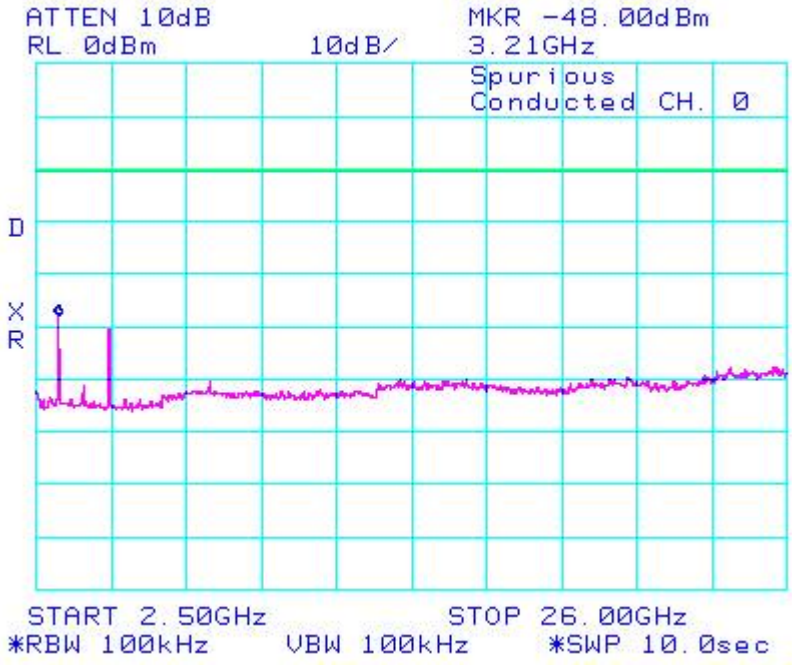
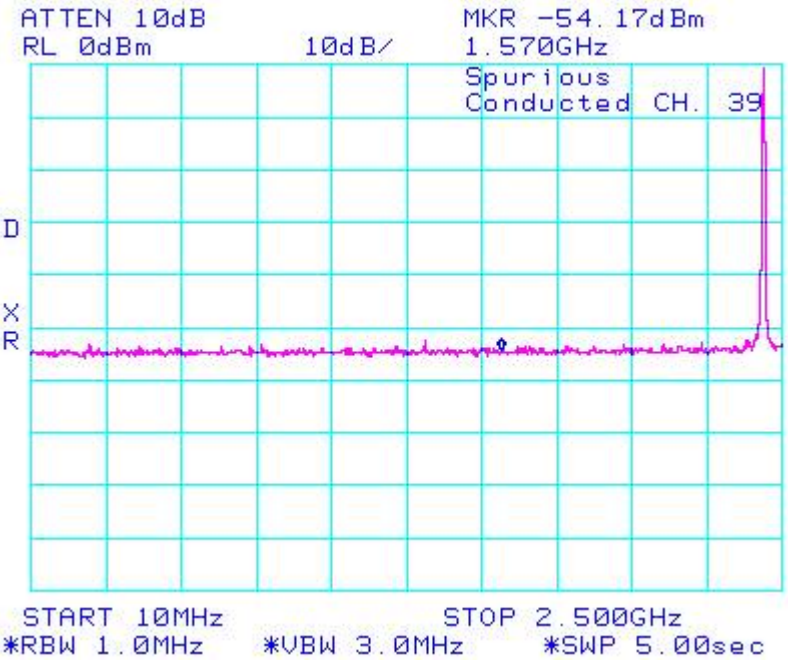



**Figure 38: Spurious RF Conducted Emissions, Channel 39**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 39**: - **Spurious RF Conducted Emissions, Channel 39**

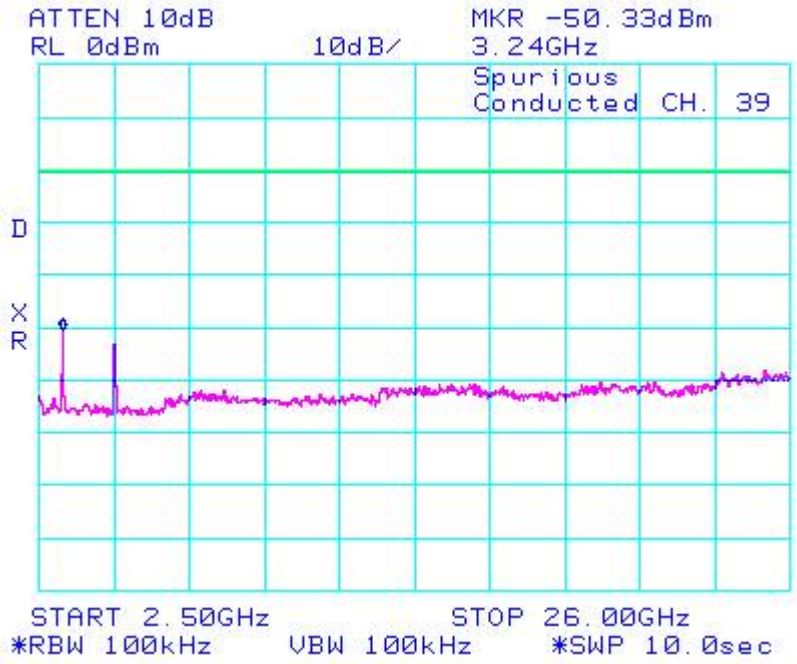
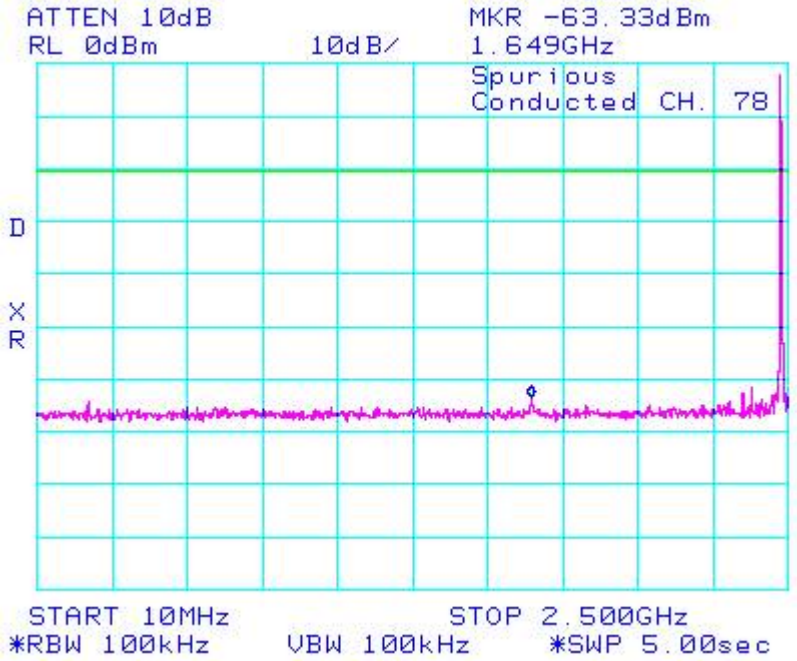



**Figure 40: Spurious RF Conducted Emissions, Channel 78**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 41**: **Spurious RF Conducted Emissions, Channel 78**

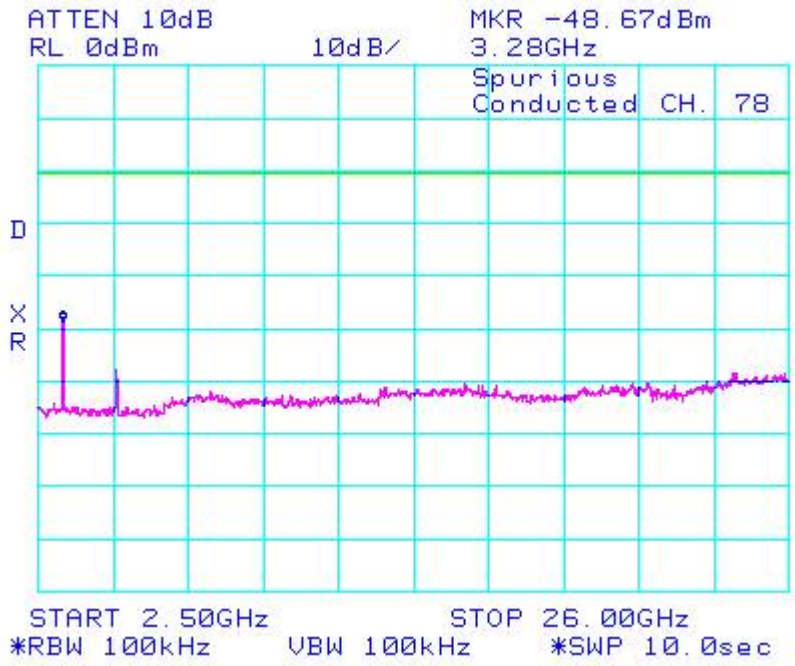
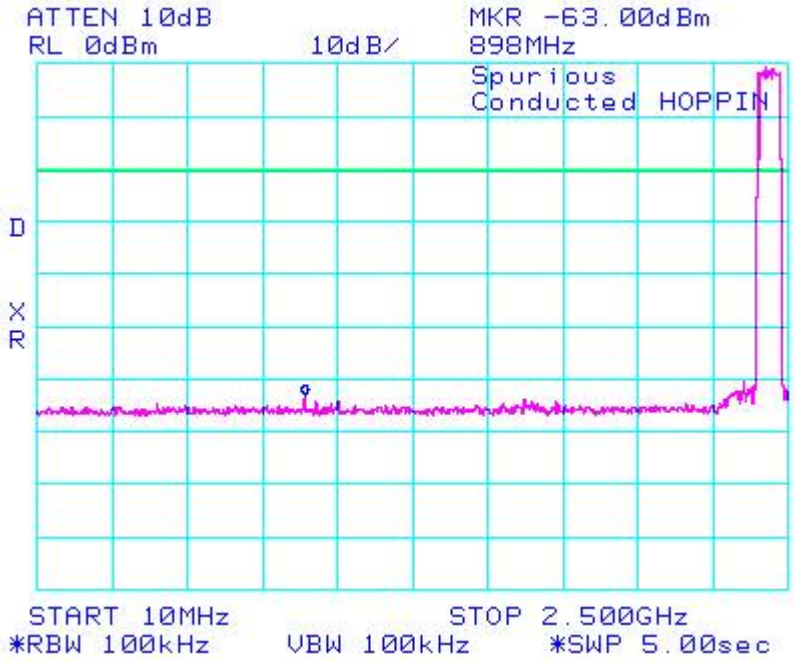
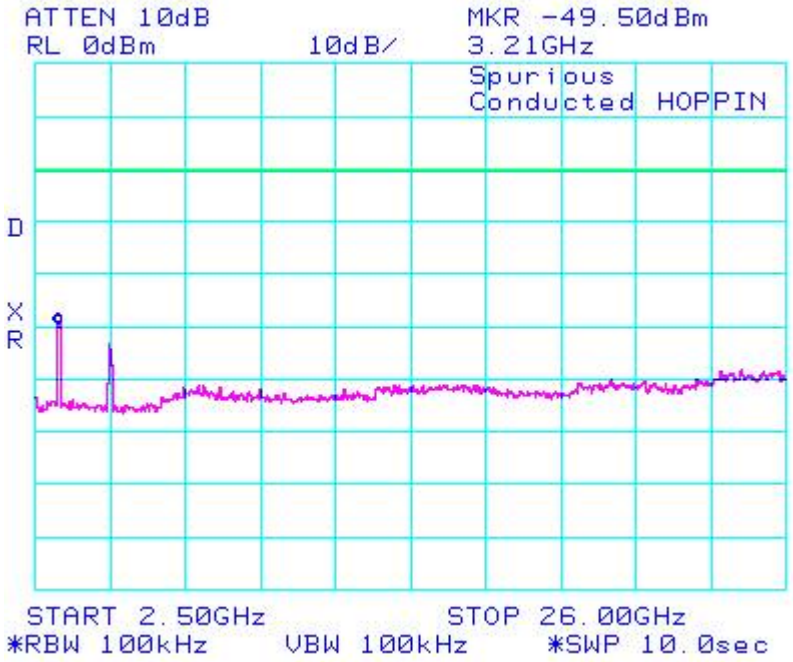



**Figure 42: Spurious RF Conducted Emissions, Frequency Hopping Mode**



Bluetooth RF Conducted Emission Test Results cont'd

**Figure 43: Spurious RF Conducted Emissions, Frequency Hopping Mode**




Using Pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

| Bluetooth Channel | Channel Power (dBm) | Max. Measured Level (dBm) | Max. Measured Level from carrier (dBc) | Limit (dBc) |
|---|---|---|---|---|
| 0 | -0.17 | -53.83 | -53.66 | -20 |
| 39 | -0.50 | -53.17 | -52.67 | -20 |
| 78 | -1.17 | -53.17 | -52.00 | -20 |
| Hopping mode | -0.17 | -53.00 | -52.83 | -20 |

The environmental test conditions were: Temperature 23ºC
Pressure 1014 mb
elative Humidity 41%

See figures 44 to 51 for the plots of the Spurious RF Conducted Emissions.

**Figure 44**: **Spurious RF Conducted Emissions, Channel 0**

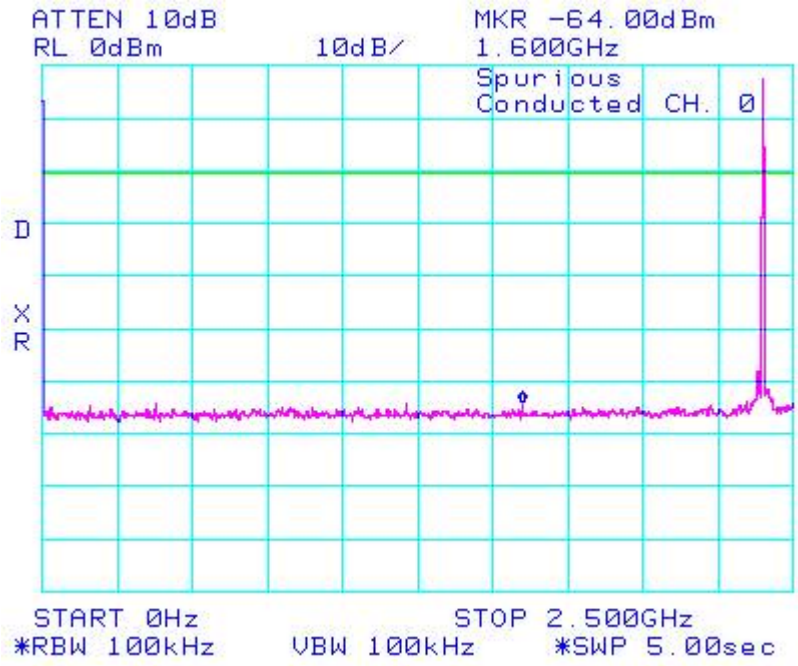



**Figure 45: Spurious RF Conducted Emissions, Channel 0**

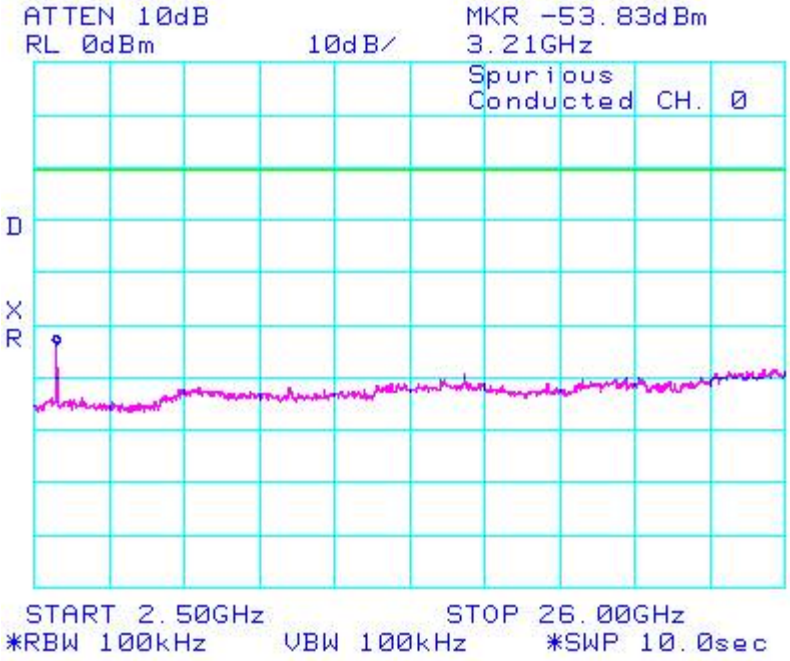



**Figure 46: Spurious RF Conducted Emissions, Channel 39**

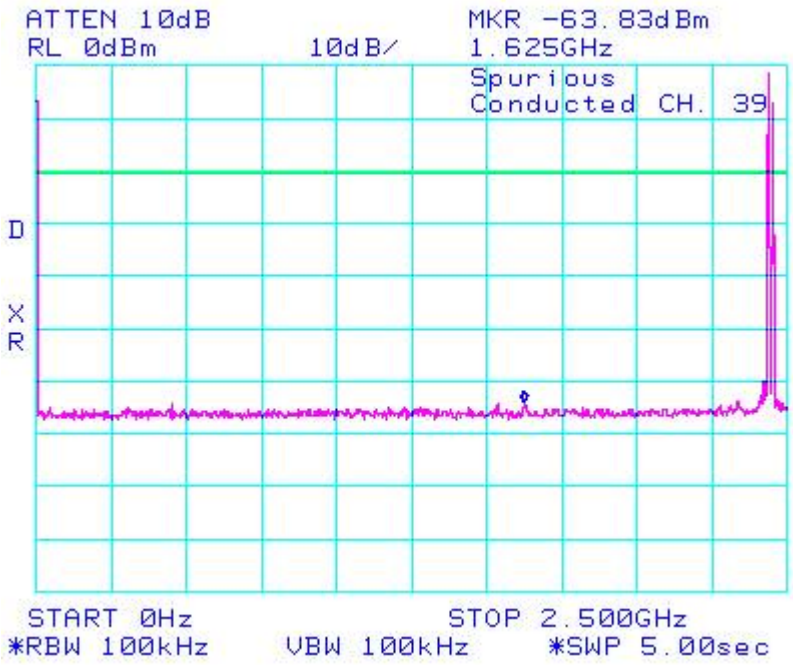



**Figure 47**: - **Spurious RF Conducted Emissions, Channel 39**

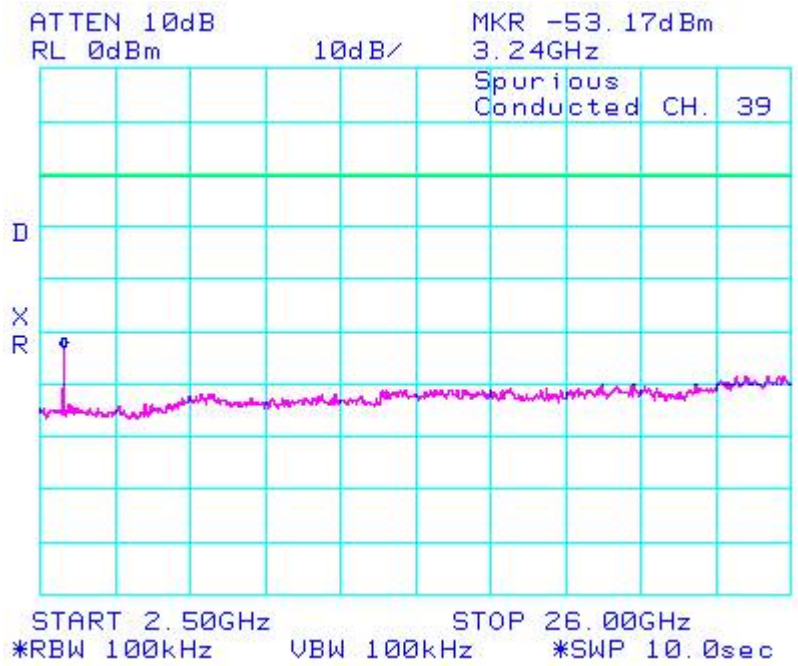


**Figure 48: Spurious RF Conducted Emissions, Channel 78**

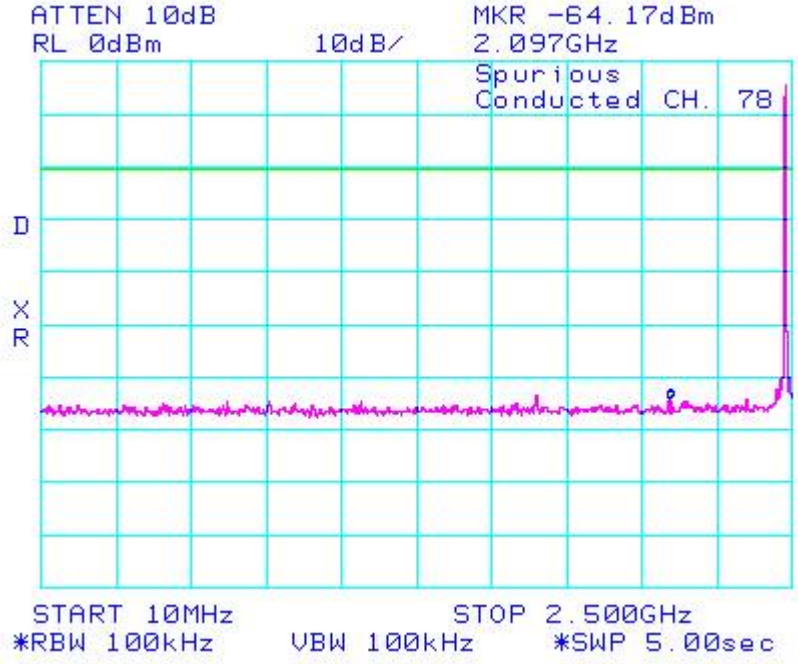



**Figure 49**: **Spurious RF Conducted Emissions, Channel 78**

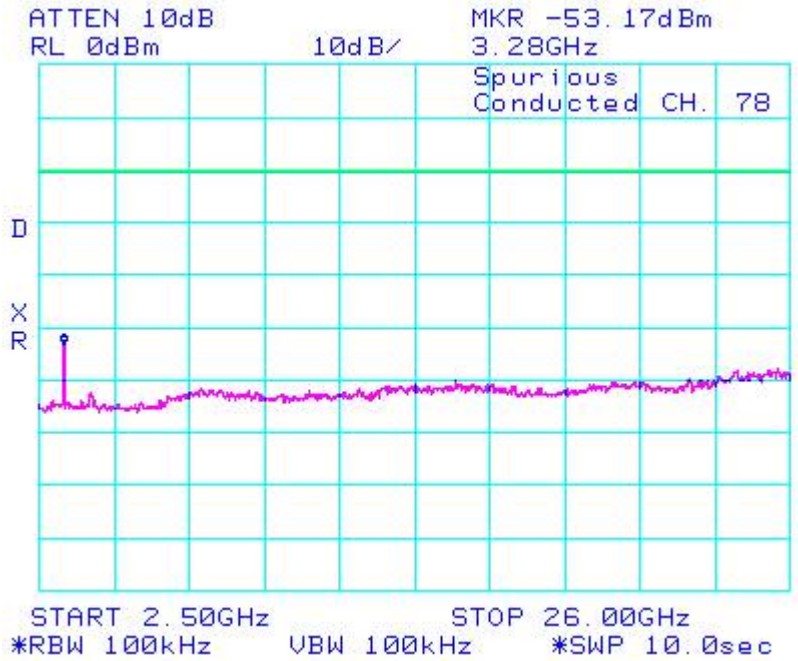


**Figure 50: Spurious RF Conducted Emissions, Frequency Hopping Mode**

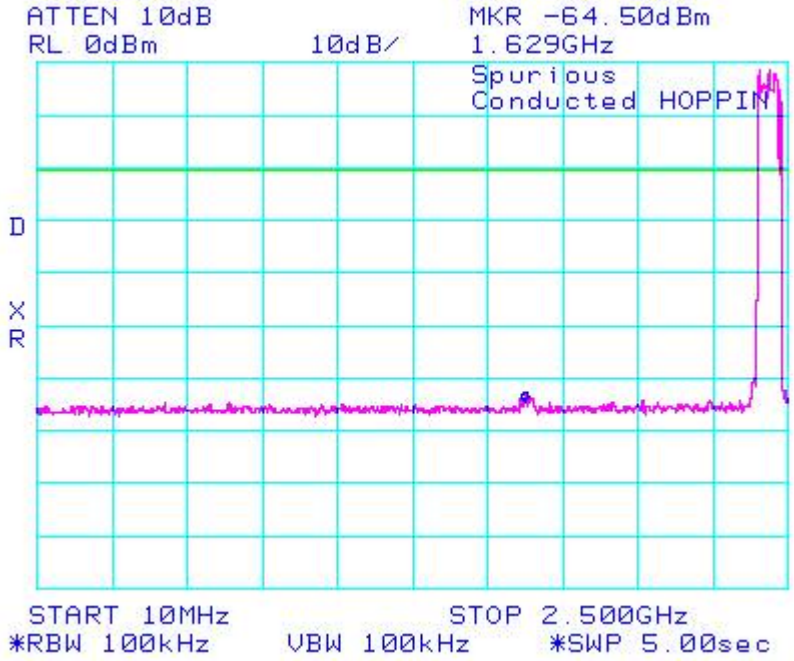



**Figure 51: Spurious RF Conducted Emissions, Frequency Hopping Mode**