

EMI Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Parts 2, 22, 24, 27
IC RSS 130, 132, 133, 139 and RSS GEN



This report supersedes the report RTS-6058-1408-12 dated August 11, 2014

REPORT NO.: RTS-6058-1408-12_Rev1

PRODUCT MODEL NO.: RHA111LW
TYPE NAME: BlackBerry® smartphone
FCC ID: L6ARHA110LW
IC: 2503A-RHA110LW

EMISSION DESIGNATOR (GSM): 246KGXW
EMISSION DESIGNATOR (EDGE): 246KG7W
EMISSION DESIGNATOR (WCDMA): 4M17F9W
EMISSION DESIGNATOR (LTE QPSK): See details in Appendix
EMISSION DESIGNATOR (LTE 16QAM): See details in Appendix

DATE: August 26, 2014

RTS is accredited
according to
EN ISO/IEC 17025 by:



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Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Report Revision History:

Rev1:

1. Addition of calibration intervals in section G.

Statement of Performance:

The BlackBerry® smartphone, model RHA111LW, part number; CER-59878-001 - Rev2-x001-02 and accessories when configured and operated per BlackBerry'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.

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A. Scope

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

- FCC CFR 47 Part 2, Subpart J, Equipment Authorization Procedures, Oct, 2013.
- FCC CFR 47 Part 22, Subpart H, Cellular Radiotelephone Services, Oct., 2013.
- FCC CFR 47 Part 24 Subpart E, Broadband PCS, Oct., 2013.
- FCC CFR 47 Part 27, Subpart C, Technical Standards, Oct, 2013.
- Industry Canada, RSS-132 Issue 2, September 2005, Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz.
- Industry Canada, RSS-133 Issue 5, February 2009, 2 GHz Personal Communications Services.
- Industry Canada, RSS-GEN Issue 3, December 2010, General Requirements and Information for the Certification of Radio communication Equipment.
- Industry Canada, RSS-139 Issue 2, February 2009, Advanced Wireless Services Equipment Operating in the Bands 1710-1755 MHz and 2110-2155 MHz.
- Industry Canada, RSS-130 Issue 1, October 2013, Mobile Broadband Services (MBS) Equipment Operating in the Frequency Bands 698-756 MHz and 777-787 MHz.

B. Associated Documents

- 1)MultiSourceDeclaration_RHA111LW_10.3.0.890,
- 2)RHA111LW_CER-59878-001 Rev 1- x001-00
- 3)RHA111LW_CER-59878-001 Rev 2- x001-02

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C. Product Identification

Manufactured by BlackBerry Limited whose headquarters is located at:
 2200 University Ave. E
 Waterloo, Ontario
 Canada, N2K 0A7
 Phone: 519 888 7465
 Fax: 519 888 7884

The equipment under test (EUT) was tested at the following locations:

BlackBerry RTS EMC test facilities

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

440 Phillip Street
 Waterloo, Ontario,
 Canada , N2L 5R9
 Phone: 519 888 7465
 Fax: 519 888 6906

The testing was performed from June 24 to August 5, 2014.

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BlackBerry® smartphone Samples Tested

Sample	Model	CER NUMBER	PIN	Software Information
1	RHA111LW	CER-59878-001Rev1-x001-00	2FFEB284	OS Version: 10.3.0.686 Bundle: 686
2	RHA111LW	CER-59878-001Rev2-x001-02	2FFFC30D	OS Version: 10.3.0.890 Bundle: 890
3	RHA111LW	CER-59878-001Rev1-x001-00	2FFEB2A5	OS Version: 10.3.0.686 Bundle: 686
4	RHA111LW	CER-59878-001Rev1-x001-00	2FFEB281	OS Version: 10.3.0.686 Bundle: 686
5	RHA111LW	CER-59878-001Rev2-x001-02	2FFFC30C	OS Version: 10.3.0.890 Bundle: 890
6	RHA111LW	CER-59878-001Rev2-x001-02	2FFEC346	OS Version: 10.3.0.890 Bundle: 890

RF Conducted Emissions testing was performed on samples 1, 2.

Radiated Emissions testing was performed on samples 3, 4, 5, 6

Only the characteristics that may have been impacted by the changes from RHA111LW Rev1 to RHA111LW Rev2 were re-tested.

For more details, refer to RHA111LW_HW_Declaration_CER-59878-001_Rev1 - x001-00 and RHA111LW_HW_Declaration_CER-59878-001_Rev2 - x001-02

To view the differences between OS: 10.3.0.686 and OS: 10.3.0.890 see documents

MultiSourceDeclaration_RHA111LW_10.3.0.890.

D. Support Equipment Used for the Testing of the EUT

No support equipment required; for list of equipment refer to section G, Compliance Test Equipment Used.

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW	
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E. Test Results Chart

SPECIFICATION		TEST TYPE	RESULT	TEST DATA APPENDIX
FCC CFR 47	IC			
Part 2.1051 Part 2.1057 Part 22.917 Part 24.238	RSS-132, 4.5 RSS-133, 6.5	GSM850 / PCS1900 Conducted Spurious Emissions	Pass	1A
Part 2.202 Part 2.1049 Part 22.917 Part 24.238	RSS-GEN, 4.6	GSM 850 / PCS1900 Occupied Bandwidth and Channel Mask	Pass	1A
Part 2.1055 Part 22.863 Part 24.235	RSS-132, 4.3 RSS-133, 6.3	GSM 850 / PCS 1900 Frequency Stability vs. Temperature and Voltage	Pass	1B
Part 22.913(a)(2) Part 24.232(b)(c)	RSS-132, 4.4 RSS-133, 6.4	GSM850 ERP PCS1900 EIRP	Pass	1C
Part 2.1053 Part 22.917 Part 24.238	RSS-132, 4.5 RSS-133, 6.5	GSM850 / PCS1900 Radiated Spurious/Harmonic Emissions	Pass	1C
Part 2.1051 Part 22.917 Part 24.238	RSS-132, 4.5 RSS-133, 6.5	WCDMA Band II/V Conducted Spurious Emissions	Pass	2A
Part 2.1049 Part 22.917 Part 24.238	RSS-GEN, 4.6	WCDMA Band II/V Occupied Bandwidth and Channel Mask	Pass	2A
Part 2.1055(a)(d) Part 22.917 Part 24.235	RSS-132, 4.3 RSS-133, 6.3	WCDMA Band II/V Frequency Stability vs. Temperature and Voltage	Pass	2B
Part 22.913(a)(2) Part 24.232(c)	RSS-132, 4.4 RSS-133, 6.4	WCDMA Band V ERP WCDMA Band II EIRP	Pass	2C
Part 22.917 Part 24.238	RSS-132, 4.5 RSS-133, 6.5	WCDMA Band II/V Radiated Spurious/Harmonic Emissions	Pass	2C
Part 2.1051 Part 24.238(a) Part 24.50 (d)	RSS-133, 6.5	LTE Band 2 Conducted Spurious Emissions	Pass	3A
Part 2.1049 Part 24.238	RSS-GEN, 4.6	LTE Band 2 Occupied Bandwidth and Channel Mask	Pass	3A
Part 24.232 (d)	RSS-133, 6.4	LTE Band 2 Peak to Average Ratio measurements	Pass	3A
Part 2.1055(a)(d) Part 24.235	RSS-133, 6.3	LTE Band 2 Frequency Stability vs. Temperature and Voltage	Pass	3B

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Part 24.232(b)(c)	RSS-133, 6.4	LTE Band 2 EIRP	Pass	3C
Part 24.238	RSS-133, 6.5	LTE Band 2 Radiated Spurious/Harmonic Emissions	Pass	3C
Part 2.1051 Part 22.917	RSS-132, 4.5	LTE Band 5 Conducted Spurious Emissions	Pass	4A
Part 2.1049 Part 22.917	RSS-GEN, 4.6	LTE Band 5 Occupied Bandwidth and Channel Mask	Pass	4A
Part 2.1055(a)(d) Part 22.917	RSS-132, 4.3	LTE Band 5 Frequency Stability vs. Temperature and Voltage	Pass	4B
Part 22.913(a)(2)	RSS-132, 4.4	LTE Band 5 ERP	Pass	4C
Part 22.917	RSS-132, 4.5	LTE Band 5 Radiated Spurious/Harmonic Emissions	Pass	4C
Part 2.1051 Part 27.53(h)	RSS-139, 6.5	LTE Band 4 Conducted Spurious Emissions	Pass	5A
Part 2.1049 Part 27.53(h)(1)	RSS-GEN, 4.6	LTE Band 4 Occupied Bandwidth and Channel Mask	Pass	5A
Part 27.50 (d)(5)	RSS-139, 6.4	LTE Band 4 Peak to Average Ratio measurements	Pass	5A
Part 2.1055 Part 27.54	RSS-139, 6.3	LTE Band 4 Frequency Stability vs. Temperature and Voltage	Pass	5B
Part 2.1053 Part 27.50(d)(4)	RSS-139, 6.4	LTE Band 4 EIRP	Pass	5C
Part 2.1053 Part 27.53(h)	RSS-139, 6.5	LTE Band 4 Radiated Spurious/Harmonic Emissions	Pass	5C
Part 2.1051 Part 27.53(g)	RSS-130, 4.6	LTE Band 17 Conducted Spurious Emissions	Pass	6A
Part 2.1049 Part 27.53(g)	RSS-GEN, 4.6	LTE Band 17 Occupied Bandwidth and Channel Mask	Pass	6A
Part 2.1055 Part 27.54	RSS-130, 4.3	LTE Band 17 Frequency Stability vs. Temperature and Voltage	Pass	6B
Part 2.1053 Part 27.50(c)(9)	RSS-130, 4.4	LTE Band 17 ERP	Pass	6C
Part 2.1053 Part 27.53(g)	RSS-130, 4.6	LTE Band 17 Radiated Spurious/Harmonic Emissions	Pass	6C

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F.Summary of Results

1) Conducted Emission Measurements

- The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the GSM850 as per 47 CFR 2.1051, CFR 22.917, CFR 22.901(d) and RSS-GEN, 4.9. The EUT was measured on the low, middle and high channels. The frequency range investigated was from 30 MHz to 10 GHz. See APPENDIX 1A for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the PCS1900 as per 47 CFR 2.1051, CFR 24.238(a) and RSS-GEN, 4.9. The EUT was measured on the low, middle and high channels. The frequency range investigated was from 30 MHz to 20 GHz. See APPENDIX 1A for test data

- The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the GSM850 as per 47 CFR 2.202, CFR 22.917 and RSS-GEN, 4.6. The EUT was measured in GSM and EDGE mode on the low, middle and high channels. The worst case occupied bandwidth was 245 kHz on the low and high channels in CALL mode, and 246 kHz on high channel in EDGE mode. See APPENDIX 1A for test data.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the PCS1900 as per 47 CFR 2.202, CFR 24.238 and RSS-GEN, 4.6. The EUT was measured in GSM and EDGE mode on the low, middle and high channels. The worst case occupied bandwidth was 246.0 kHz on high channel in CALL mode, and 243 kHz on all channels in EDGE mode. See APPENDIX 1A for test data.

- The BlackBerry® smartphone met the requirements of the Frequency Stability in the GSM850 as per 47 CFR 2.1055, CFR 22.917 and RSS-GEN, 4.3. The EUT was measured in GSM850 mode on the low, middle and high channels. See APPENDIX 1B for test data.

The BlackBerry® smartphone met the requirements of the Frequency Stability in the PCS1900 as per 47 CFR 2.1055, CFR 24.235 and RSS-GEN, 4.7. The EUT was measured in PCS1900 mode on the low, middle and high channels. See APPENDIX 1B for test data.

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- The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the WCDMA band V as per 47 CFR 2.1051, CFR 22.917, CFR 22.901(d) and RSS-GEN, 4.9. The EUT was measured on the low, middle and high channels. The frequency range investigated was from 30 MHz to 10 GHz. See APPENDIX 2A for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the WCDMA band II as per 47 CFR 2.1051, CFR 24.238(a) and RSS-GEN, 4.9. The EUT was measured on the low, middle and high channels. The frequency range investigated was from 30 MHz to 20 GHz. See APPENDIX 2A for test data

- The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the WCDMA band V as per 47 CFR 2.202, CFR 22.917 and RSS-GEN, 4.6. The EUT was measured in Voice and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.167 MHz on the low and high channel in Loopback mode, and 4.167 MHz on all channels in HSUPA mode. See APPENDIX 2A for test data.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the WCDMA band II as per 47 CFR 2.202, CFR 24.238 and RSS-GEN, 4.6. The EUT was measured in Voice and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.167 MHz on high channel in Loopback mode, and 4.167 MHz on all channels in HSUPA mode. See APPENDIX 2A for test data.

- The BlackBerry® smartphone met the requirements of the Frequency Stability in the WCDMA band V as per 47 CFR 2.1055. The EUT was measured in WCDMA band V mode on the low, middle and high channels. See APPENDIX 2B for test data.

The BlackBerry® smartphone met the requirements of the Frequency Stability in the WCDMA band II as per 47 CFR 2.1055, CFR 24.235. The EUT was measured in WCDMA band II mode on the low, middle and high channels. See APPENDIX 2B for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 2 as per 47 CFR 2.1051, CFR 24.238, CFR 24.50(d), RSS-133, 6.5 and RSS-GEN, 4.9. The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 2 with both QPSK and 16-QAM modulations. Different Resource Block allocations were investigated; a minimum

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one RB case was also tested. The frequency range investigated was from 30 MHz to 20 GHz.

See APPENDIX 3A for test data.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the LTE Band 2 as per 47 CFR 2.202, CFR 24.238 and RSS-GEN, 4.6. The EUT was measured on the low, middle and high channels in all bandwidth and both modulations. The worst case occupied bandwidth was 17.94 MHz on the middle channel in 20MHz BW, 100 RB and 16QAM modulation.

See Appendix 3A for test data

The BlackBerry® smartphone met the requirements of the Tx Peak to Average Ratio in the LTE Band 2 as per 47 CFR 24.232 (5)(d). The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 2 with QPSK and 16-QAM modulations. Different RB allocations were also investigated, a minimum one RB case was also tested. The worst case Peak to Average Ratio was 11.20 dB on mid channel in 10MHz bandwidth with 50 RB.

See APPENDIX 3A for test data

The BlackBerry® smartphone met the requirements of the Frequency Stability in the LTE Band 2 as per 47 CFR 2.1055, CFR 24.235 and RSS-133, 6.3. The EUT was measured in LTE Band 2 mode on the low, middle and high channels in 20MHz BW with 100 RB and QPSK modulation.

See APPENDIX 3B for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 5 as per 47 CFR 2.1051, CFR 22.917, CFR 22.901(d), RSS-132, 5.5 and RSS-GEN, 4.9. The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Different RB allocations were investigated, a minimum one RB case was also tested. The frequency range investigated was from 30 MHz to 10 GHz.

See APPENDIX 4A for test data.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the LTE Band 5 as per 47 CFR 2.202, CFR 22.917 and RSS-GEN, 4.6. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz and 10MHz bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Different RB allocations were investigated, a minimum one RB case was also tested. The worst case occupied bandwidth was 8.97 MHz on the high channel in 10MHz BW, 50 RB and 16QAM modulation.

See APPENDIX 4A for test data.

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The BlackBerry® smartphone met the requirements of the Frequency Stability in the LTE Band 5 as per 47 CFR 2.1055, CFR 22.917 and RSS-132, 5.3. The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Different RB allocations were investigated, a minimum one RB case was also tested.

See APPENDIX 4B for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 4 as per 47 CFR 2.1051, CFR 27.53 and RSS-139, 6.5. The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 4 with QPSK and 16-QAM modulations. Different RB allocations were investigated, a minimum one RB case was also tested. The frequency range investigated was from 30 MHz to 20 GHz.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the LTE Band 4 as per 47 CFR 2.1049, CFR 27.53 and RSS-GEN, 4.6. The EUT was measured on the low, middle and high channels in all bandwidths and both modulations. The worst case occupied bandwidth was 17.94 MHz on the high channel in 20MHz BW, 100 RBs and 16QAM modulation.

See Appendix 5A for test data

The BlackBerry® smartphone met the requirements of the Tx Peak to Average Ratio in the LTE Band 4 as per 47 CFR 27.50 (5)(d) and RSS-139, 6.4. The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 4 with QPSK and 16-QAM modulations. Different RB allocations were also investigated, a minimum one RB case was also tested. The worst case Peak to Average Ratio was 10.90 dB on middle channel in 10MHz bandwidth with 50 RBs.

See APPENDIX 5A for test data

The BlackBerry® smartphone met the requirements of the Frequency Stability in the LTE Band 4 as per 47 CFR 2.1055, CFR 27.54 and RSS-139, 6.3. The EUT was measured in LTE Band 4 mode on the low, middle and high channels in 20MHz BW with 100 RBs and QPSK modulation.

See APPENDIX 5B for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 17 as per 47 CFR 2.1051, CFR 27.53. The EUT was measured on the low, middle and high channels in 5MHz and 10MHz, bandwidths for LTE Band 17 with QPSK and 16-QAM modulations. Different RB allocations were investigated, a minimum one RB case was also tested. The frequency range investigated was from 30 MHz to 20 GHz.

See Appendix 6A for test data

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The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the LTE Band 17 as per 47 CFR 2.1049, CFR 27.53. The EUT was measured on the low, middle and high channels. The worst case occupied bandwidth was 8.973MHz on the low channel in 10MHz BW, 50 RBs and 16-QAM modulation.

See Appendix 6A for test data

The BlackBerry® smartphone met the requirements of the Tx Peak to Average Ratio in the LTE Band 17 as per 47 CFR 27.50 (5)(d). The EUT was measured on the low, middle and high channels in 5MHz and 10MHz bandwidths for LTE Band 17 with QPSK and 16-QAM modulations. Different RB allocations were also investigated, a minimum one RB case was also tested. The worst case Peak to Average Ratio was 10.48 dB on middle channel in 10MHz bandwidth with 50 RBs. See APPENDIX 6A for test data

The BlackBerry® smartphone met the requirements of the Frequency Stability in the LTE Band 17 as per 47 CFR 2.1055, CFR 27.54. The EUT was measured in LTE Band 17 mode on the low, middle and high channels in 20MHz BW with 100 RBs and QPSK modulation.

See APPENDIX 6B for test data.

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2) Radiated Emission Measurements

The radiated spurious emissions/harmonics and ERP/EIRP were measured for GSM 850 and PCS 1900. The results are within the limits. The BlackBerry® smartphone was placed on a nonconductive styrofoam table, 80 cm high that was positioned on a remotely controlled turntable. The test distance used between the BlackBerry® smartphone and the receiving antenna was three meters. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 meters. The turntable was rotated to determine the azimuth of the peak emissions. Both the horizontal and vertical polarizations of the emissions were measured. The maximum emissions level was recorded. The BlackBerry® smartphone was then substituted with an antenna placed in the same location as the BlackBerry® smartphone. A Dipole antenna was used for the ERP measurements and a Horn antenna was used for EIRP measurements. The substitution antenna was connected into a signal generator that was set to the test frequency.

The emissions were maximized by elevating the antenna in the range of 1 to 4 meters. The signal generator output was then adjusted to match the BlackBerry® smartphone output reading. The signal generator output was recorded. Both the horizontal and vertical polarizations of the emissions were measured.

The following measurements were done in a semi-anechoic chamber (SAC) below 1 GHz and a modified Semi-anechoic Chamber ((SAC) with floor absorber) above 1 GHz. The SAC's FCC registration number is **778487** and the Industry Canada (IC) file number is **2503B-1**. The modified SAC with floor absorber's FCC registration number is **959115** and the IC file number is **2503C-1**. The BlackBerry® smartphone was measured on the low, middle and high channels.

- a) The radiated spurious emissions/harmonics and ERP/EIRP were measured for GSM 850 and PCS 1900. The results are within the limits.
 - The highest ERP in the 850 band Call mode measured was 30.56 dBm (1.14 W) at 848.80 MHz (channel 251).
 - The highest ERP in the 850 band EDGE mode measured was 29.74 dBm (0.94 W) at 848.80 MHz (channel 251).
 - The highest EIRP in the PCS band Call mode measured was 32.44 dBm (1.75 W) at 1850.20 MHz (channel 512).
 - The highest EIRP in the PCS band EDGE mode measured was 31.85 dBm (1.53 W) at 1850.20 MHz (channel 512).

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The radiated spurious emission and carrier harmonics were measured up to the 10th harmonic for low, middle, and high channels in the GSM 850 and PCS 1900. Each band was measured in CALL and EDGE modes, with both the horizontal and vertical polarizations.

- The worst margin was 10.2 dB below the limit at 2509.696 MHz in Call mode in band GSM850.
- All margins in the GSM850 in EDGE mode for harmonic emissions were at least 25 dB below the limit for all test frequencies
- All margins in the PCS1900 for harmonic emissions were at least 25 dB below the limit for all test frequencies in CALL mode.
- All margins in the PCS1900 for harmonic emissions were at least 25 dB below the limit for all test frequencies in EDGE mode.

See Appendix 1C for test data.

b) The radiated spurious emissions/harmonics and ERP/EIRP were measured for WCDMA Band II/V.

- The highest ERP in the WCDMA band V, Call Service mode was 23.35 dBm (0.22 W) at 826.40 MHz (channel 4132).
- The highest ERP in the WCDMA band V, HSUPA mode was 21.78 dBm (0.15 W) at 826.40 MHz (channel 4132).
- The highest EIRP in the WCDMA band II, Call Service mode measured was 28.13 dBm (0.65 W) at 1907.60 MHz (channel 9538).
- The highest EIRP in the WCDMA band II, HSUPA mode measured was 27.71 dBm (0.59 W) at 1907.60 MHz (channel 9538).

The radiated carrier harmonics were measured up to the 10th harmonic for low, middle and high channels in the WCDMA Band V, WCDMA Band II. Each band was measured in Call, and HSUPA modes. Both the horizontal and vertical polarizations were measured.

- All margins in the WCDMA Band V for harmonic emissions were at least 25 dB below the limit for all test frequencies.
- All margins in the WCDMA Band II for harmonic emissions were at least 25 dB below the limit for all test frequencies.

See Appendix 2C for test data.

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- c) The radiated spurious emissions/harmonics and ERP were measured for LTE Band 2.

The EUT was measured on the low, middle and high channels in 20MHz bandwidths for LTE Band 2 with QPSK and 16-QAM modulations. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

- The highest EIRP in the LTE Band 2 measured was 27.86 dBm (0.61 W) at 1907.40 MHz (channel 19174) in 5 MHz BW, 1 RB and QPSK modulation and
- The highest EIRP in the LTE Band 2 measured was 26.82 dBm (0.48 W) at 1907.40 MHz (channel 19174) in 5 MHz BW, 1 RB and 16-QAM modulation.

The radiated carrier harmonics were measured up to the 10th harmonic. The EUT was measured on the low, middle and high channels in the worst bandwidth 15MHz bandwidth for LTE Band 2 with QPSK and 16-QAM modulations as per conducted power. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

- All margins in the LTE Band 2 for harmonic emissions were at least 25 dB below the limit for all test frequencies.

See Appendix 3C for test data.

- d) The radiated spurious emissions/harmonics and ERP were measured for LTE Band 5.

The EUT was measured on the low, middle and high channels in 10 MHz bandwidth for LTE Band 5 with QPSK and 16-QAM modulations. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

- The highest EIRP in the LTE Band 5 measured was 22.24 dBm (0.17 W) at 836.50 MHz (channel 20525) in 5 MHz BW, 1 RB and QPSK modulation.
- The highest EIRP in the LTE Band 5 measured was 21.19 dBm (0.13 W) at 836.50 MHz (channel 20525) in 5 MHz BW, 1 RB and 16-QAM modulation.

The radiated carrier harmonics were measured up to the 10th harmonic. The EUT was measured on the low, middle and high channels in the worst bandwidth 3MHz bandwidths for LTE Band 5 with QPSK and 16-QAM modulations as per conducted power. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

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- All margins in the LTE Band 5 for harmonic emissions were at least 25 dB below the accepted limits for all test frequencies.

See Appendix 4C for test data.

- e) The radiated spurious emissions/harmonics and ERP were measured for LTE Band 4.

The EUT was measured on the low, middle and high channels in 1.4MHz, 5MHz and 20MHz bandwidths for LTE Band 4 with QPSK and 16-QAM modulations. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

- The highest EIRP in the LTE Band 4 measured was 29.35 dBm (0.86 W) at 1749.90 MHz (channel 20349) in 15MHz BW, 1 RB and QPSK modulation.
- The highest EIRP in the LTE Band 4 measured was 28.06 dBm (0.64 W) at 1715.00 MHz (channel 20000) in 20MHz BW, 1 RB and 16-QAM modulation.

The radiated carrier harmonics were measured up to the 10th harmonic. The EUT was measured on the low, middle and high channels in the worst bandwidth 5MHz bandwidth for LTE Band 4 with QPSK and 16-QAM modulations as per conducted power. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

- All margins in the LTE Band 4 for harmonic emissions were at least 25 dB below the limit for all test frequencies.

See Appendix 5C for test data.

- f) The radiated spurious emissions/harmonics and ERP were measured for LTE Band 17.

The EUT was measured on the low, middle and high channels in 5MHz and 10 MHz bandwidths for LTE band 17 with QPSK and 16-QAM modulations. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

- The highest EIRP in the LTE band 17 measured was 22.72dBm (0.19 W) at 706.50 MHz (channel 23755) in 5MHz BW, 1 RB and QPSK modulation.
- The highest EIRP in the LTE band 17 measured was 21.69 dBm (0.15 W) at 706.50 MHz (channel 23755) in 5MHz BW, 1 RB and 16-QAM modulation.

The radiated carrier harmonics were measured up to the 10th harmonic. The EUT was measured on the low, middle and high channels in the worst bandwidth 10

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MHz bandwidth for LTE Band 17 with QPSK and 16-QAM modulations as per conducted power. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

- All margins in the LTE Band 17 for harmonic emissions were at least 25 dB below the limit for all test frequencies.

See Appendix 6C for test data.

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3) Co-Location Radiated Measurements

The radiated emissions were measured up to 18 GHz for middle channels for simultaneous transmission in the following test configuration combinations:

- GSM 850 + Bluetooth(DH5) + 802.11b
- PCS 1900 + Bluetooth(2DH5) + 802.11g
- WCDMA Band II + Bluetooth(3DH5)+ 802.11n(2.4GHz).
- WCDMA Band V + Bluetooth(DH5) + 802.11a
- LTE B2 + Bluetooth(2DH5) + 802.11b
- LTE B4 + Bluetooth(3DH5) + 802.11g
- LTE B5 + Bluetooth(DH5) + 802.11n(2.4GHz)
- LTE B17 + Bluetooth(DH5) + 802.11a

Both the horizontal and vertical polarizations were measured. The emissions due to different simultaneous transmission did not increase the amplitude of any emissions nor did it produce any new inter-modulation products as a result of mixing.

Sample Calculation:

Corrected Signal level (CSL) is calculated as follows:

CSL (dBm) = Measured Level (dBμV) – Antenna Gain (dBi) + Free Space loss (dB) – 107(dB) + Cable Loss (dB) - Preamp (dB) + Filter Loss (dB) -2.15(dB)

Measurement Uncertainty ±4.3 dB

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G. Compliance Test Equipment Used

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SERIAL NUMBER</u>	<u>CAL DUE DATE</u> (YY MM DD)	<u>CAL INTERVAL</u> (YEARS)	<u>USE</u>
Preamplifier	Sonoma	310N/11909A	185831	14-10-16	1	Radiated Emissions
Preamplifier system	TDK RF Solutions	PA-02	080010	14-10-16	1	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA4-SP	001	14-10-23	1	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	14-10-23	1	Radiated Emissions
Hybrid Log Antenna	EMC Automation	HLP-3003C	017301	14-08-13	2	Radiated Emissions
Horn Antenna	EMC Automation	HRN-0118	030101	14-08-07	2	Radiated Emissions
Horn Antenna	EMC Automation	HRN-0118	030201	15-05-07	2	Radiated Emissions
Horn Antenna	Emco	3117	47563	15-08-07	2	Radiated Emissions
Horn Antenna	ETS	3116	2538	14-09-29	2	Radiated Emissions
Dipole Antenna	Schwarzbeck	UHAP	974	14-11-27	2	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	837493/073	14-11-24	1	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	112394	14-11-25	1	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	109747	14-11-25	1	RF Conducted Emissions
EMI Receiver	Rohde & Schwarz	ESIB-40	100255	14-12-11	1	Radiated Emissions
EMI Receiver	Rohde & Schwarz	ESU-40	100162	14-12-08	1	Radiated Emissions
Environment Monitor	Omega	iTHX-SD	0380561	16-11-15	3	Radiated Emissions
Environment Monitor	Omega	iTHX-SD	0340060	16-11-15	3	RF Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0380567	16-11-15	3	Radiated Emissions

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Compliance Test Equipment Used cont'd

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SERIAL NUMBER</u>	<u>CAL DUE DATE (YY MM DD)</u>	<u>CAL INTERVAL (YEARS)</u>	<u>USE</u>
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	101469	14-12-09	1	Radiated /RF Conducted Emission
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	109949	14-12-07	1	Radiated /RF Conducted Emission
Signal Generator	Agilent	E8257D	MY45140527	14-12-10	1	Radiated Emissions
Signal Generator	Agilent	83630B	3844A00927	14-11-23	1	Radiated Emissions
Spectrum Analyzer	Rohde & Schwarz	FSV	101820	14-11-21	1	RF Conducted Emissions
Spectrum Analyzer	Rohde & Schwarz	FSP	100884	14-11-21	1	RF Conducted Emissions

H. Test Software used

<u>SOFTWARE</u>	<u>COMPANY</u>	<u>VERSION</u>	<u>USE</u>
EMC32	Rohde & Schwarz	8.53.0	Radiated Emissions
TDK Standard Emission Test	TDK RF Solutions	8.53.1.62	Radiated Emissions

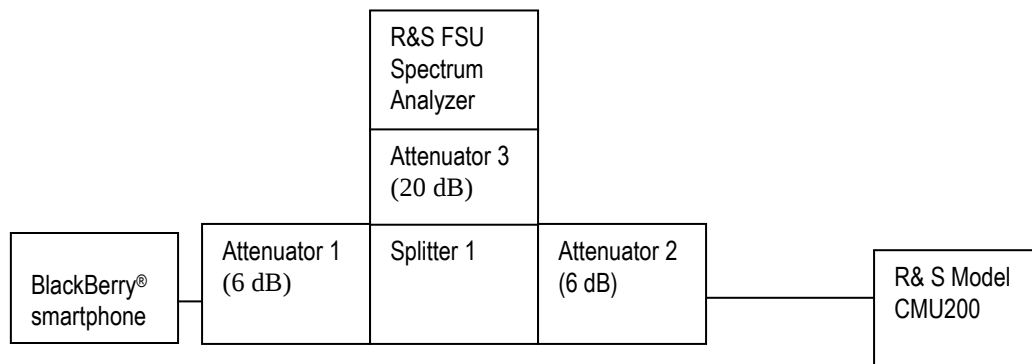
APPENDIX 1A – GSM CONDUCTED RF EMISSIONS TEST DATA/PLOTS

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GSM Conducted RF Emission Test Data

This appendix contains measurement data pertaining to conducted spurious emissions, –26 dBc bandwidth, 99% power bandwidth and the channel mask on BlackBerry® smartphone.

Test Setup Diagram



A reference offset of 32.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SERIAL NUMBER</u>
Attenuator 1	Mini-Circuits	BW-S6W2+	0647
Attenuator 2	Mini-Circuits	BW-S6W2+	0648
Attenuator 3	Mini-Circuits	BW-S20-2W263+	1234
Splitter 1	Weinschel	1515	MES 92

The environmental test conditions were:

Temperature: 25.1 °C
Relative Humidity: 41.3 %

The following measurements were performed by Chuan Tran.

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GSM Conducted RF Emission Test Data cont'd

The conducted spurious emissions – As per 47 CFR 2.1051, CRF 22.917, CFR 24.238(a) were measured from 30 MHz to 20 GHz.

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each carrier frequency of low, middle and high, the modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth.

The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.

The worst case –26dBc bandwidth for the GSM850 band was measured to be 274kHz, and for the PCS1900 band was measured to be 272kHz as shown below. Results were derived in a 3.0 kHz resolution bandwidth.

On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

Test Data for GSM850 band and PCS1900 band in Call mode

GSM850 band Frequency (MHz)	-26dBc Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
824.2	267	245
837.6	274	243
848.8	272	245

PCS1900 band Frequency (MHz)	-26dBc Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
1850.2	272	242
1880.0	270	243
1909.8	272	246

Measurement Plots for 850 and 1900 bands in Call mode

See Figures 1-1a to 1-12a for the plots of the conducted spurious emissions.

See Figures 1-13a to 1-24a for the plots of 26dBc/99% Occupied Bandwidth.

See Figures 1-25a to 1-28a for the plots of the Channel mask.

See figures 1-51a to 1-53a for the plots of Peak to Average Ratio.

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GSM Conducted RF Emission Test Data cont'd

Test Data for GSM850 and PCS1900 bands in EDGE mode

GSM850 band Frequency (MHz)	99% Occupied Bandwidth (kHz)
824.2	245
837.6	245
848.8	246

PCS1900 band Frequency (MHz)	99% Occupied Bandwidth (kHz)
1850.2	243
1880.0	243
1909.8	243

Measurement Plots for GSM850 and PCS1900 bands in EDGE mode

See Figures 1-29a to 1-34a for the plots of the 99% Occupied Bandwidth EDGE results.

See Figures 1-35a to 1-38a for the plots of channel mask EDGE results.

See Figures 1-39a to 1-50a for the plots of the conducted spurious emissions EDGE results

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GSM Conducted RF Emission Test Data cont'd

Figure 1-a: GSM850 band, Spurious Conducted Emissions, Low channel

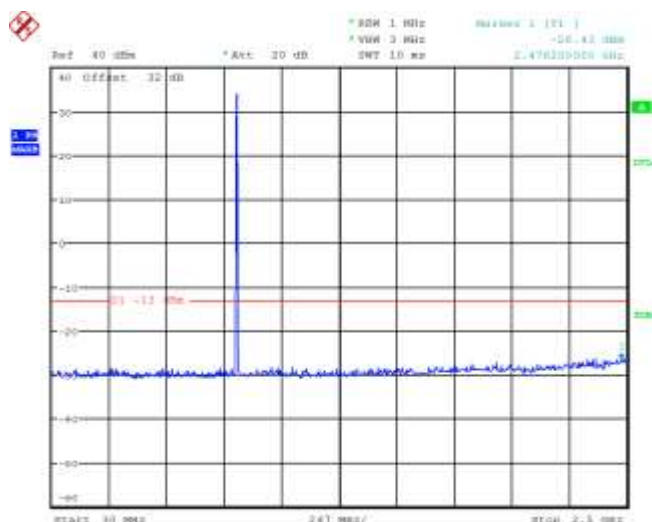


Figure 1-1a: GSM850 band, Spurious Conducted Emissions, Low channel

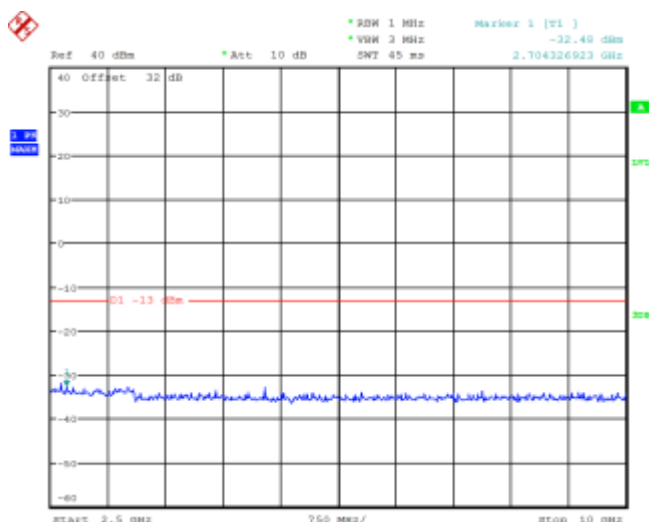


Figure 1-2a: GSM850 band, Spurious Conducted Emissions, Middle Channel

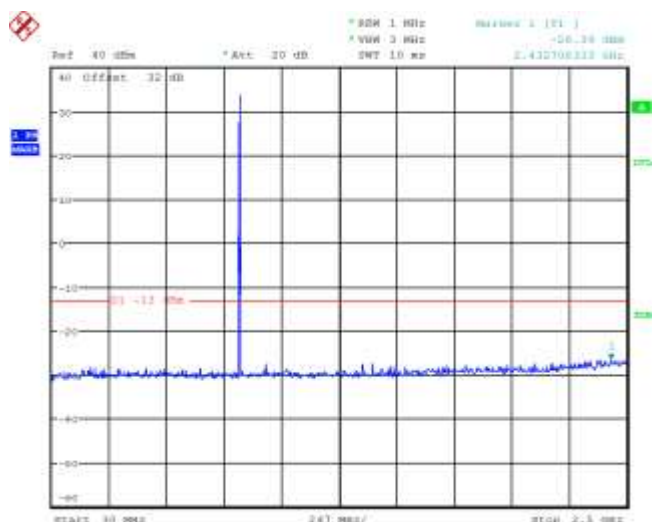
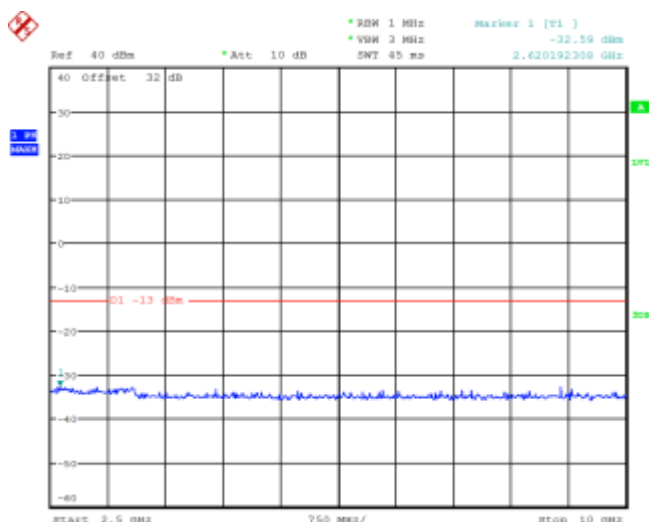


Figure 1-3a: GSM850 band, Spurious Conducted Emissions, Middle Channel



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GSM Conducted RF Emission Test Data cont'd

Figure 1-4a: GSM850 band, Spurious Conducted Emissions, High Channel

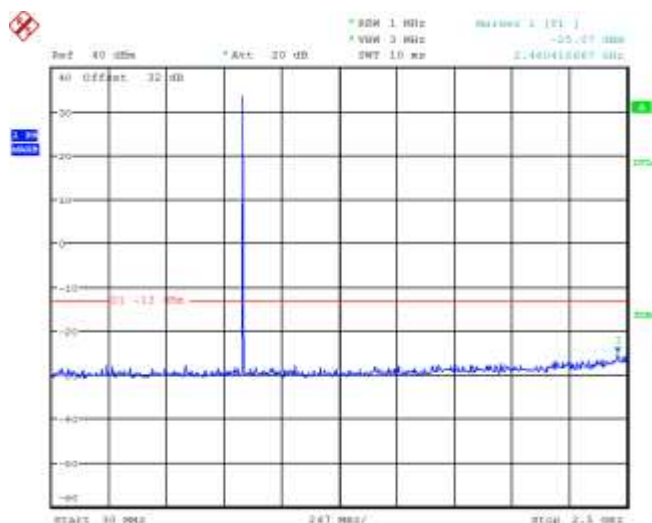


Figure 1-5a: GSM850 band, Spurious Conducted Emissions, High Channel

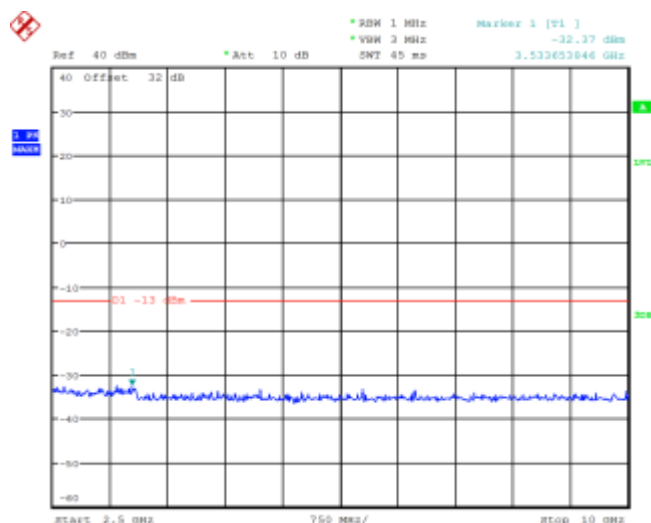


Figure 1-7a: PCS1900 band, Spurious Conducted Emissions, Low Channel

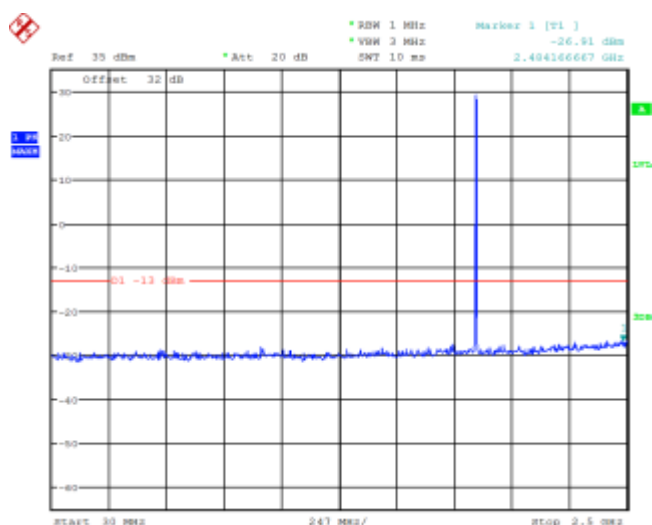
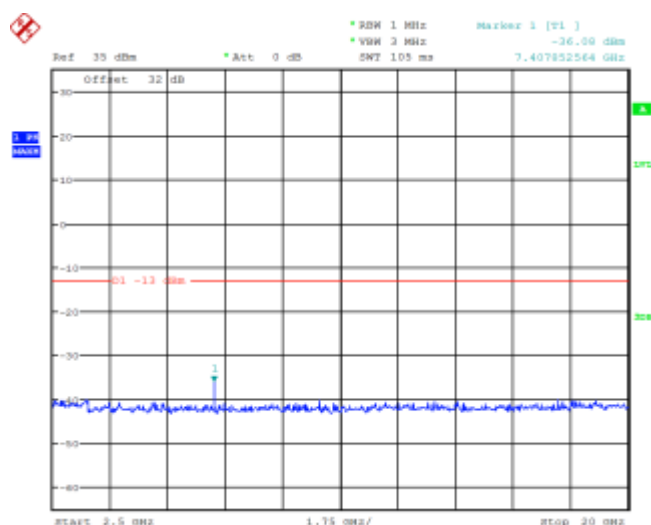


Figure 1-8a: PCS1900 band, Spurious Conducted Emissions, Low Channel



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GSM Conducted RF Emission Test Data cont'd

Figure 1-9a: PCS1900 band, Spurious Conducted Emissions, Middle Channel

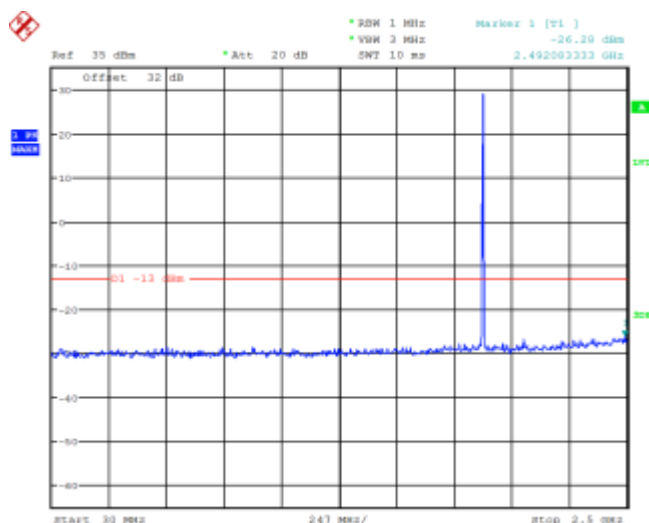


Figure 1-10a: PCS1900 band, Spurious Conducted Emissions, Middle Channel

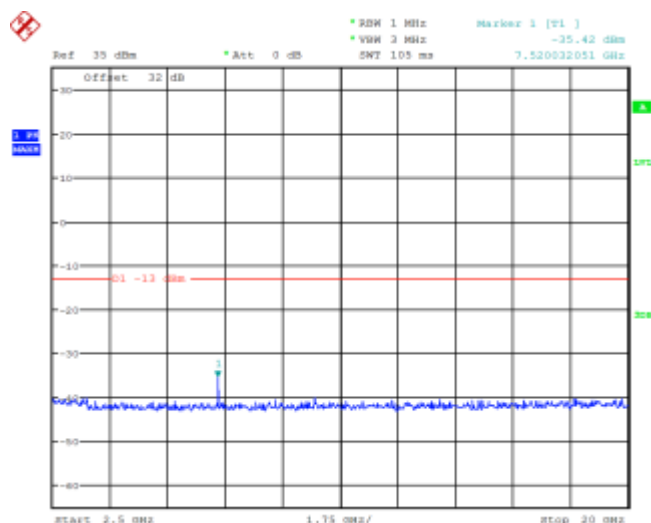


Figure 1-11a: PCS1900 band, Spurious Conducted Emissions, High Channel

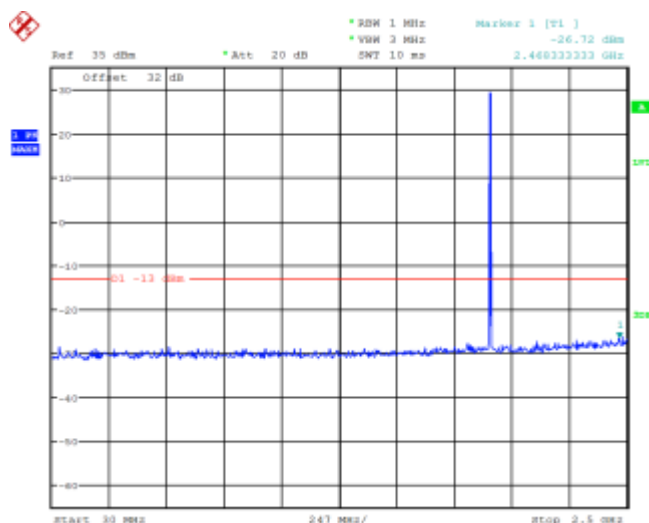
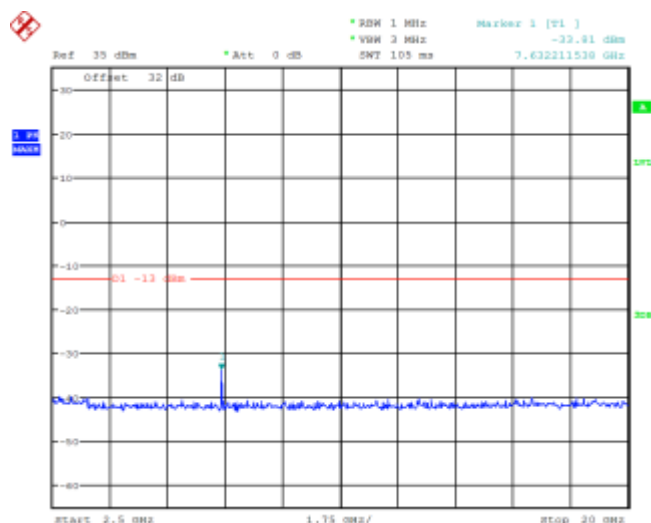


Figure 1-12a: PCS1900 band, Spurious Conducted Emissions, High Channel



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GSM Conducted RF Emission Test Data cont'd

Figure 1-13a: -26dBc bandwidth, GSM850 band Low Channel in GSM mode

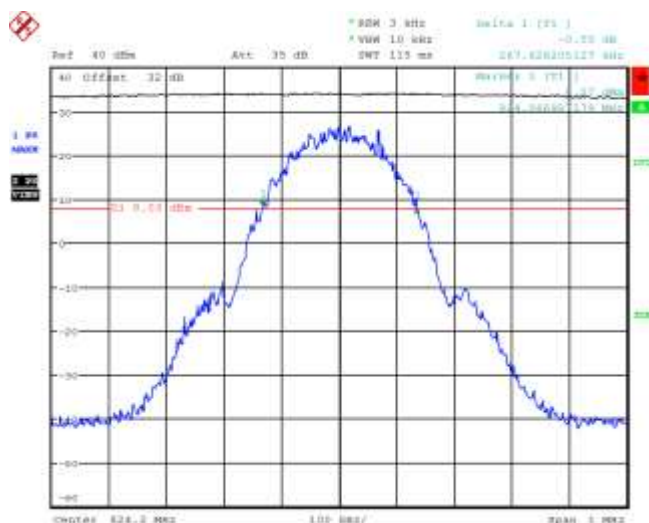


Figure 1-14a: Occupied Bandwidth, GSM850 band Low Channel in GSM mode

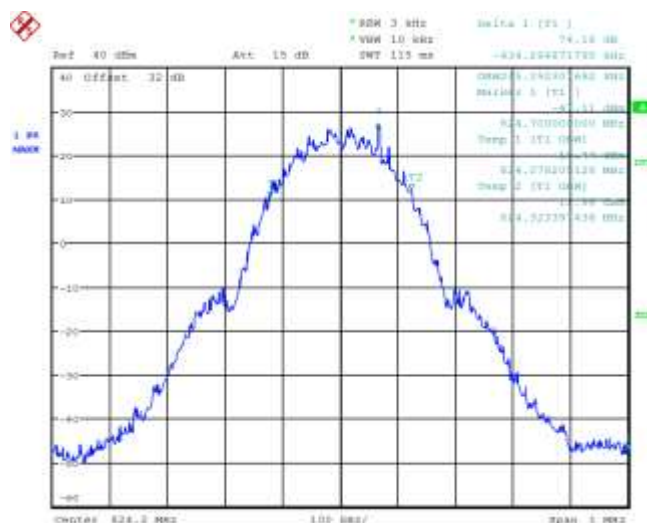


Figure 1-15a: -26dBc bandwidth, GSM850 band Middle Channel in GSM mode

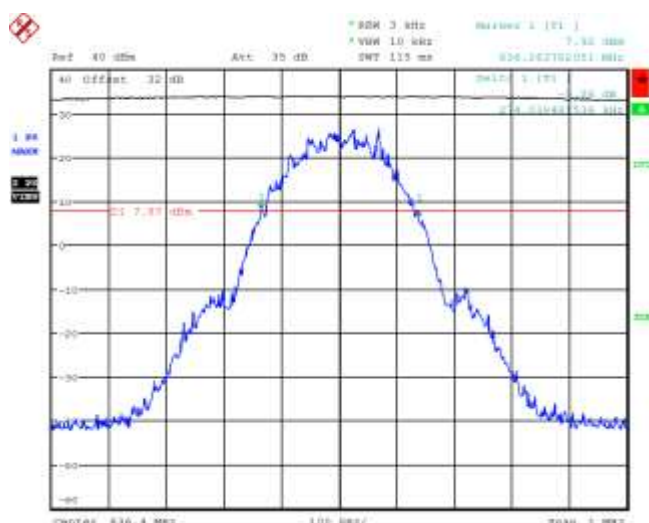
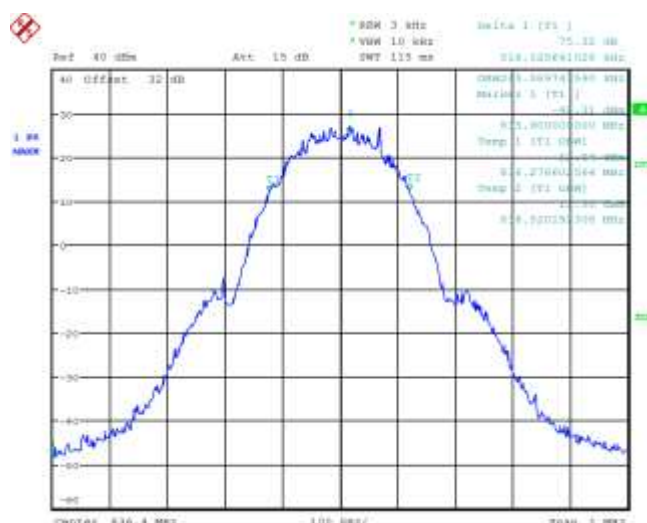


Figure 1-16a: Occupied Bandwidth, GSM850 band Middle Channel in GSM mode



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GSM Conducted RF Emission Test Data cont'd

Figure 1-17a: -26dBc bandwidth, GSM850 band High Channel in GSM mode

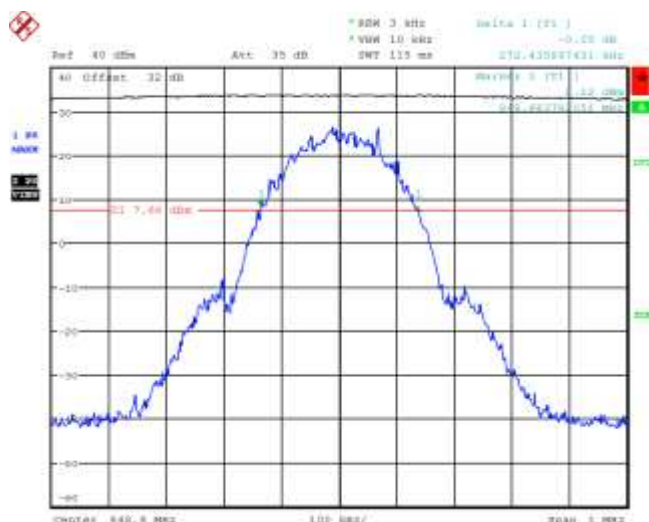


Figure 1-18a: Occupied Bandwidth, GSM850 band High Channel in GSM mode

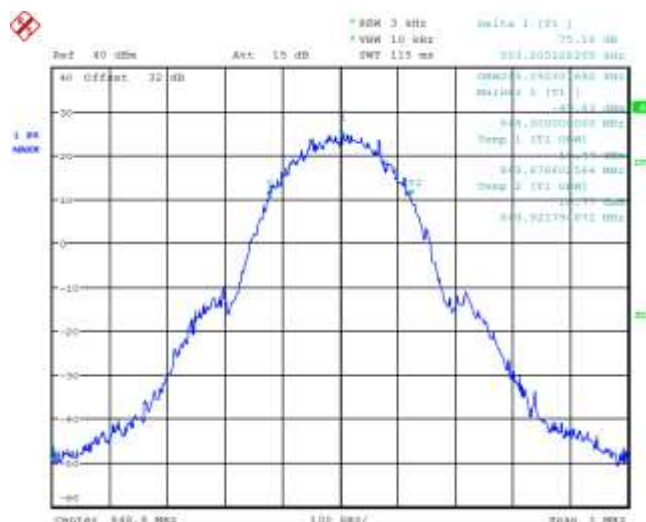


Figure 1-19a: -26dBc bandwidth, PCS1900 Low Channel in GSM mode

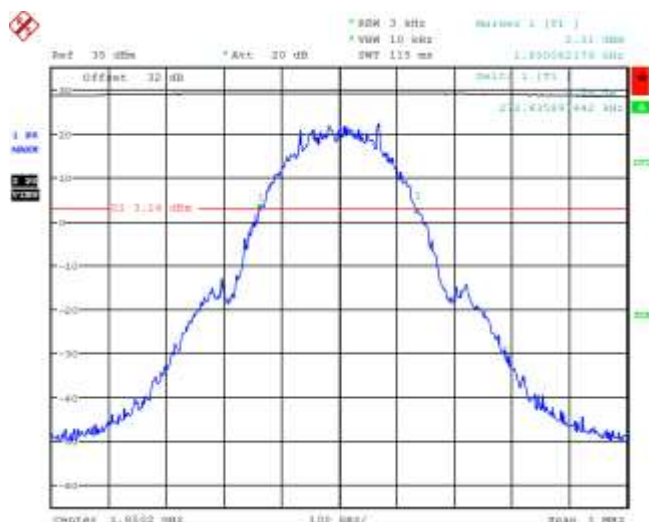
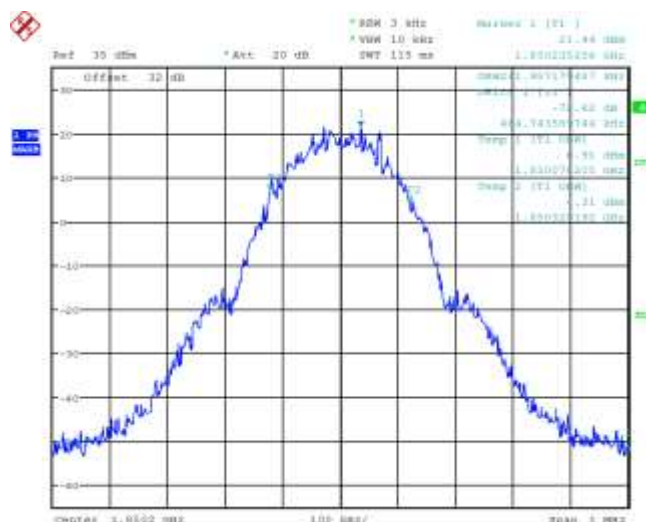


Figure 1-20a: Occupied Bandwidth, PCS1900 Low Channel in GSM mode



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GSM Conducted RF Emission Test Data cont'd

Figure 1-25a: GSM850 band, Low Channel Mask in GSM mode

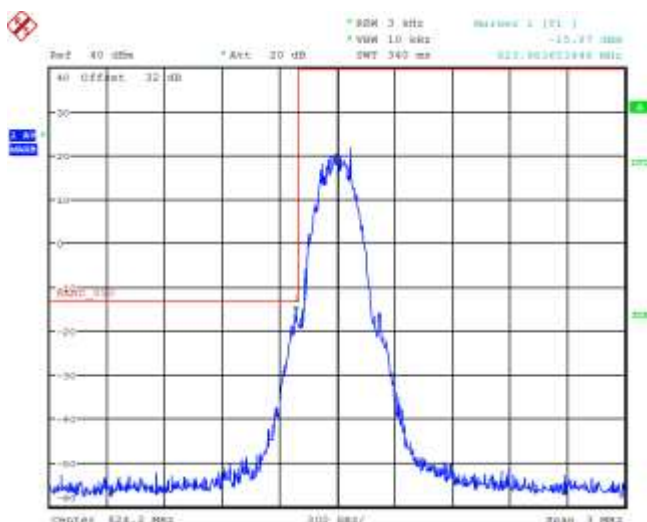


Figure 1-26a: GSM850 band High Channel Mask in GSM mode

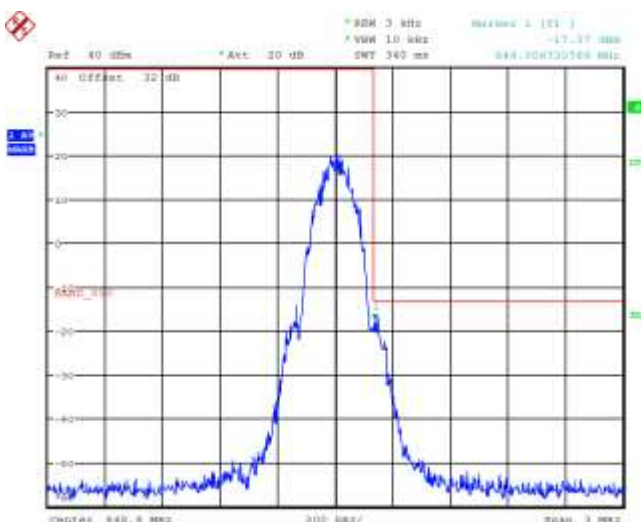


Figure 1-27a: PCS1900, Low Channel Mask in GSM mode

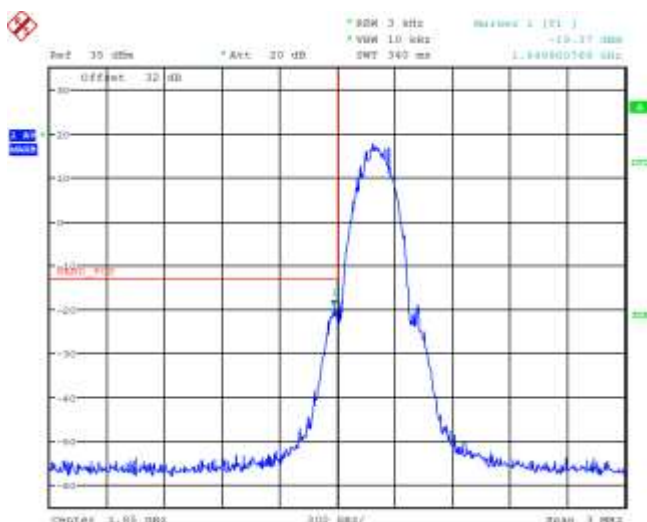
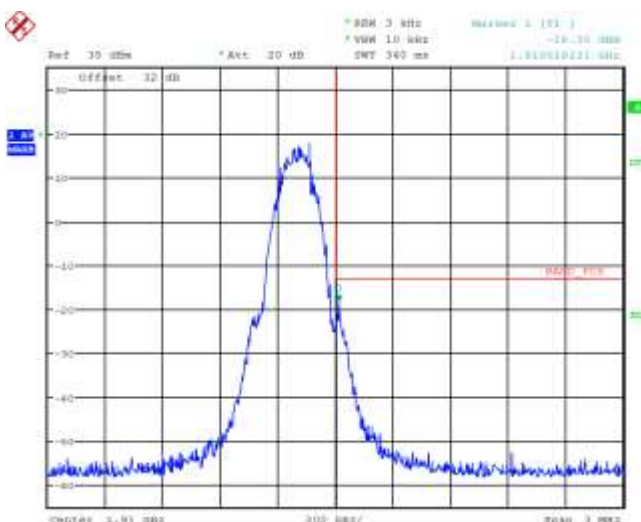


Figure 1-28a: PCS1900, High Channel Mask in GSM mode



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GSM Conducted RF Emission Test Data cont'd

Figure 1-51a: PCS1900 Band, PAR Low Channel

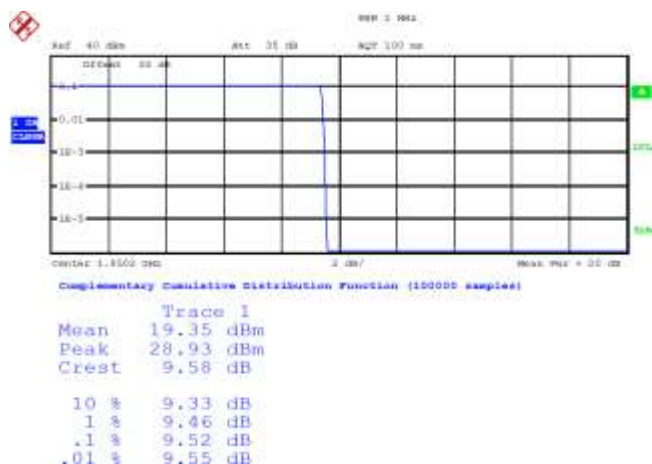


Figure 1-52a: PCS1900 Band, PAR Mid Channel

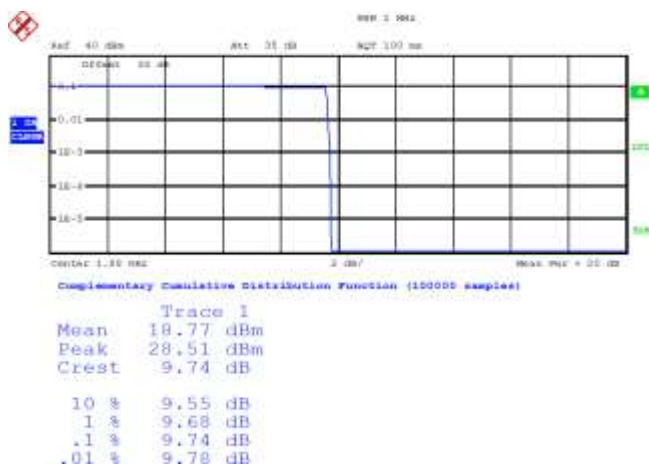
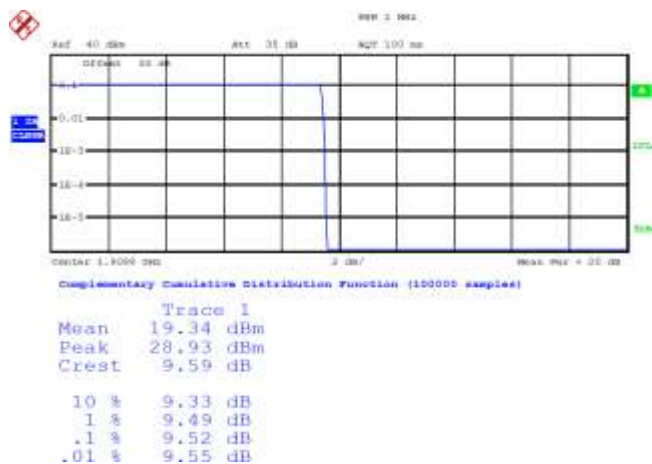


Figure 1-53a: PCS1900 Band, PAR High Channel



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GSM Conducted RF Emission Test Data cont'd

Figure 1-33a: Occupied Bandwidth, PCS1900 Band, Middle Channel in EDGE mode

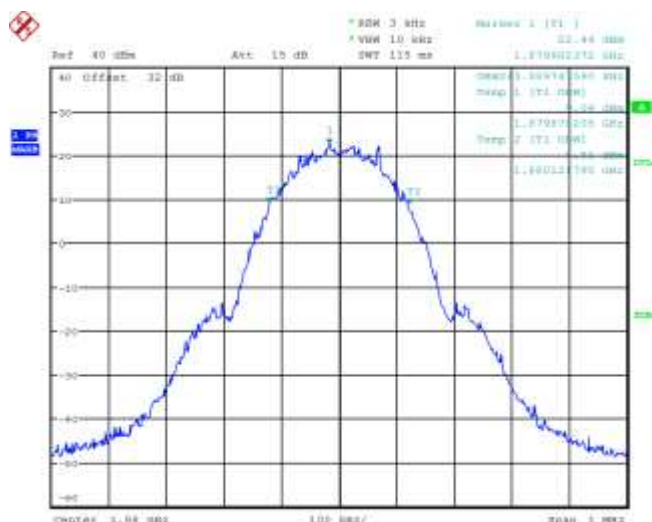


Figure 1-34a: Occupied Bandwidth, PCS1900 Band, High Channel in EDGE mode

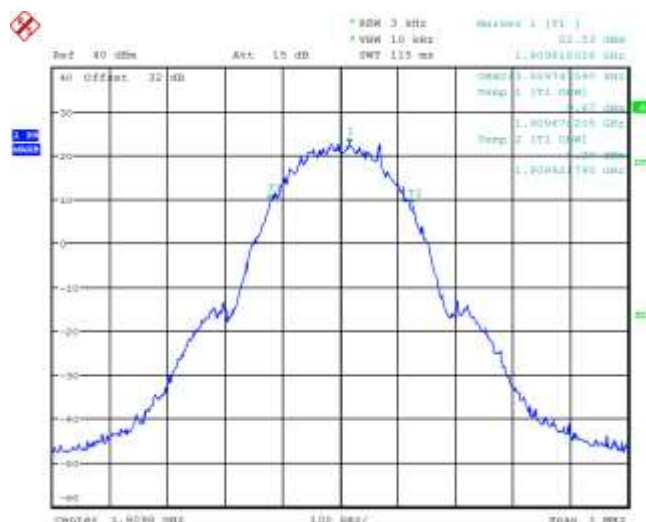


Figure 1-35a: GSM850 Band, Low Channel Mask in EDGE mode

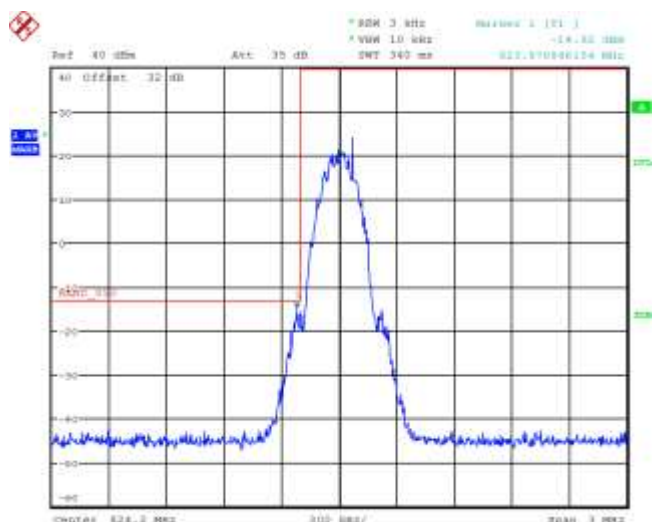
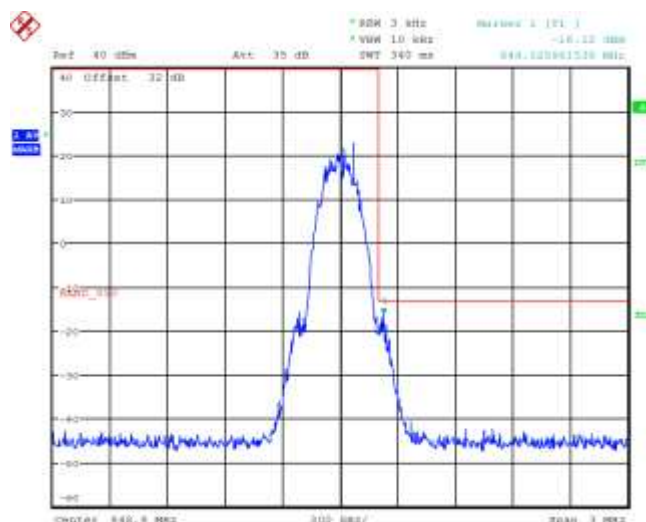


Figure 1-36a: GSM850 Band, High Channel Mask in EDGE mode



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GSM Conducted RF Emission Test Data cont'd

Figure 1-37a: PCS1900 Band, Low Channel Mask in EDGE mode

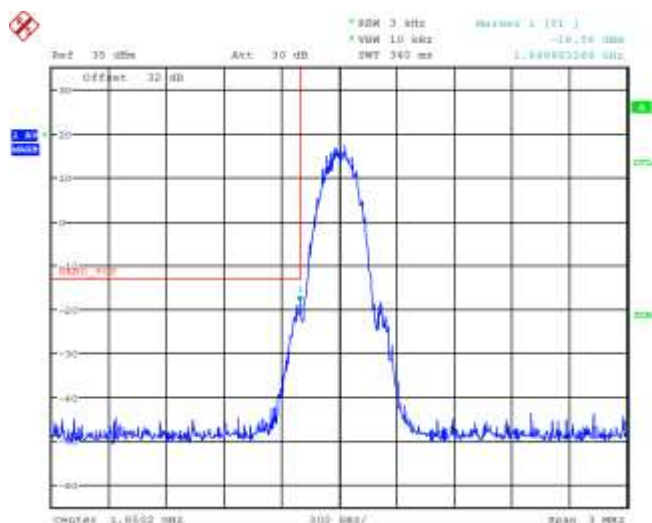
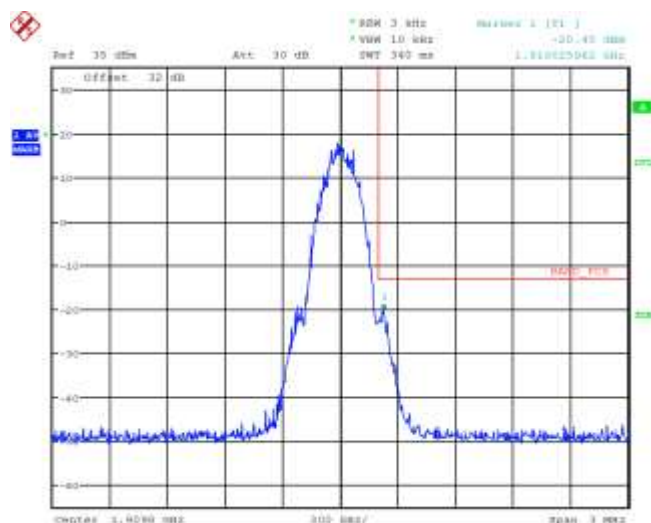


Figure 1-38a: PCS1900 Band, High Channel Mask in EDGE mode



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1A	
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GSM Conducted RF Emission Test Data cont'd

Figure 1-39a: GSM850 band, Spurious Conducted Emissions, Low channel in Edge Mode

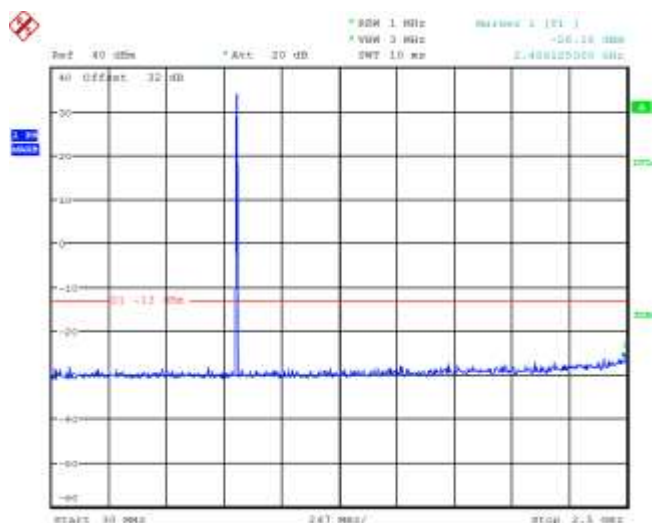


Figure 1-40a: GSM850 band, Spurious Conducted Emissions, Low channel in Edge Mode

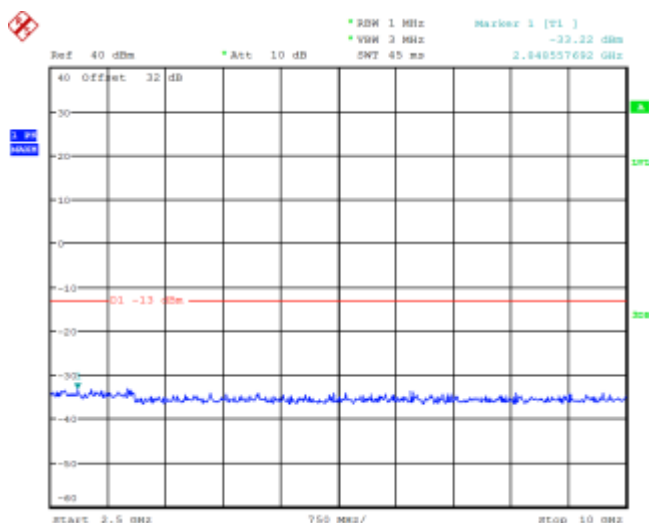


Figure 1-41a: GSM850 band, Spurious Conducted Emissions, Middle channel in Edge Mode

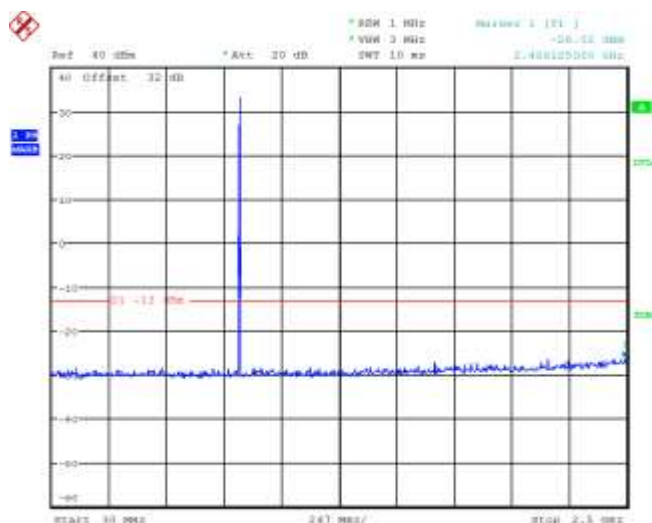
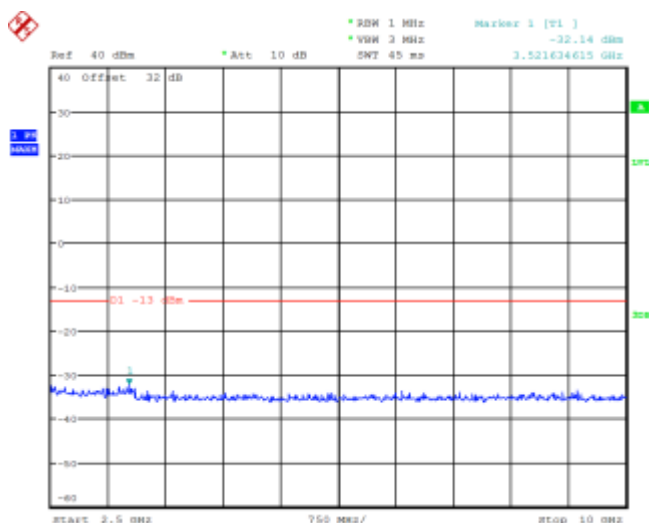


Figure 1-42a: GSM850 band, Spurious Conducted Emissions, Middle channel in Edge Mode



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1A	
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GSM Conducted RF Emission Test Data cont'd

Figure 1-43a: GSM850 band, Spurious Conducted Emissions, High channel in Edge Mode

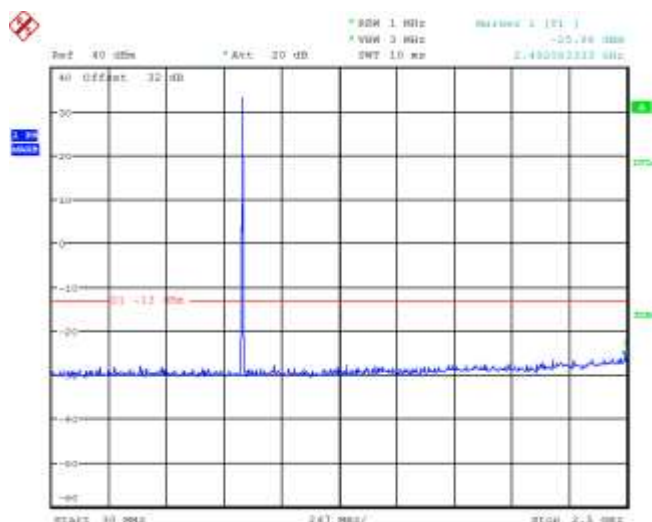


Figure 1-44a: GSM850 band, Spurious Conducted Emissions, High channel in Edge Mode

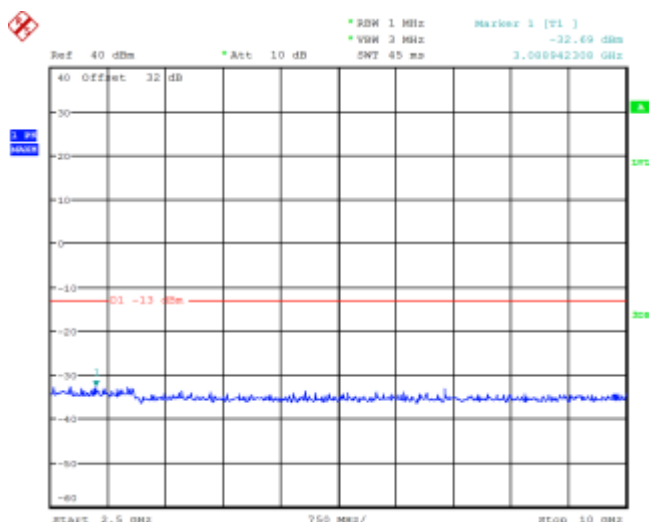


Figure 1-45a: PCS1900 band, Spurious Conducted Emissions, Low channel in Edge Mode

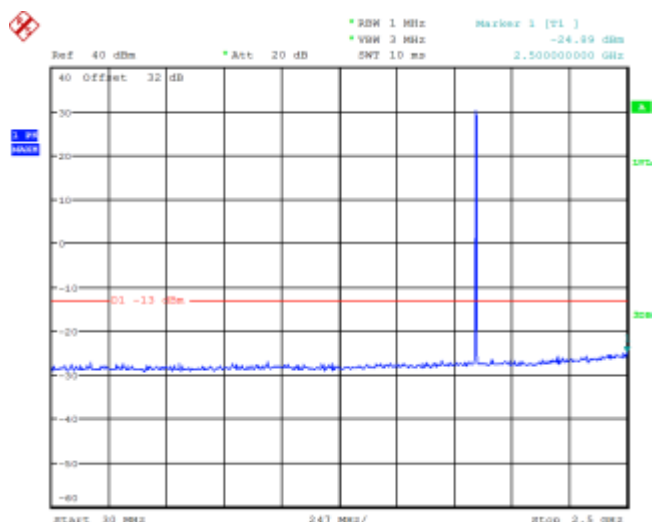
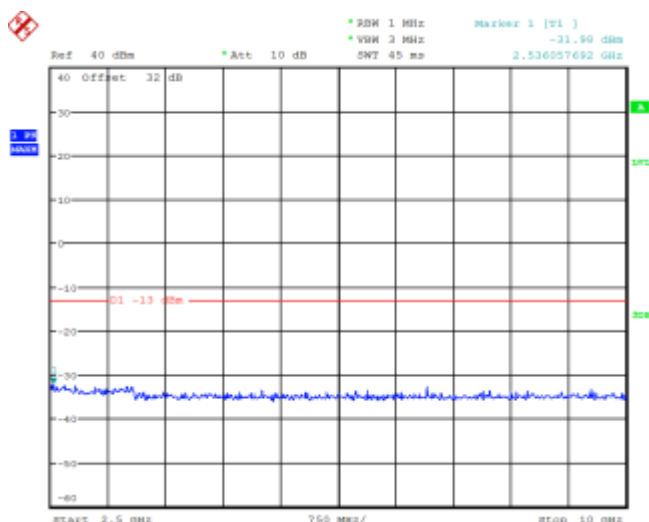


Figure 1-46a: PCS1900 band, Spurious Conducted Emissions, Low channel in Edge Mode



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GSM Conducted RF Emission Test Data cont'd

Figure 1-47a: PCS1900 band, Spurious Conducted Emissions, middle channel in Edge Mode

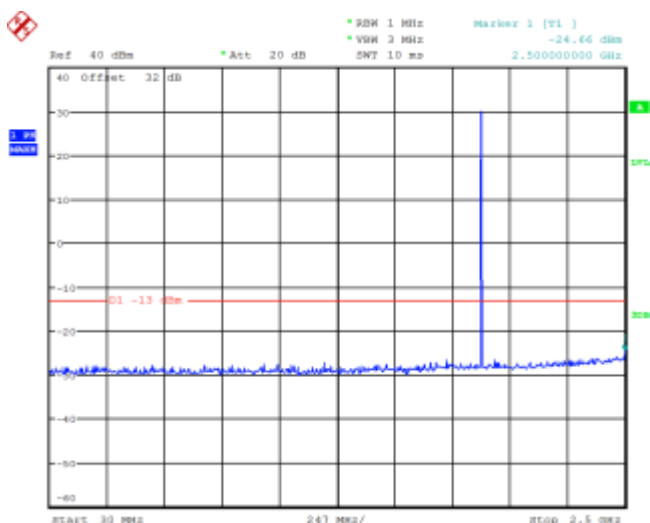


Figure 1-48a: PCS1900 band, Spurious Conducted Emissions, middle channel in Edge Mode

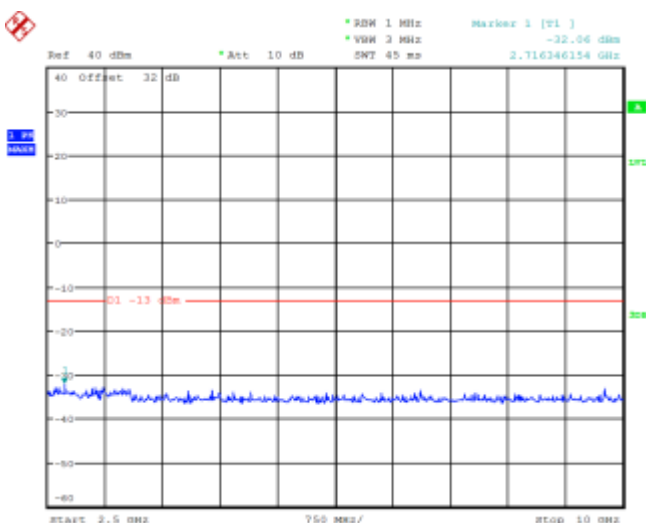


Figure 1-49a: PCS1900 band, Spurious Conducted Emissions, High channel in Edge Mode

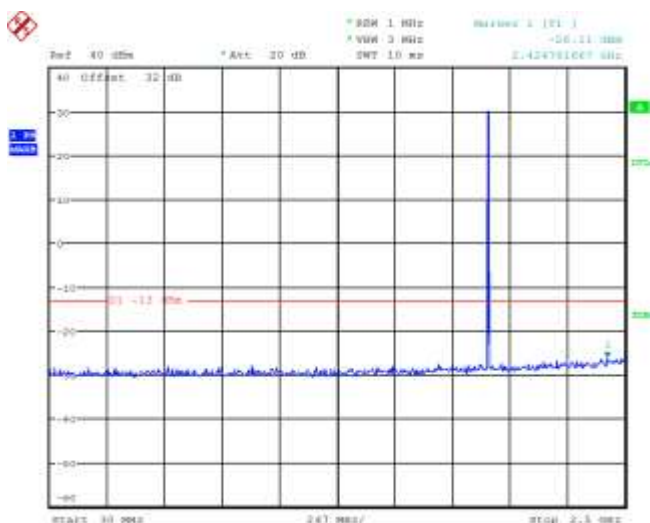
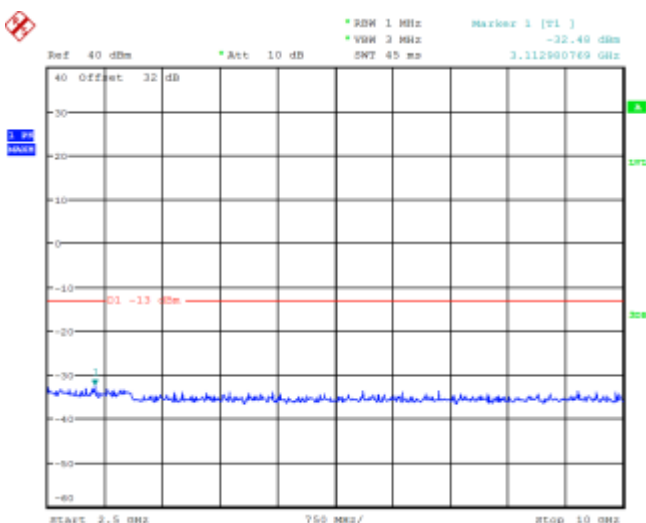


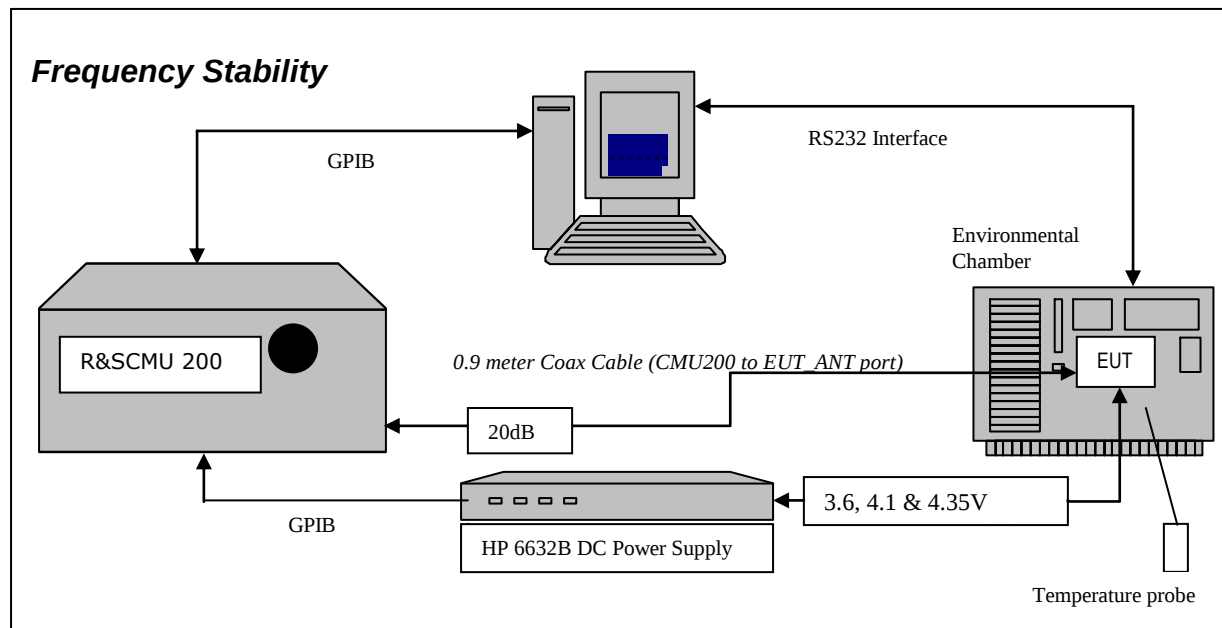
Figure 1-50a: PCS1900 band, Spurious Conducted Emissions, High channel in Edge Mode



APPENDIX 1B – GSM FREQUENCY STABILITY TEST DATA

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

GSM Frequency Stability Test Data



The measurements were performed by Chuan Tran.

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2 Required Measurements

2.995 Frequency Stability - Procedures

(a,b) Frequency Stability - Temperature Variation

(d) Frequency Stability - Voltage Variation

24.235 Frequency Stability.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

The EUT meets the requirements as stated in CFR 47 chapter 1, Section 24.235, CFR 47 chapter 1, Section 22.917 Frequency Stability.

Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-metre coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMU 200 and the EUT antenna port.

Calibration for the Cable Loss was performed in the RF Laboratory using the Agilent power meter and Agilent Signal Generator.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Test setup:

The EUT was placed in the Temperature chamber and connected to CMU 200 outside as shown in the figure above. Dry air was pumped inside the temperature chamber to maintain a backpressure during the test. The EUT was kept in the off condition at all times except when the measurements were to be made.

The chamber was switched on and the temperature was set to -30°C. After the chamber stabilized at -30 °C there was a soak period of one hour to alleviate moisture in the chamber, the EUT voltage was enabled. The system software recorded the frequency, power, and associated measurements.

A Computer system controlled the automated software. This application was given the command of activating all machines intrinsic to the temperature and voltage tests controlling the CMU 200 via the GPIB Bus. The Environmental Chamber was instructed through an RS-232 serial line. The EUT dialogue was passed through a serial connection.

The EUT repetitively transmitted 100 bursts for each set of programmed parameters recording temperature, voltage settings, and systematically selected frequencies. The power supply was cycled from minimum voltage 3.6 volts, to 4.1 and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 4.1 and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 824.2, 836.4, and 848.8 MHz for the GSM850 band, 1850.2, 1880.0 and 1909.8 MHz for the PCS1900 band. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million. After the initial one-hour soak at the beginning of the tests, a period of thirty minutes soak was initialized between each ascending temperature step, before proceeding to the next measurement test cycle.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Procedure:

The test system software for commencing the Frequency Stability Tests carried through the following cycle.

1. Switch on the HP 6632B power supply; CMU 200 Communications test Set, and Environmental Chamber.
2. Start test program
3. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
4. Set power supply voltage to 3.6 volts.
5. Set up CMU 200 Radio Communication Tester.
6. Command the CMU 200 to switch to the low channel.
7. Enable the voltage to the EUT, and connect a link to the CMU 200 test set.
8. EUT is commanded to Transmit 100 Bursts.
9. Software logs the following data from the CMU 200, power supply and temperature chamber: Traffic Channel Number, Traffic Channel Frequency, Power Level, Chamber Temperature, Supply Voltage, Power and Frequency Error.
10. The CMU 200 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
11. Repeat steps 5 to 10 changing the supply voltage to 4.1 Volts
12. Increase temperature by 10°C and soak for 1/2 hour.
13. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
14. Repeat steps 5 to 10 changing the supply voltage to 4.35 volts

Procedure 5 to 10 was repeated at room temperature (20°C) with the power supply voltage set to 3.6, 4.1 and 4.35 volts.

The maximum frequency error in the GSM850 band measured was 0.0402 PPM.
The maximum frequency error in the PCS1900 band measured was -0.0273 PPM.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Date of Test: June 30, 2014

GSM850 results: channels 128, 189 and 251 @ 20°C maximum transmitted power

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	3.6	20	13.69	0.0166
189	836.40	3.6	20	12.07	0.0144
251	848.60	3.6	20	10.01	0.0118

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.1	20	8.07	0.0098
189	836.40	4.1	20	5.17	0.0062
251	848.60	4.1	20	7.94	0.0094

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.35	20	-3.55	-0.0043
189	836.40	4.35	20	6.97	0.0083
251	848.60	4.35	20	6.97	0.0082

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

GSM850 Results: channel 128 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	3.6	-30	-19.11	-0.0232
128	824.20	3.6	-20	-8.85	-0.0107
128	824.20	3.6	-10	-7.17	-0.0087
128	824.20	3.6	0	5.55	0.0067
128	824.20	3.6	10	8.98	0.0109
128	824.20	3.6	20	13.69	0.0166
128	824.20	3.6	30	10.65	0.0129
128	824.20	3.6	40	6.07	0.0074
128	824.20	3.6	50	3.16	0.0038
128	824.20	3.6	60	6.84	0.0083
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.1	-30	12.20	0.0148
128	824.20	4.1	-20	-13.11	-0.0159
128	824.20	4.1	-10	9.10	0.0110
128	824.20	4.1	0	7.88	0.0096
128	824.20	4.1	10	-12.33	-0.0150
128	824.20	4.1	20	8.07	0.0098
128	824.20	4.1	30	-15.43	-0.0187
128	824.20	4.1	40	5.75	0.0070
128	824.20	4.1	50	-16.53	-0.0201
128	824.20	4.1	60	-4.84	-0.0059
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.35	-30	24.41	0.0296
128	824.20	4.35	-20	-20.92	-0.0254
128	824.20	4.35	-10	12.07	0.0146
128	824.20	4.35	0	7.23	0.0088
128	824.20	4.35	10	-22.54	-0.0273
128	824.20	4.35	20	-3.55	-0.0043
128	824.20	4.35	30	-24.67	-0.0299
128	824.20	4.35	40	3.94	0.0048
128	824.20	4.35	50	-21.89	-0.0266
128	824.20	4.35	60	-9.75	-0.0118

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

GSM850 Results: channel 189 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
189	836.40	3.6	-30	-15.56	-0.0186
189	836.40	3.6	-20	-9.56	-0.0114
189	836.40	3.6	-10	-3.49	-0.0042
189	836.40	3.6	0	8.01	0.0096
189	836.40	3.6	10	8.46	0.0101
189	836.40	3.6	20	12.07	0.0144
189	836.40	3.6	30	12.20	0.0146
189	836.40	3.6	40	10.27	0.0123
189	836.40	3.6	50	-6.59	-0.0079
189	836.40	3.6	60	7.30	0.0087
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
189	836.40	4.1	-30	25.89	0.0310
189	836.40	4.1	-20	-11.17	-0.0134
189	836.40	4.1	-10	10.46	0.0125
189	836.40	4.1	0	7.68	0.0092
189	836.40	4.1	10	-16.98	-0.0203
189	836.40	4.1	20	5.17	0.0062
189	836.40	4.1	30	-20.15	-0.0241
189	836.40	4.1	40	10.98	0.0131
189	836.40	4.1	50	-16.79	-0.0201
189	836.40	4.1	60	-4.65	-0.0056
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
189	836.40	4.35	-30	25.96	0.0310
189	836.40	4.35	-20	-23.89	-0.0286
189	836.40	4.35	-10	10.01	0.0120
189	836.40	4.35	0	7.49	0.0090
189	836.40	4.35	10	-26.02	-0.0311
189	836.40	4.35	20	6.97	0.0083
189	836.40	4.35	30	-26.35	-0.0315
189	836.40	4.35	40	9.94	0.0119
189	836.40	4.35	50	-21.63	-0.0259
189	836.40	4.35	60	-9.94	-0.0119

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

GSM850 Results: channel 251 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
251	848.8	3.6	-30	-6.13	-0.0072
251	848.8	3.6	-20	-7.75	-0.0091
251	848.8	3.6	-10	-4.58	-0.0054
251	848.8	3.6	0	10.53	0.0124
251	848.8	3.6	10	5.23	0.0062
251	848.8	3.6	20	10.01	0.0118
251	848.8	3.6	30	-5.62	-0.0066
251	848.8	3.6	40	12.98	0.0153
251	848.8	3.6	50	-9.69	-0.0114
251	848.8	3.6	60	5.29	0.0062
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
251	848.8	4.1	-30	34.16	0.0402
251	848.8	4.1	-20	-14.40	-0.0170
251	848.8	4.1	-10	14.08	0.0166
251	848.8	4.1	0	9.17	0.0108
251	848.8	4.1	10	-14.98	-0.0176
251	848.8	4.1	20	7.94	0.0094
251	848.8	4.1	30	-20.92	-0.0246
251	848.8	4.1	40	11.04	0.0130
251	848.8	4.1	50	-18.40	-0.0217
251	848.8	4.1	60	-5.42	-0.0064
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
251	848.8	4.35	-30	30.99	0.0365
251	848.8	4.35	-20	-26.02	-0.0307
251	848.8	4.35	-10	13.75	0.0162
251	848.8	4.35	0	4.91	0.0058
251	848.8	4.35	10	-22.73	-0.0268
251	848.8	4.35	20	6.97	0.0082
251	848.8	4.35	30	-26.54	-0.0313
251	848.8	4.35	40	14.98	0.0176
251	848.8	4.35	50	-19.50	-0.0230
251	848.8	4.35	60	-12.40	-0.0146

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

PCS results: channels 512, 661, & 810 @ 20°C maximum transmitted power

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	3.6	20	9.49	0.0051
661	1880.00	3.6	20	8.59	0.0046
810	1909.80	3.6	20	14.53	0.0076

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.1	20	-8.07	-0.0044
661	1880.00	4.1	20	9.04	0.0048
810	1909.80	4.1	20	13.75	0.0072

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.35	20	10.85	0.0059
661	1880.00	4.35	20	8.85	0.0047
810	1909.80	4.35	20	8.98	0.0047

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
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PCS1900 Results: channel 512 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	3.6	-30	-32.09	-0.0173
512	1850.20	3.6	-20	-25.12	-0.0136
512	1850.20	3.6	-10	-15.24	-0.0082
512	1850.20	3.6	0	-7.75	-0.0042
512	1850.20	3.6	10	-6.84	-0.0037
512	1850.20	3.6	20	9.49	0.0051
512	1850.20	3.6	30	10.14	0.0055
512	1850.20	3.6	40	15.43	0.0083
512	1850.20	3.6	50	9.23	0.0050
512	1850.20	3.6	60	-10.07	-0.0054
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.1	-30	-50.43	-0.0273
512	1850.20	4.1	-20	-32.35	-0.0175
512	1850.20	4.1	-10	-17.56	-0.0095
512	1850.20	4.1	0	-16.21	-0.0088
512	1850.20	4.1	10	-7.55	-0.0041
512	1850.20	4.1	20	-8.07	-0.0044
512	1850.20	4.1	30	-6.59	-0.0036
512	1850.20	4.1	40	-10.20	-0.0055
512	1850.20	4.1	50	-14.46	-0.0078
512	1850.20	4.1	60	-19.05	-0.0103
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.35	-30	-45.72	-0.0247
512	1850.20	4.35	-20	-28.54	-0.0154
512	1850.20	4.35	-10	-21.95	-0.0119
512	1850.20	4.35	0	-10.46	-0.0057
512	1850.20	4.35	10	15.95	0.0086
512	1850.20	4.35	20	10.85	0.0059
512	1850.20	4.35	30	-18.92	-0.0102
512	1850.20	4.35	40	7.75	0.0042
512	1850.20	4.35	50	-10.46	-0.0057
512	1850.20	4.35	60	-30.99	-0.0167

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

PCS1900 Results: channel 661 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
661	1880.00	3.6	-30	-32.67	-0.0174
661	1880.00	3.6	-20	-22.34	-0.0119
661	1880.00	3.6	-10	-18.27	-0.0097
661	1880.00	3.6	0	8.01	0.0043
661	1880.00	3.6	10	10.40	0.0055
661	1880.00	3.6	20	8.59	0.0046
661	1880.00	3.6	30	12.53	0.0067
661	1880.00	3.6	40	21.63	0.0115
661	1880.00	3.6	50	13.11	0.0070
661	1880.00	3.6	60	-7.49	-0.0040
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
661	1880.00	4.1	-30	-41.65	-0.0222
661	1880.00	4.1	-20	-24.80	-0.0132
661	1880.00	4.1	-10	-20.53	-0.0109
661	1880.00	4.1	0	-13.04	-0.0069
661	1880.00	4.1	10	8.78	0.0047
661	1880.00	4.1	20	9.04	0.0048
661	1880.00	4.1	30	-13.82	-0.0074
661	1880.00	4.1	40	-11.56	-0.0061
661	1880.00	4.1	50	-12.07	-0.0064
661	1880.00	4.1	60	-19.50	-0.0104
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
661	1880.00	4.35	-30	-36.10	-0.0192
661	1880.00	4.35	-20	-32.35	-0.0172
661	1880.00	4.35	-10	-23.50	-0.0125
661	1880.00	4.35	0	-12.27	-0.0065
661	1880.00	4.35	10	6.84	0.0036
661	1880.00	4.35	20	8.85	0.0047
661	1880.00	4.35	30	-31.51	-0.0168
661	1880.00	4.35	40	11.49	0.0061
661	1880.00	4.35	50	-10.14	-0.0054
661	1880.00	4.35	60	-32.22	-0.0171

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

PCS1900 Results: channel 810 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
810	1909.80	3.6	-30	-39.65	-0.0208
810	1909.80	3.6	-20	-26.41	-0.0138
810	1909.80	3.6	-10	-11.75	-0.0062
810	1909.80	3.6	0	7.36	0.0039
810	1909.80	3.6	10	19.24	0.0101
810	1909.80	3.6	20	14.53	0.0076
810	1909.80	3.6	30	18.53	0.0097
810	1909.80	3.6	40	17.24	0.0090
810	1909.80	3.6	50	17.50	0.0092
810	1909.80	3.6	60	10.53	0.0055
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
810	1909.80	4.1	-30	-49.20	-0.0258
810	1909.80	4.1	-20	-26.86	-0.0141
810	1909.80	4.1	-10	-22.99	-0.0120
810	1909.80	4.1	0	-7.94	-0.0042
810	1909.80	4.1	10	16.59	0.0087
810	1909.80	4.1	20	13.75	0.0072
810	1909.80	4.1	30	-18.27	-0.0096
810	1909.80	4.1	40	7.55	0.0040
810	1909.80	4.1	50	6.20	0.0032
810	1909.80	4.1	60	-22.54	-0.0118
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
810	1909.80	4.35	-30	-42.88	-0.0225
810	1909.80	4.35	-20	-33.90	-0.0178
810	1909.80	4.35	-10	-21.31	-0.0112
810	1909.80	4.35	0	-11.04	-0.0058
810	1909.80	4.35	10	14.21	0.0074
810	1909.80	4.35	20	8.98	0.0047
810	1909.80	4.35	30	-32.61	-0.0171
810	1909.80	4.35	40	12.85	0.0067
810	1909.80	4.35	50	-10.27	-0.0054
810	1909.80	4.35	60	-29.06	-0.0152

APPENDIX 1C – GSM RADIATED EMISSIONS TEST DATA

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1C		
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW	

Radiated Power Test Data Results

Date of test: July 17, 2014

The following measurements were performed by Rex Zhang.

The environmental tests conditions were: Temperature: 24.8 °C
Relative Humidity: 36.2 %

The BlackBerry® smartphone was standalone, USB down and screen pointing to RX antenna when the turntable is at 0 degree position.

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

GSM850 Band in Call Mode

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method					
								Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole)		Limit (dBm)	Diff. To Limit (dB)
F0	128	824.20	850	Dipole	V	-36.76	-22.55	V-V	12.26	29.73	0.94	38.50	8.77
F0	128	824.20	850	Dipole	H	-22.55		H-H	11.81				
F0	190	836.60	850	Dipole	V	-35.80	-23.16	V-V	12.49	29.63	0.92	38.50	8.87
F0	190	836.60	850	Dipole	H	-23.16		H-H	10.62				
F0	251	848.80	850	Dipole	V	-36.57	-23.67	V-V	13.47	30.56	1.14	38.50	7.94
F0	251	848.80	850	Dipole	H	-23.67		H-H	10.74				

GSM850 Band in EDGE Mode

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method					
								Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole)		Limit (dBm)	Diff. To Limit (dB)
F0	128	824.20	850	Dipole	V	-37.60	-23.40	V-V	11.42	28.89	0.77	38.50	9.61
F0	128	824.20	850	Dipole	H	-23.40		H-H	10.96				
F0	190	836.60	850	Dipole	V	-36.59	-24.19	V-V	11.41	28.55	0.72	38.50	9.95
F0	190	836.60	850	Dipole	H	-24.19		H-H	9.54				
F0	251	848.80	850	Dipole	V	-37.34	-24.51	V-V	12.65	29.74	0.94	38.50	8.76
F0	251	848.80	850	Dipole	H	-24.51		H-H	9.86				

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	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 1C		
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW	

Radiated Power Test Data Results cont'd

Date of test: July 16, 2014

The following measurements were performed by Rex Zhang.

The environmental tests conditions were: Temperature: 24.4 °C
Relative Humidity: 39.9 %

The BlackBerry® smartphone was standalone, horizontal up and top pointing to RX antenna when the turntable is at 0 degree position.

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

PCS1900 Band in Call Mode

								Substitution Method					
EUT				Receive Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBm)	Max (V,H) dBm	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator)		Limit (dBm)	Diff to Limit (dB)
										(dBm)	(W)		
F0	512	1850.20	1900	Horn	V	-29.43	-19.69	V-V	-8.26	32.44	1.75	33	0.56
F0	512	1850.20	1900	Horn	H	-19.69		H-H	-7.27				
F0	661	1880.00	1900	Horn	V	-29.56	-20.70	V-V	-8.37	31.81	1.52	33	1.19
F0	661	1880.00	1900	Horn	H	-20.70		H-H	-7.48				
F0	810	1909.80	1900	Horn	V	-30.09	-21.37	V-V	-9.18	31.12	1.29	33	1.88
F0	810	1909.80	1900	Horn	H	-21.37		H-H	-8.41				

PCS1900 Band in EDGE Mode

								Substitution Method					
EUT				Receive Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) dBuV	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator)		Limit (dBm)	Diff to Limit (dB)
										(dBm)	(W)		
F0	512	1850.20	1900	Horn	V	-29.85	-20.23	V-V	-8.84	31.85	1.53	33	1.15
F0	512	1850.20	1900	Horn	H	-20.23		H-H	-7.86				
F0	661	1880.00	1900	Horn	V	-30.09	-21.06	V-V	-8.74	31.43	1.39	33	1.57
F0	661	1880.00	1900	Horn	H	-21.06		H-H	-7.86				
F0	810	1909.80	1900	Horn	V	-30.51	-21.78	V-V	-9.58	30.70	1.17	33	2.30
F0	810	1909.80	1900	Horn	H	-21.78		H-H	-8.83				

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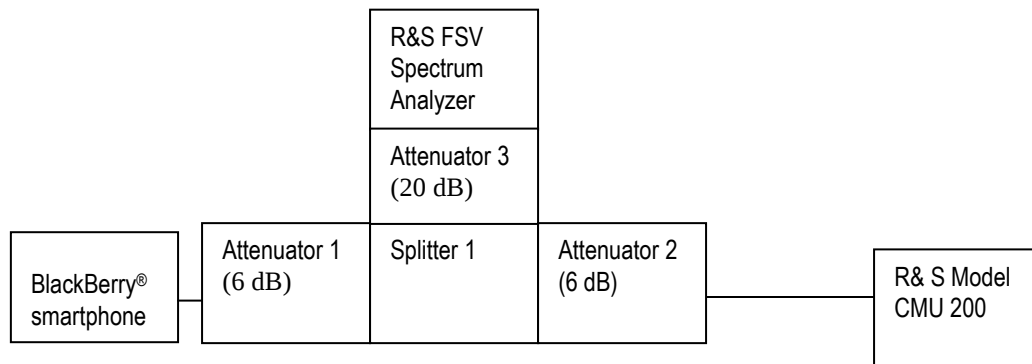
APPENDIX 2A– WCDMA Band II/V CONDUCTED RF EMISSIONS TEST DATA/PLOTS

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Band II/V Conducted RF Emission Test Data

This appendix contains measurement data pertaining to conducted spurious emissions, 99% power bandwidth and the channel mask.

Test Setup Diagram



A reference offset of 32.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SERIAL NUMBER</u>
Attenuator 1	Mini-Circuits	BW-S6W2+	0647
Attenuator 2	Mini-Circuits	BW-S6W2+	0648
Attenuator 3	Mini-Circuits	BW-S20-2W263+	1234
Splitter 1	Weinschel	1515	MES 92

Date of Test: July 3-7, 2014

The environmental test conditions were: Temperature: 25.1°C
 Relative Humidity: 29%

The following measurements were performed by Chuan Tran.

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WCDMA Conducted RF Emission Test Data cont'd

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 22.917, CFR 24.238(a), RSS-132, 5.5, RSS – 133, 6.5, CFR 27.53 and RSS-139, 6.5 were measured from 30 MHz to 20 GHz.

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each carrier frequency of low, middle and high, the modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth.

The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.

The worst case –26dBc bandwidth for WCDMA Band V was measured to be 4.59 MHz, WCDMA Band II was measured to be 4.58 MHz. Results were derived in a 100 kHz resolution bandwidth.

On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

Test Data for WCDMA Band II/IV/V selected Frequencies in Loopback mode

WCDMA Band V Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
826.400	4.59	4.167
836.400	4.54	4.158
846.600	4.58	4.167

WCDMA Band II Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
1852.400	4.56	4.158
1880.000	4.58	4.158
1907.600	4.58	4.167

Peak to Average Ratio (PAR)

The peak to average ratio was measured on the low, middle and high channels.

On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

The worst case measured was 6.91 dB on the low channel of WCDMA Band II.

Measurement Plots for WCDMA Band II/V Voice mode

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See Figures 2-1a to 2-12a for the plots of the conducted spurious emissions.
See Figures 2-13a to 2-24a for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.
See Figures 2-25a to 2-28a for the plots of the Channel mask.
See Figures 2-29a to 2-31a for the plots of the Peak to Average Ratio (WCDMA Band II).

See Figures 2-1b to 2-6b for the plots of the conducted spurious emissions.
See Figures 2-7b to 2-12b for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
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Test Data for WCDMA Band II/IV/V selected Frequencies in HSUPA mode

WCDMA Band V Frequency (MHz)	99% Occupied Bandwidth (MHz)
826.400	4.167
836.400	4.167
846.600	4.167

WCDMA Band II Frequency (MHz)	99% Occupied Bandwidth (MHz)
1852.400	4.167
1880.000	4.167
1907.600	4.167

Measurement Plots for WCDMA Band V/II in HSUPA mode

Refer to the following measurement plots for more detail:

See Figures 2-32a to 2-43a for the plots of the conducted spurious emissions.
See Figures 2-44a to 2-49a for the plots of 99% Occupied Bandwidth.
See Figures 2-50a to 2-53a for the plots of the Channel mask.

See Figures 2-18b to 2-23b for the plots of the conducted spurious emissions.
See Figures 2-24b to 2-26b for the plots of 99% Occupied Bandwidth.
See Figures 2-27b to 2-28b for the plots of the Channel mask.

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
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WCDMA Conducted RF Emission Test Data cont'd

Figure 2-1a: Band V, Spurious Conducted Emissions, Low channel

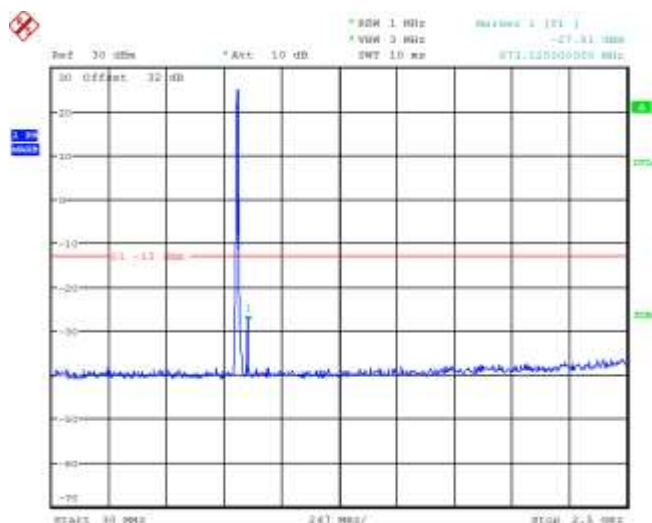


Figure 2-2a: Band V, Spurious Conducted Emissions, Low channel

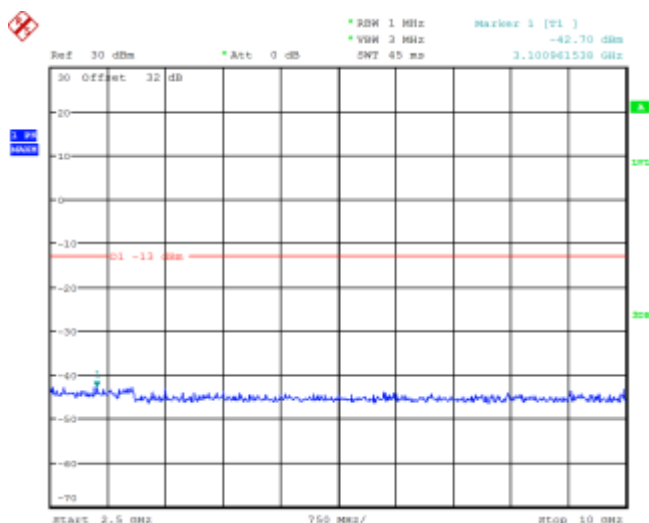


Figure 2-3a: Band V, Spurious Conducted Emissions, Middle channel

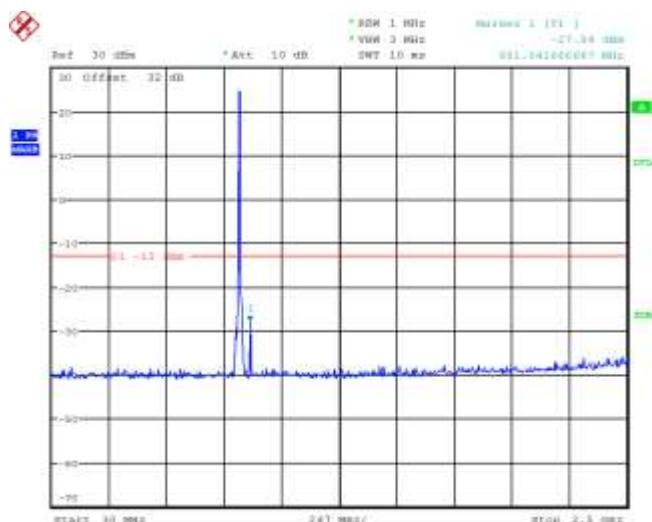
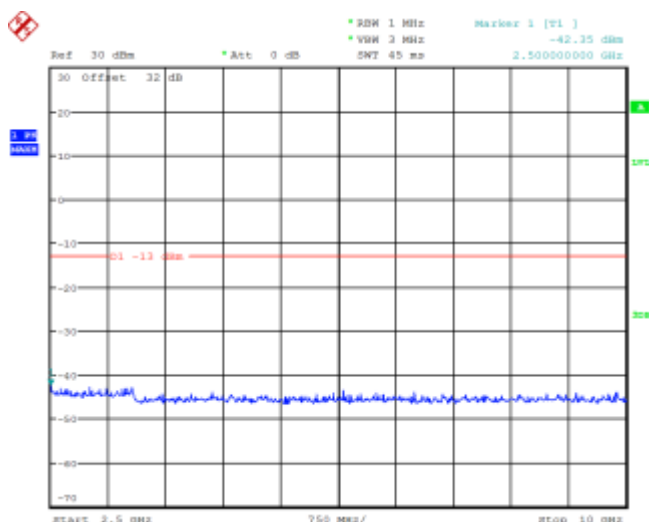


Figure 2-4a: Band V, Spurious Conducted Emissions, Middle channel



	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
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WCDMA Conducted RF Emission Test Data cont'd

Figure 2-5a: Band V, Spurious Conducted Emissions, High Channel

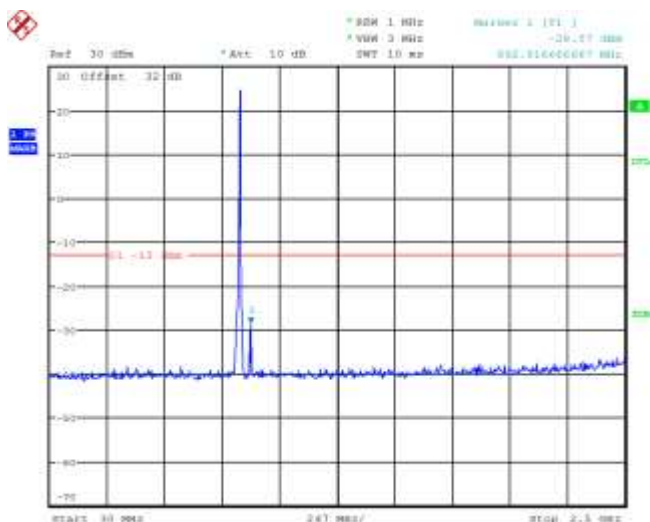


Figure 2-6a: Band V, Spurious Conducted Emissions, High Channel

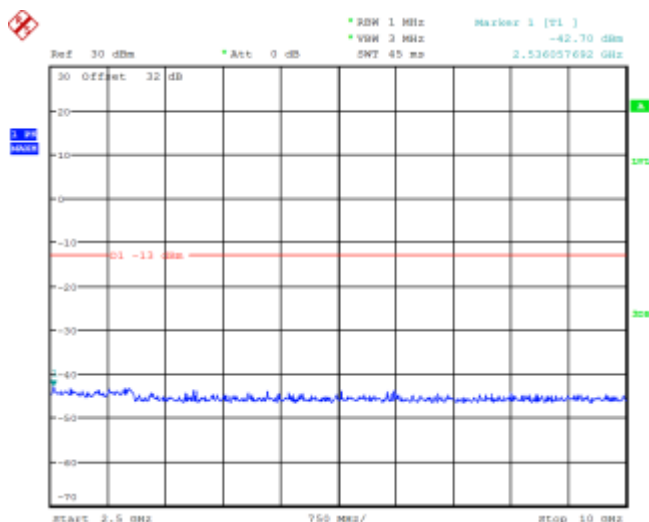


Figure 2-2a: BAND II Spurious Conducted Emissions, Low Channel

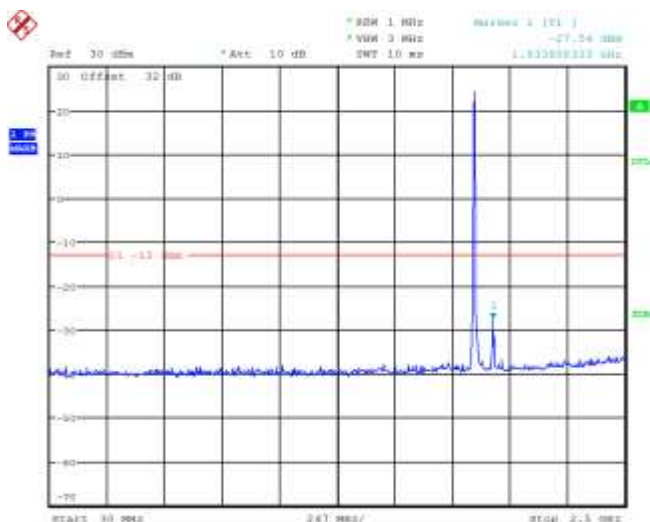
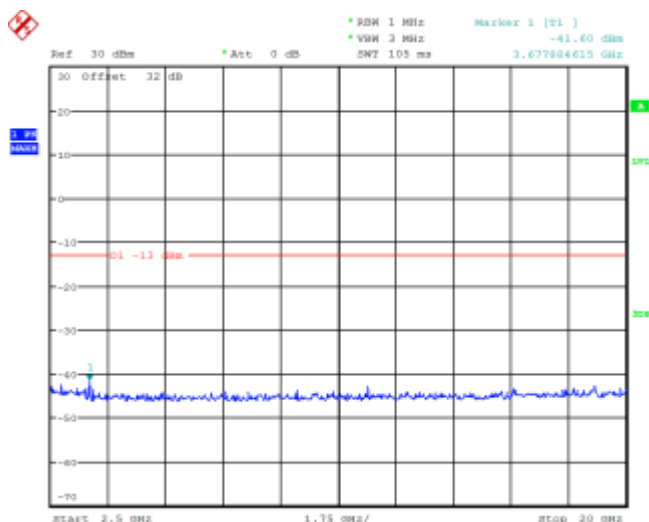


Figure 2-8a: BAND II, Spurious Conducted Emissions, Low Channel



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Conducted RF Emission Test Data cont'd

Figure 2-9a: BAND II, Spurious Conducted Emissions, Middle Channel

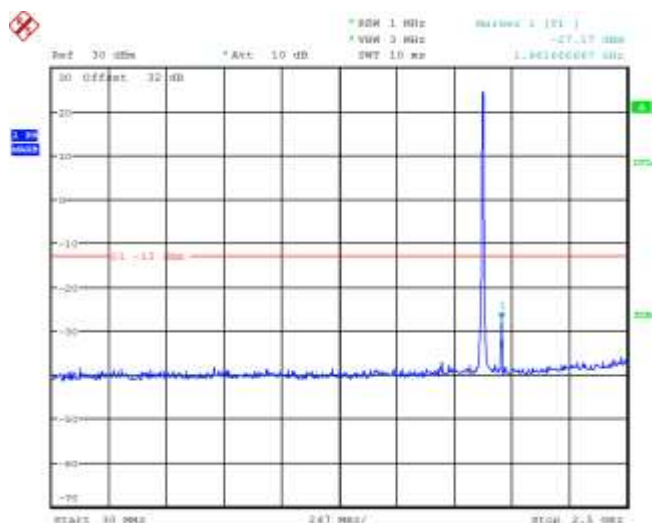


Figure 2-10a: BAND II, Spurious Conducted Emissions, Middle Channel

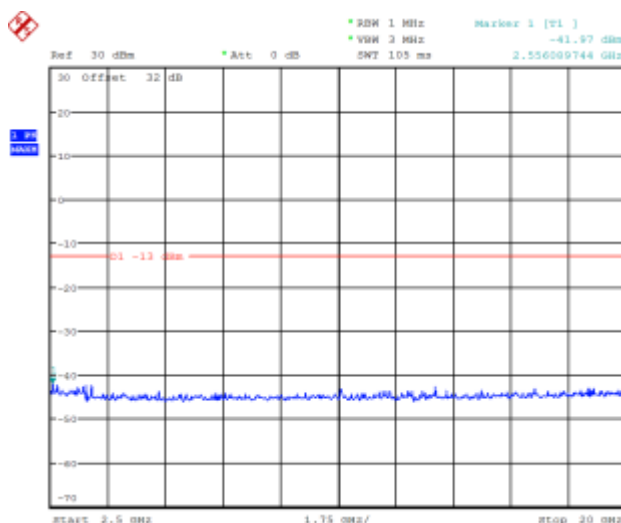


Figure 2-11a: BAND II, Spurious Conducted Emissions, High Channel

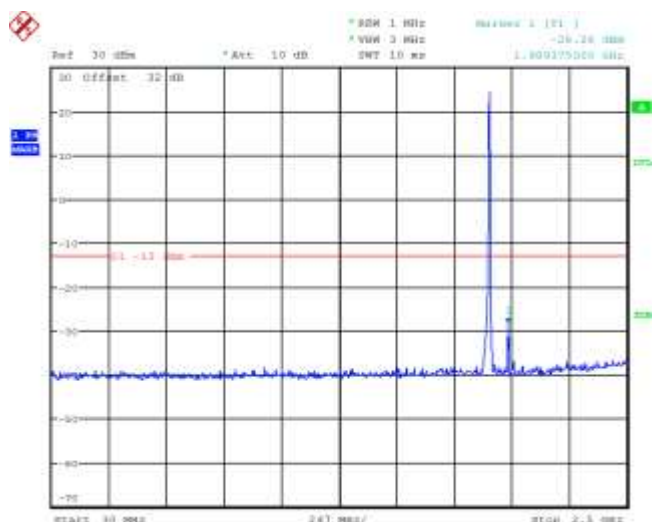
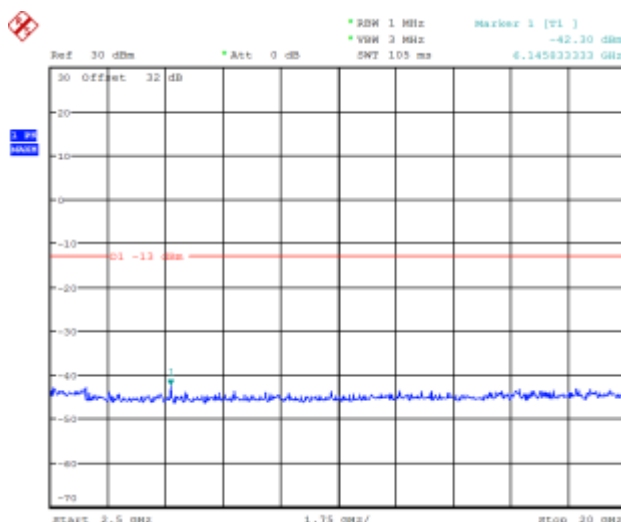


Figure 2-12a: BAND II, Spurious Conducted Emissions, High Channel



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Conducted RF Emission Test Data cont'd

Figure 2-13a: Occupied Bandwidth, Band V Low Channel

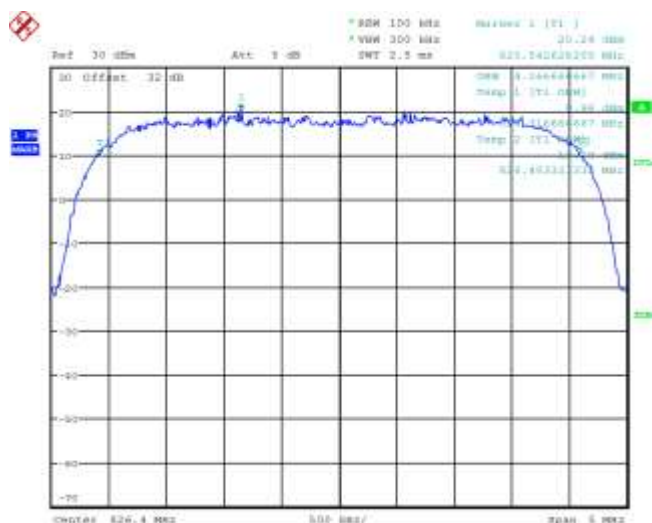


Figure 2-14a: Occupied Bandwidth, Band V Middle Channel

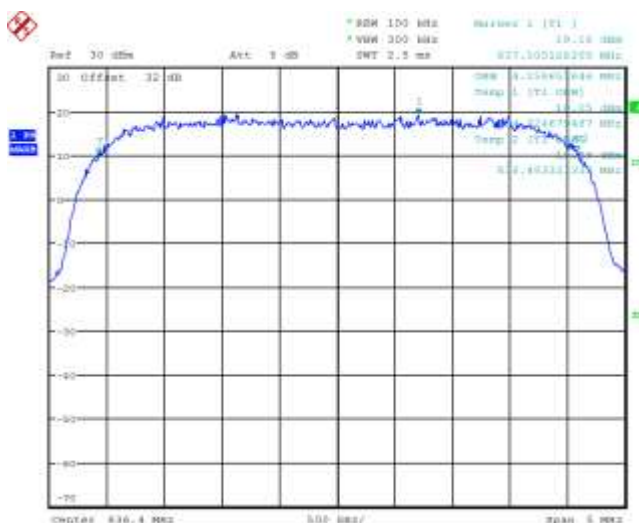


Figure 2-15a: Occupied Bandwidth, Band V High Channel

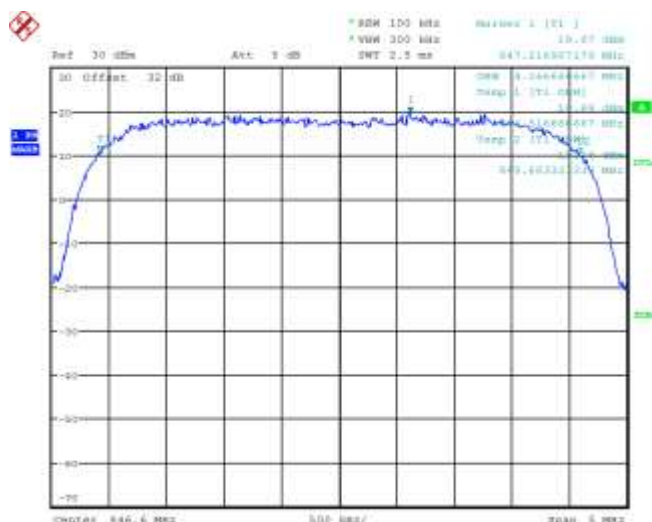
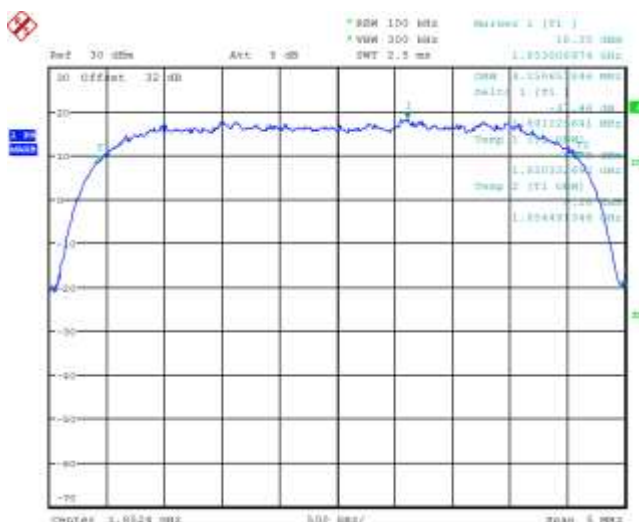


Figure 2-16a: Occupied Bandwidth, Band II Low Channel



	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Conducted RF Emission Test Data cont'd

Figure 2-17a: Occupied Bandwidth, Band II Middle Channel

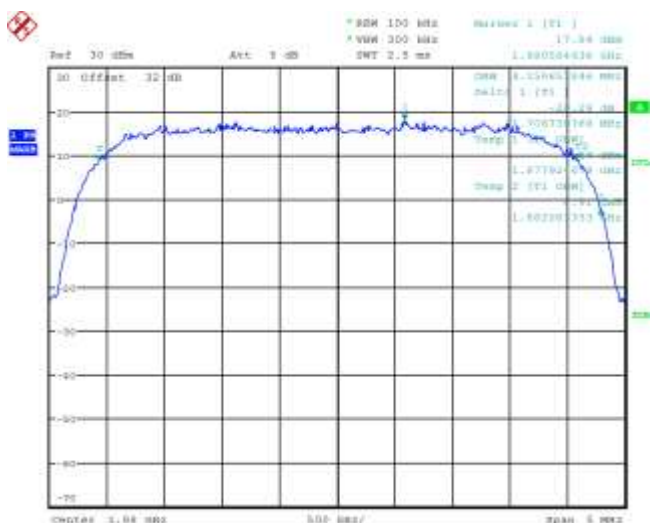


Figure 2-18a: Occupied Bandwidth, Band II High Channel

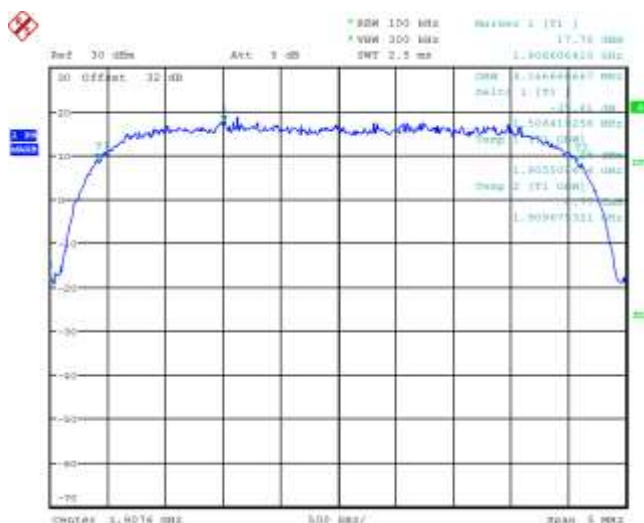


Figure 2-19a: -26 dBc Bandwidth, Band V Low Channel

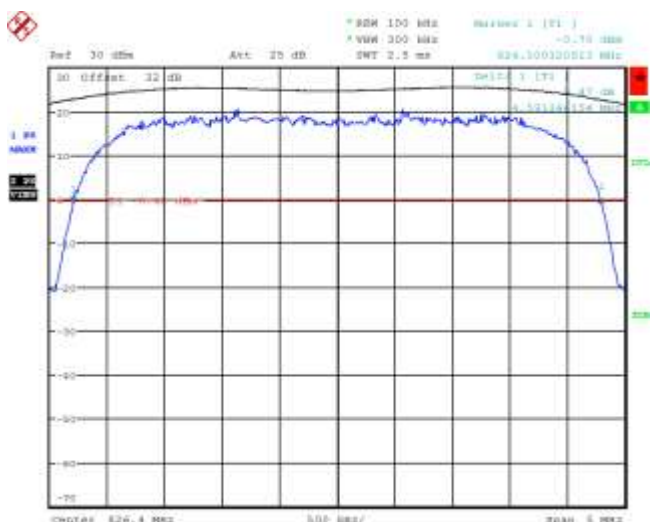
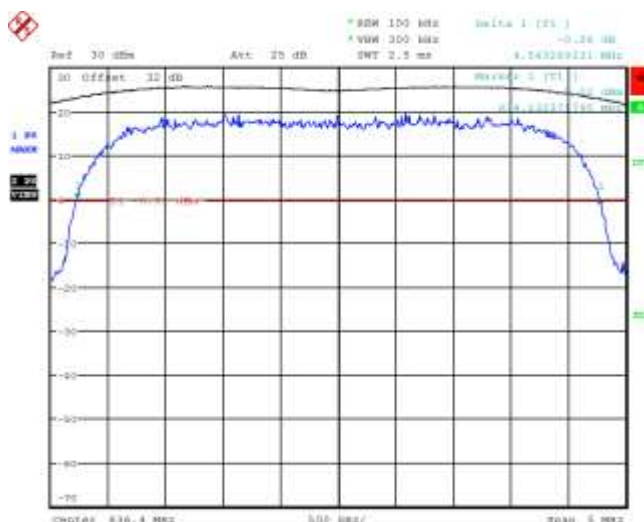


Figure 2-20a: -26 dBc Bandwidth, Band V Middle Channel



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WCDMA Conducted RF Emission Test Data cont'd

Figure 2-21a: -26 dBc Bandwidth, Band V High Channel

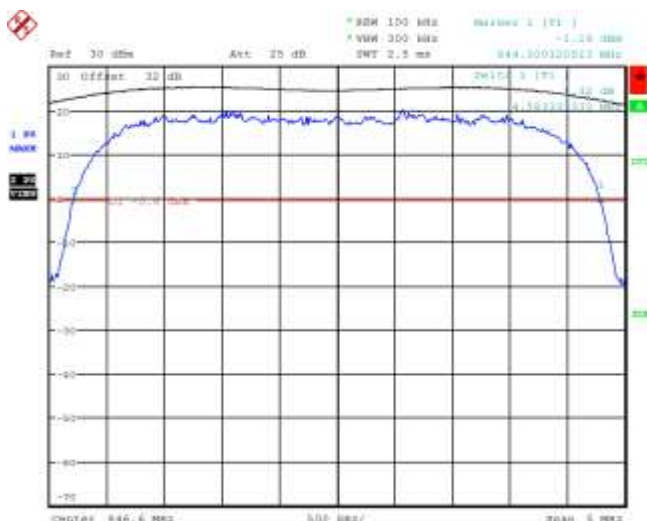


Figure 2-22a: -26 dBc Bandwidth, Band II Low Channel

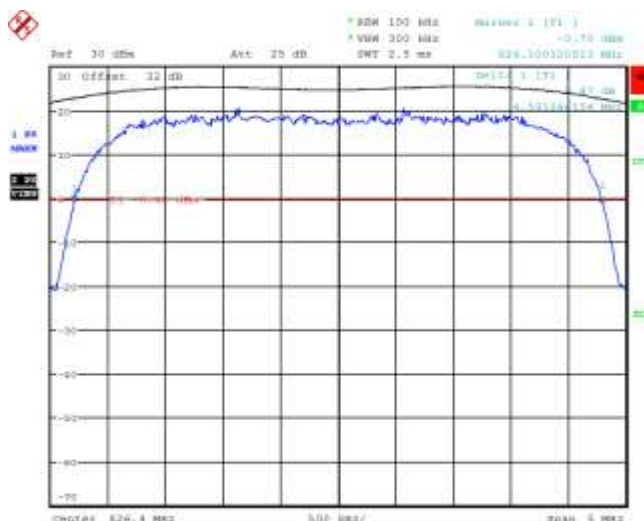


Figure 2-23a: -26 dBc Bandwidth, Band II Middle Channel

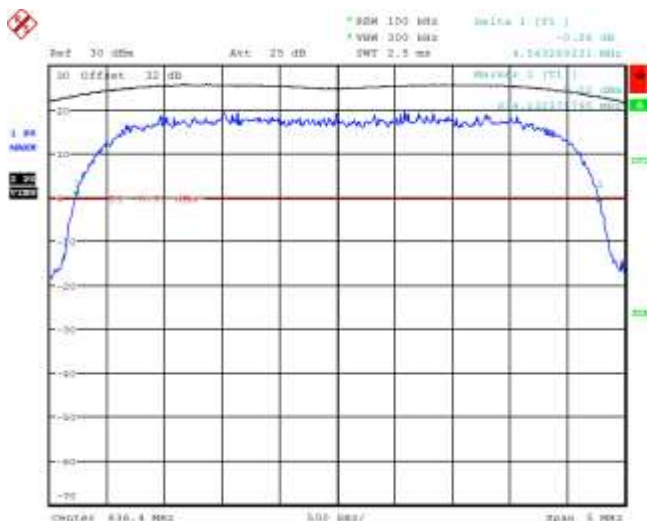
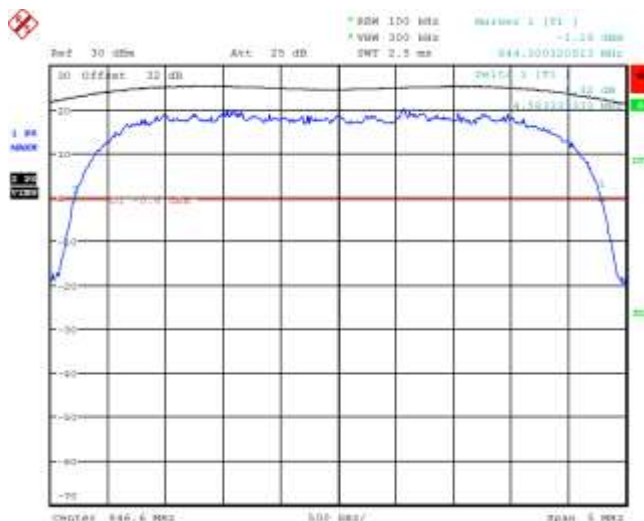


Figure 2-24a: -26 dBc Bandwidth, Band II High Channel



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
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WCDMA Conducted RF Emission Test Data cont'd

Figure 2-25a: Band V Low Channel Mask

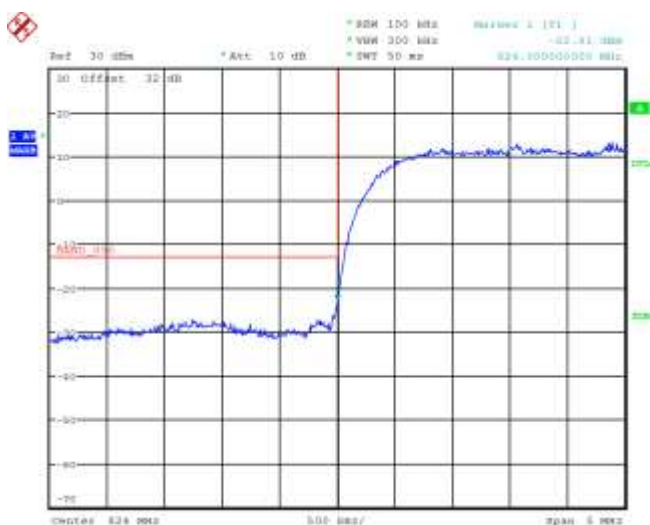


Figure 2-26a: Band V High Channel Mask

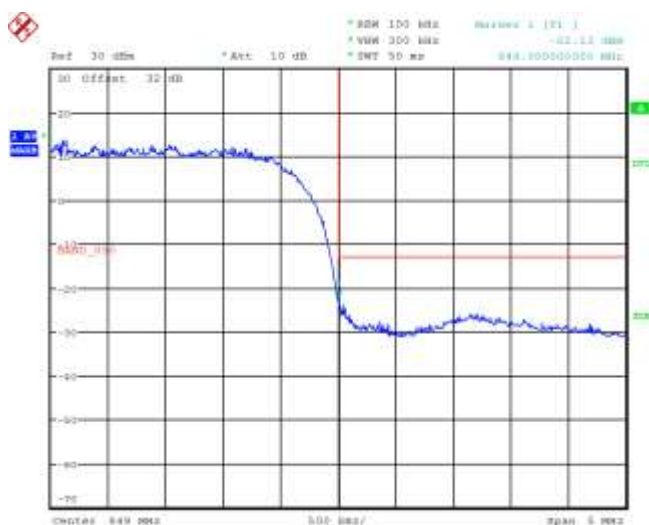


Figure 2-27a: Band II Low Channel Mask

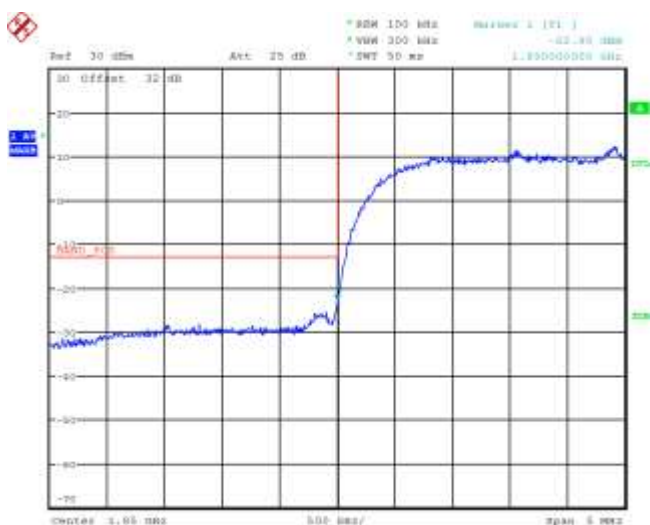
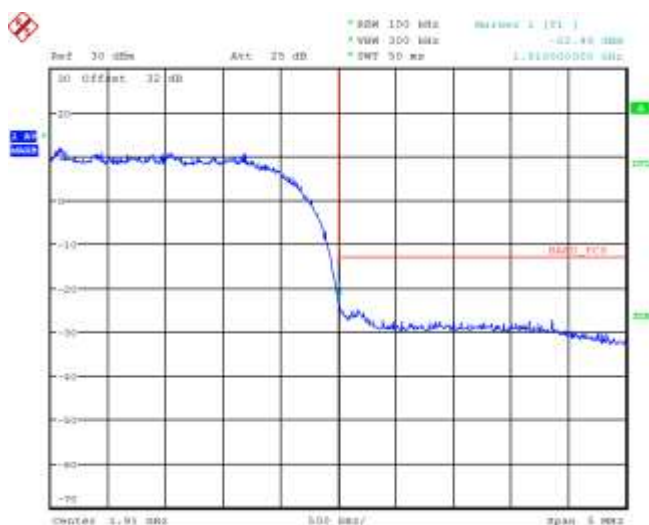


Figure 2-28a: Band II High Channel Mask



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
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WCDMA Conducted RF Emission Test Data cont'd

Figure 2-29a: Band II, PAR Low Channel

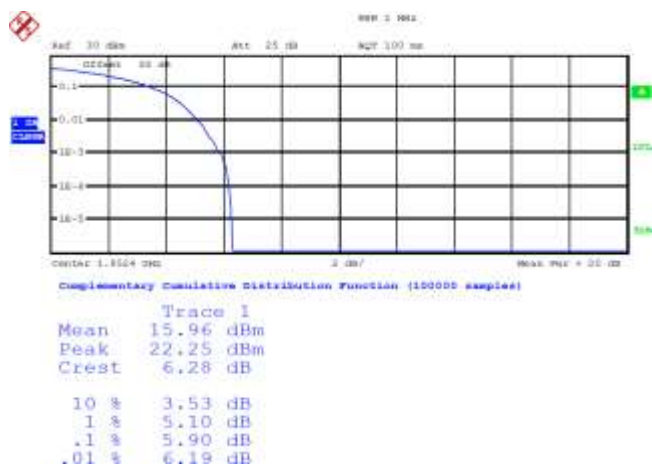


Figure 2-30a: Band II, PAR Mid Channel

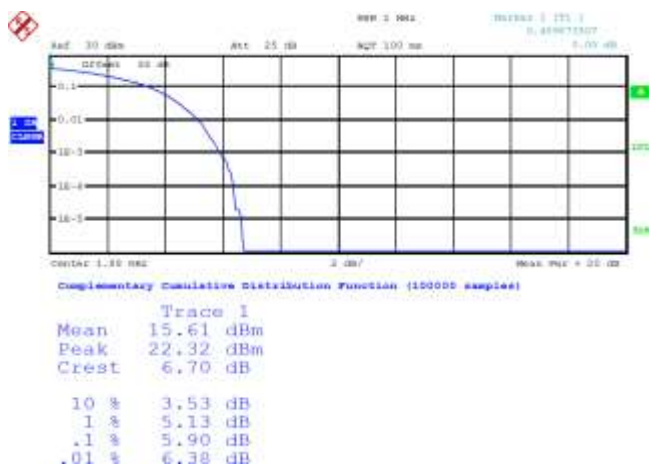
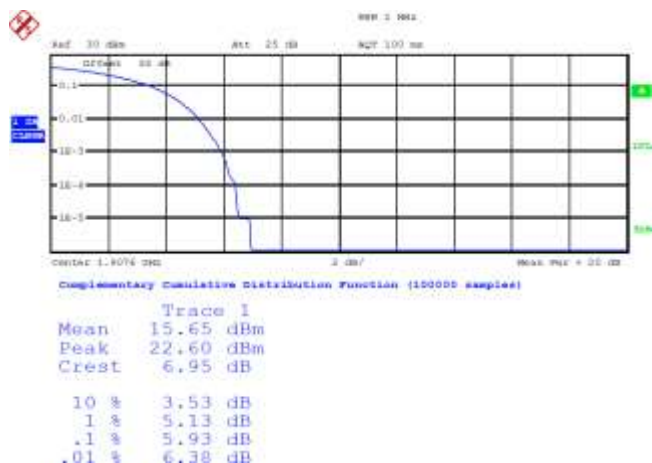


Figure 2-31a: Band II, PAR High Channel



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WCDMA Conducted RF Emission Test Data cont'd

Figure 2-32a: Band V HSUPA, Spurious Conducted Emissions, Low channel

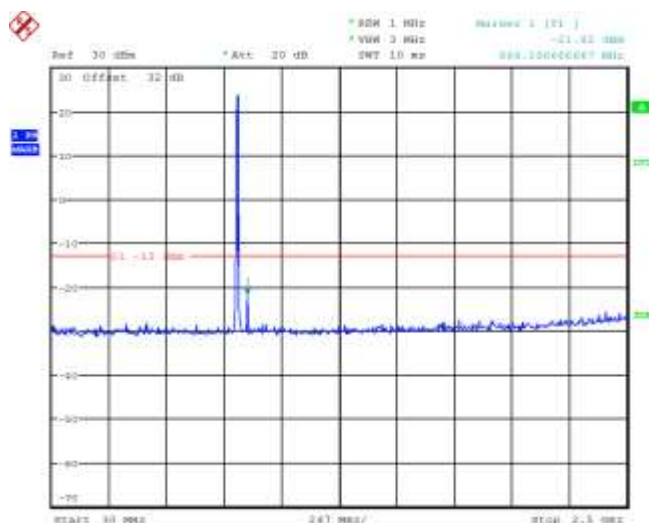


Figure 2-33a: Band V HSUPA, Spurious Conducted Emissions, Low channel

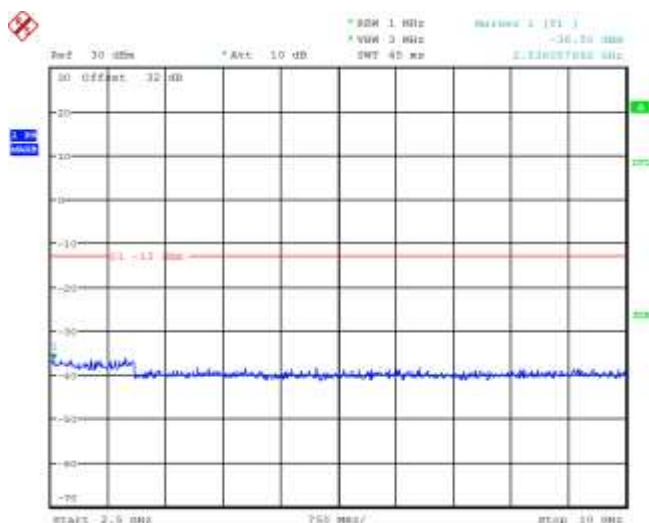


Figure 2-34a: Band V HSUPA, Spurious Conducted Emissions, Middle channel

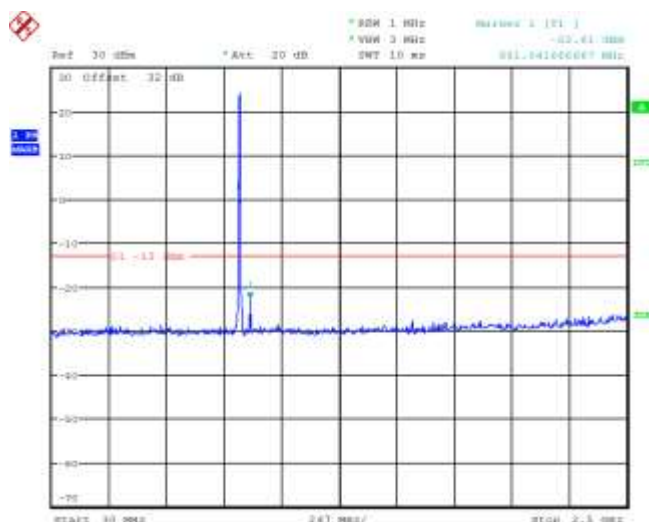
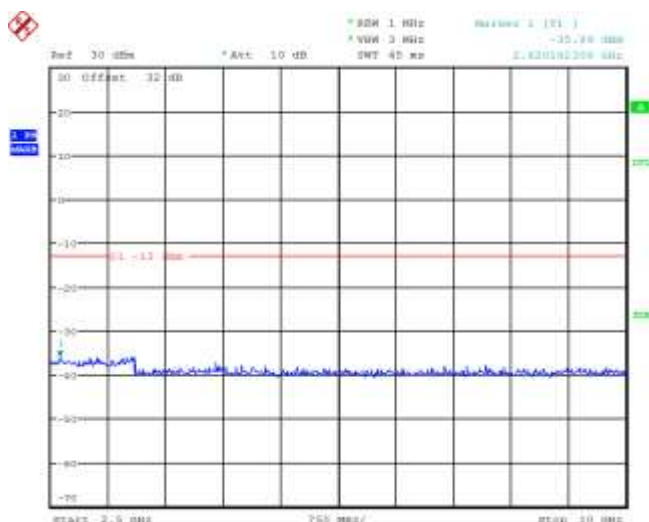


Figure 2-35a: Band V HSUPA, Spurious Conducted Emissions, Middle channel



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
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WCDMA Conducted RF Emission Test Data cont'd

Figure 2-36a: Band V HSUPA, Spurious Conducted Emissions, High Channel

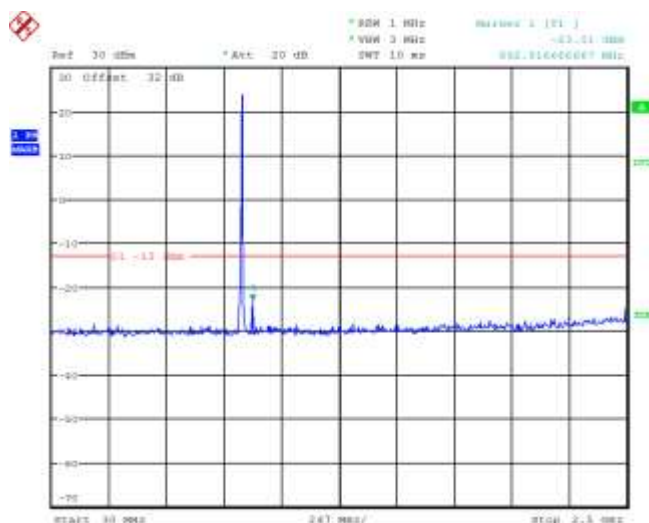


Figure 2-37a: Band V HSUPA, Spurious Conducted Emissions, High Channel

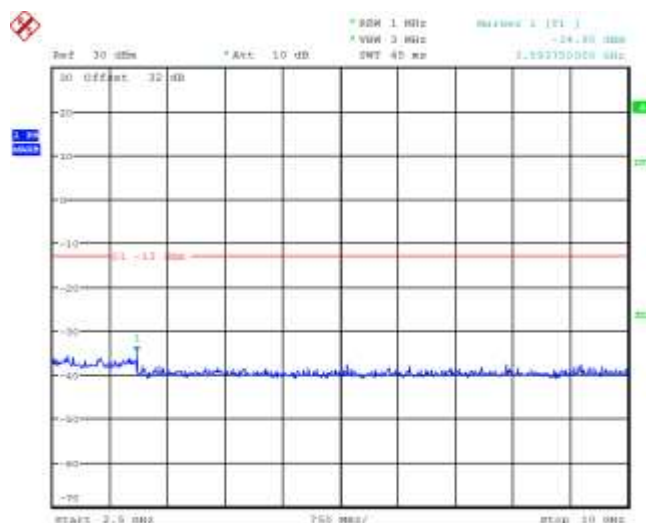


Figure 2-38a: Band II HSUPA, Spurious Conducted Emissions, Low Channel

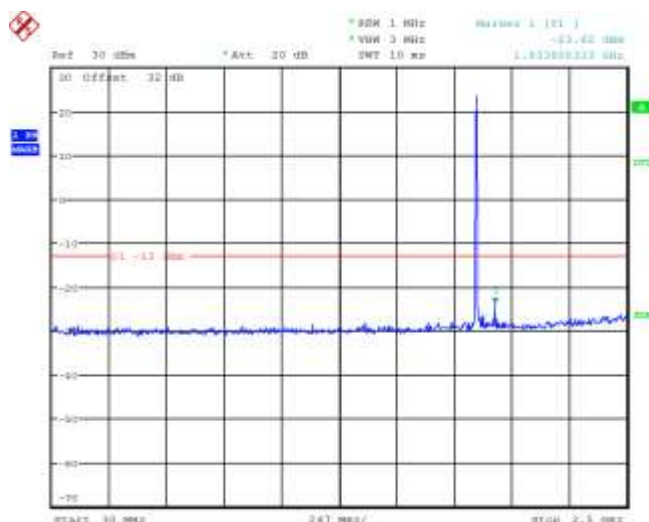
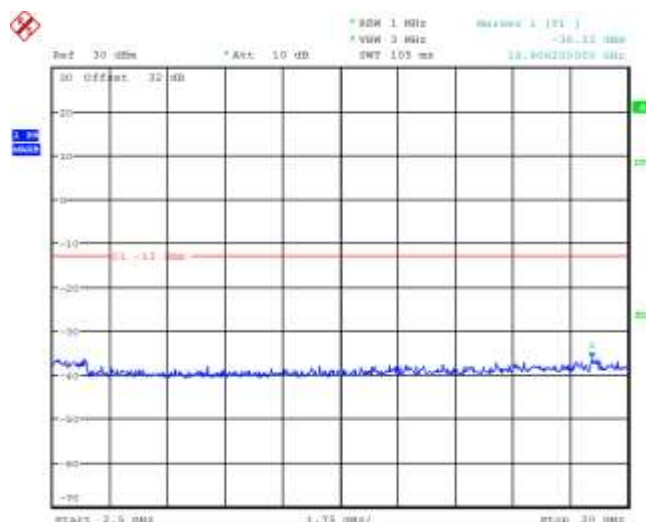


Figure 2-39a: Band II HSUPA, Spurious Conducted Emissions, Low Channel



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
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WCDMA Conducted RF Emission Test Data cont'd

Figure 2-40a: Band II HSUPA, Spurious Conducted Emissions, Middle Channel

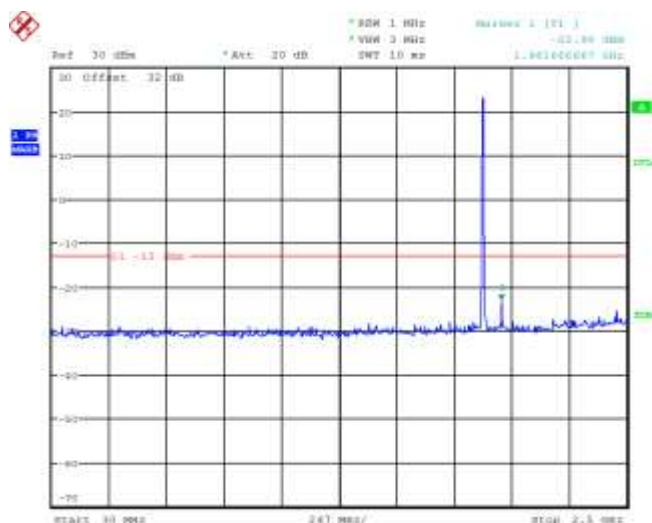


Figure 2-41a: Band II HSUPA, Spurious Conducted Emissions, Middle Channel

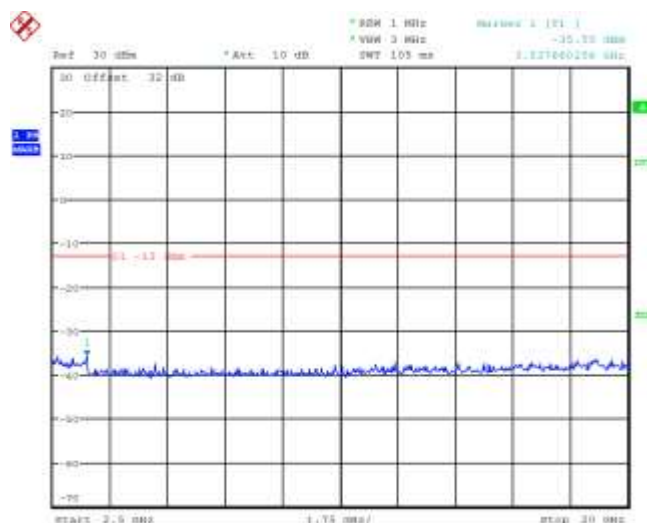


Figure 2-42a: Band II HSUPA, Spurious Conducted Emissions, High Channel

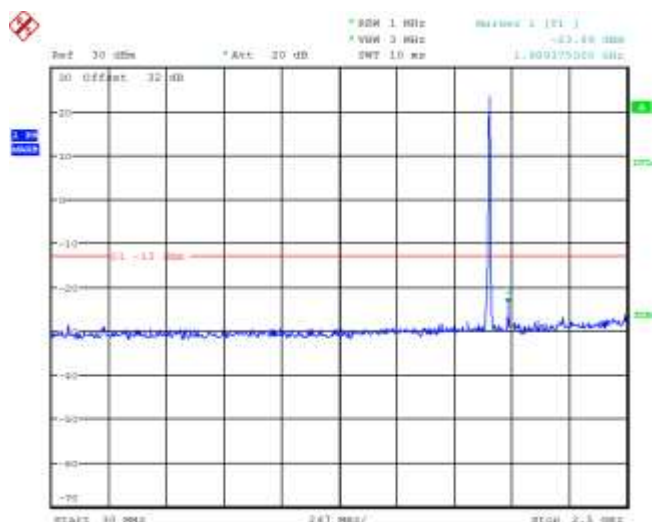
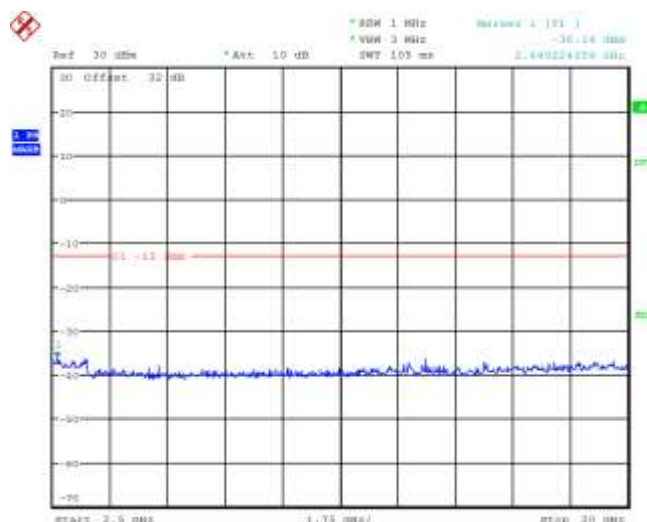


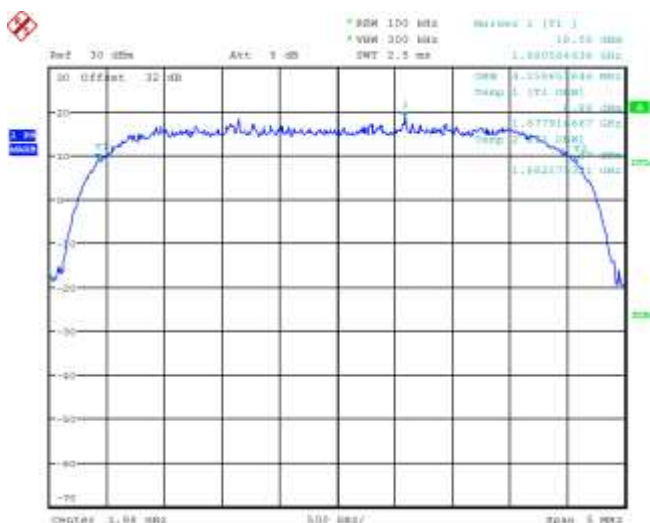
Figure 2-43a: Band II HSUPA, Spurious Conducted Emissions, High Channel



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Conducted RF Emission Test Data cont'd

**Figure 2-48a: Occupied Bandwidth, Band II
HSUPA Middle Channel**



**Figure 2-49a: Occupied Bandwidth, Band II
HSUPA High Channel**

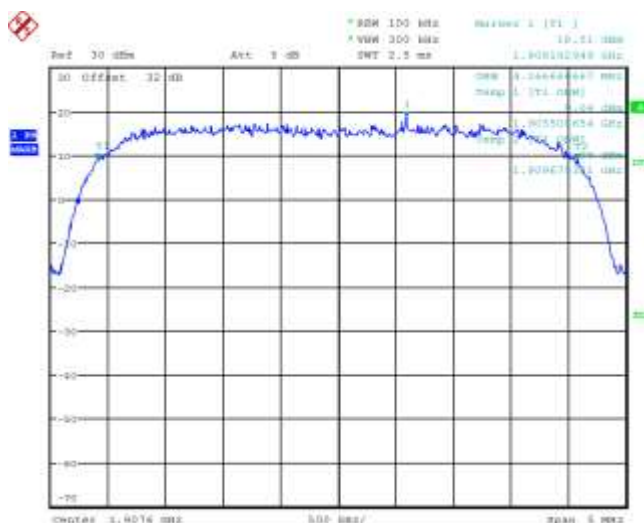


Figure 2-50a: Band V , HSUPA Low Channel Mask

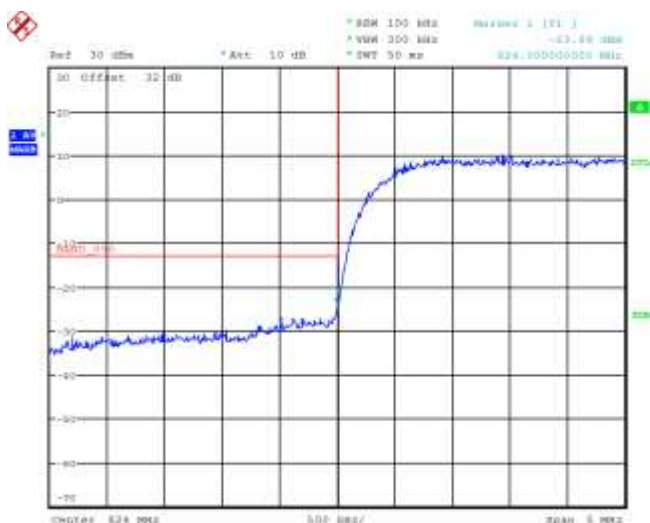
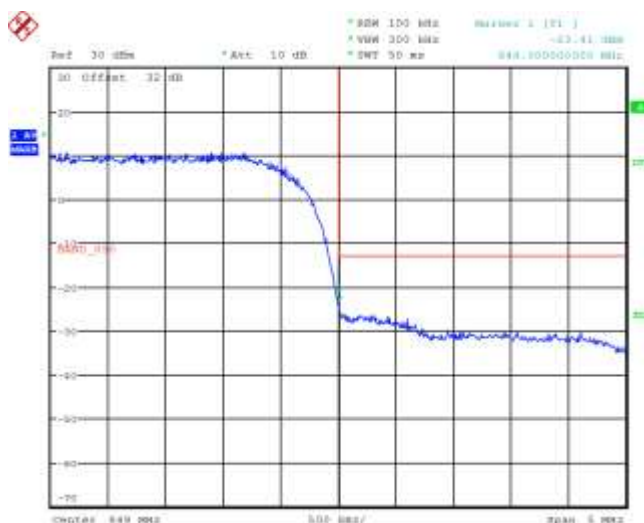


Figure 2-51a: Band V , HSUPA High Channel Mask



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WCDMA Conducted RF Emission Test Data cont'd

Figure 2-52a: Band II, HSUPA Low Channel Mask

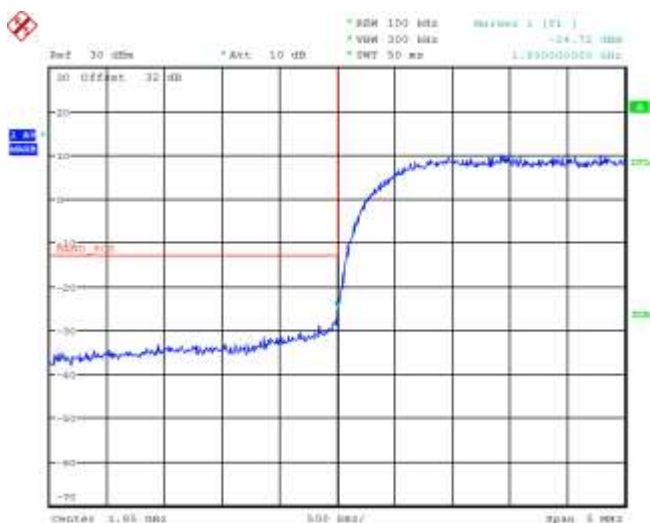
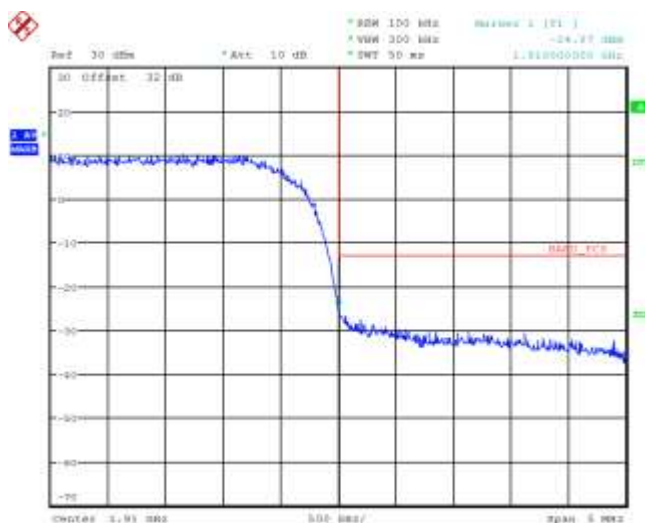


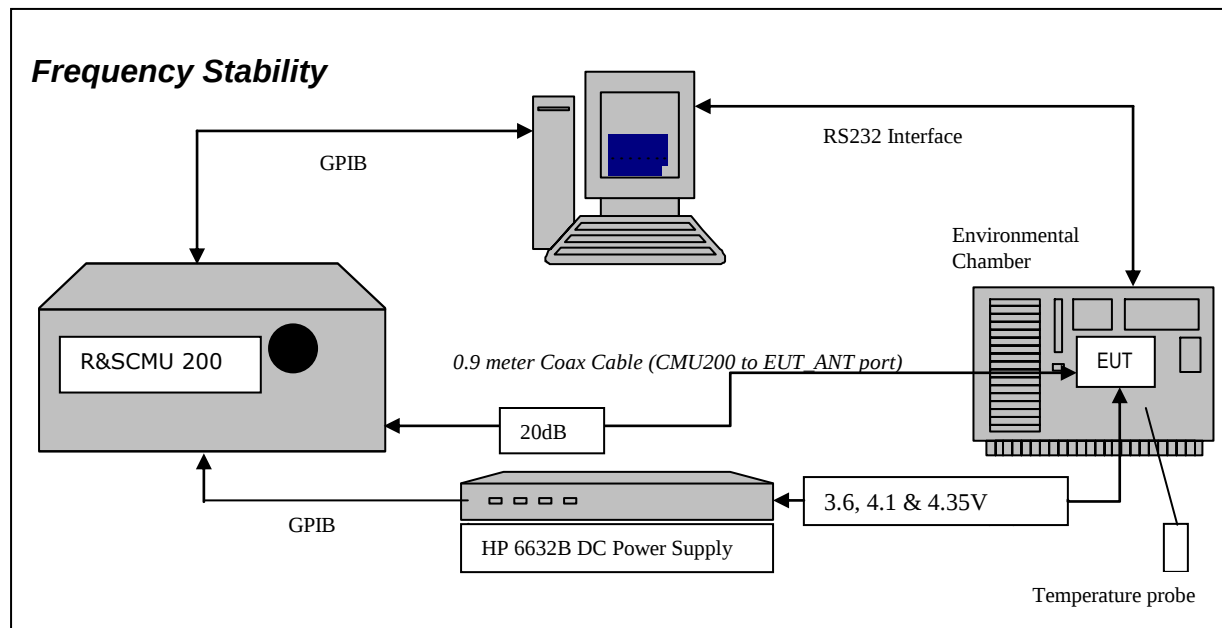
Figure 2-53a: Band II, HSUPA High Channel Mask



APPENDIX 2B – WCDMA Band II/V FREQUENCY STABILITY TEST DATA

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Frequency Stability Test Data



The following measurements were performed by Chuan Tran.

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2 Required Measurements

2.1055 Frequency Stability - Procedures

(a,b) Frequency Stability - Temperature Variation

(d) Frequency Stability - Voltage Variation

24.235 *Frequency Stability.*

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

The EUT meets the requirements as stated in CFR 47 chapter 1, Section 24.235, CFR 47 chapter 1, Section 22.917 RSS-132, 4.3 Frequency Stability, and RSS-133, 6.3 Frequency Stability.

Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-metre coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMU 200 and the EUT antenna port.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Test Setup:

The EUT was placed in the Temperature chamber and connected to CMU 200 outside as shown in the figure above. Dry air was pumped inside the temperature chamber to maintain a backpressure during the test. The EUT was kept in the off condition at all times except when the following measurements were to be made.

The chamber was switched on and the temperature was set to -30°C. After the chamber stabilized at -30 °C there was a soak period of one hour to alleviate moisture in the chamber, the EUT voltage was enabled. The system software recorded the frequency, power, and associated measurements.

A Computer system controlled the automated software. This application was given the command of activating all machines intrinsic to the temperature and voltage tests controlling the CMU 200 via the GPIB Bus. The Environmental Chamber was instructed through an RS-232 serial line. The EUT dialogue was passed through a serial connection.

The EUT repetitively transmitted 100 bursts for each set of programmed parameters recording temperature, voltage settings, and systematically selected frequencies. The power supply was cycled from minimum voltage 3.6 volts, 4.1 volts and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 4.1 volts and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 826.4, 836.4 and 846.6 MHz for the WCDMA band V. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million.

After the initial one-hour soak at the beginning of the tests, a period of thirty minutes soak was initialized between each ascending temperature step, before proceeding to the next measurement test cycle.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Procedure:

The test system software for commencing the Frequency Stability Tests carried through the following cycle.

1. Switch on the HP 6632B power supply; CMU 200 Communications test Set, and Environmental Chamber.
2. Start test program
3. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
4. Set power supply voltage to 3.6 volts.
5. Set up CMU 200 Radio Communication Tester.
6. Command the CMU 200 to switch to the low channel.
7. Enable the voltage to the EUT, and connect a link to the CMU 200 test set.
8. EUT is commanded to Transmit 100 Bursts.
9. Software logs the following data from the CMU 200, power supply and temperature chamber: Traffic Channel Number, Traffic Channel Frequency, Power Level, Chamber Temperature, Supply Voltage, Power and Frequency Error.
10. The CMU 200 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
11. Repeat steps 5 to 10 changing the supply voltage to 4.1 Volts
12. Increase temperature by 10°C and soak for 1/2 hour.
13. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
14. Repeat steps 5 to 10 changing the supply voltage to 4.35 volts

Procedure 5 to 10 was repeated at room temperature (20°C) with the power supply voltage set to 3.6, 4.1 and 4.35 volts

The maximum frequency error in the WCDMA band V measured was 0.0088PPM.
The maximum frequency error in the WCDMA band II measured was 0.0157 PPM.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Band V results: channels 4132, 4182 and 4233 @ 20°C maximum transmitted power

Traffic Channel Number	WCDMA Band V Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	3.6	20	5.72	0.0069
4182	836.4	3.6	20	3.56	0.0043
4233	846.6	3.6	20	5.31	0.0063

Traffic Channel Number	WCDMA Band V Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.1	20	-6.71	-0.0081
4182	836.4	4.1	20	-6.84	-0.0082
4233	846.6	4.1	20	5.75	0.0068

Traffic Channel Number	WCDMA Band V Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.35	20	-4.94	-0.0060
4182	836.4	4.35	20	4.20	0.0050
4233	846.6	4.35	20	5.29	0.0063

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Band V Results: channel 4132 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	3.6	-30	4.55	0.0055
4132	826.4	3.6	-20	-4.36	-0.0053
4132	826.4	3.6	-10	-6.29	-0.0076
4132	826.4	3.6	0	-5.40	-0.0065
4132	826.4	3.6	10	-4.97	-0.0060
4132	826.4	3.6	20	5.72	0.0069
4132	826.4	3.6	30	7.19	0.0087
4132	826.4	3.6	40	7.35	0.0089
4132	826.4	3.6	50	6.52	0.0079
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.1	-30	5.66	0.0069
4132	826.4	4.1	-20	-6.97	-0.0084
4132	826.4	4.1	-10	-6.59	-0.0080
4132	826.4	4.1	0	-6.30	-0.0076
4132	826.4	4.1	10	-7.08	-0.0086
4132	826.4	4.1	20	-6.71	-0.0081
4132	826.4	4.1	30	5.84	0.0071
4132	826.4	4.1	40	6.18	0.0075
4132	826.4	4.1	50	6.41	0.0078
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.35	-30	5.26	0.0064
4132	826.4	4.35	-20	-5.80	-0.0070
4132	826.4	4.35	-10	-6.85	-0.0083
4132	826.4	4.35	0	-5.46	-0.0066
4132	826.4	4.35	10	-6.01	-0.0073
4132	826.4	4.35	20	-4.94	-0.0060
4132	826.4	4.35	30	5.83	0.0071
4132	826.4	4.35	40	7.19	0.0087
4132	826.4	4.35	50	7.49	0.0091

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Band V Results: channel 4182 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4182	836.4	3.6	-30	-3.85	-0.0046
4182	836.4	3.6	-20	-4.97	-0.0059
4182	836.4	3.6	-10	4.85	0.0058
4182	836.4	3.6	0	4.17	0.0050
4182	836.4	3.6	10	4.20	0.0050
4182	836.4	3.6	20	3.56	0.0043
4182	836.4	3.6	30	-6.39	-0.0076
4182	836.4	3.6	40	5.68	0.0068
4182	836.4	3.6	50	-3.92	-0.0047
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4182	836.4	4.1	-30	-5.16	-0.0062
4182	836.4	4.1	-20	-3.78	-0.0045
4182	836.4	4.1	-10	5.08	0.0061
4182	836.4	4.1	0	5.81	0.0070
4182	836.4	4.1	10	-4.20	-0.0050
4182	836.4	4.1	20	-6.84	-0.0082
4182	836.4	4.1	30	4.59	0.0055
4182	836.4	4.1	40	5.37	0.0064
4182	836.4	4.1	50	4.85	0.0058
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4182	836.4	4.35	-30	6.18	0.0074
4182	836.4	4.35	-20	5.74	0.0069
4182	836.4	4.35	-10	5.25	0.0063
4182	836.4	4.35	0	-4.99	-0.0060
4182	836.4	4.35	10	-4.39	-0.0053
4182	836.4	4.35	20	4.20	0.0050
4182	836.4	4.35	30	-5.10	-0.0061
4182	836.4	4.35	40	4.93	0.0059
4182	836.4	4.35	50	-6.16	-0.0074

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WCDMA Band V Results: channel 4233 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4233	846.6	3.6	-30	-10.31	-0.0122
4233	846.6	3.6	-20	-4.82	-0.0057
4233	846.6	3.6	-10	5.72	0.0068
4233	846.6	3.6	0	5.77	0.0068
4233	846.6	3.6	10	5.39	0.0064
4233	846.6	3.6	20	5.31	0.0063
4233	846.6	3.6	30	-6.29	-0.0074
4233	846.6	3.6	40	-5.17	-0.0061
4233	846.6	3.6	50	-6.81	-0.0080
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4233	846.6	4.1	-30	-6.44	-0.0076
4233	846.6	4.1	-20	5.19	0.0061
4233	846.6	4.1	-10	6.04	0.0071
4233	846.6	4.1	0	6.16	0.0073
4233	846.6	4.1	10	6.56	0.0078
4233	846.6	4.1	20	5.75	0.0068
4233	846.6	4.1	30	-6.10	-0.0072
4233	846.6	4.1	40	-6.18	-0.0073
4233	846.6	4.1	50	-7.58	-0.0090
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4233	846.6	4.35	-30	-6.36	-0.0075
4233	846.6	4.35	-20	-5.87	-0.0069
4233	846.6	4.35	-10	7.20	0.0085
4233	846.6	4.35	0	6.26	0.0074
4233	846.6	4.35	10	5.80	0.0068
4233	846.6	4.35	20	5.29	0.0063
4233	846.6	4.35	30	-4.97	-0.0059
4233	846.6	4.35	40	-7.03	-0.0083
4233	846.6	4.35	50	-7.84	-0.0093

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Band II results: channels 9262, 9400, & 9538 @ 20°C maximum transmitted power

Traffic Channel Number	WCDMA1900 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	3.6	20	9.41	0.0051
9400	1880.00	3.6	20	9.98	0.0053
9538	1907.60	3.6	20	10.03	0.0053

Traffic Channel Number	WCDMA1900 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.1	20	7.42	0.0040
9400	1880.00	4.1	20	8.27	0.0044
9538	1907.60	4.1	20	9.40	0.0049

Traffic Channel Number	WCDMA1900 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.35	20	7.32	0.0040
9400	1880.00	4.35	20	9.08	0.0048
9538	1907.60	4.35	20	10.85	0.0057

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Band II Results: channel 9262 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	3.6	-30	8.19	0.0044
9262	1852.40	3.6	-20	-4.82	-0.0026
9262	1852.40	3.6	-10	-7.42	-0.0040
9262	1852.40	3.6	0	-8.21	-0.0044
9262	1852.40	3.6	10	5.78	0.0031
9262	1852.40	3.6	20	9.41	0.0051
9262	1852.40	3.6	30	11.78	0.0064
9262	1852.40	3.6	40	13.37	0.0072
9262	1852.40	3.6	50	16.33	0.0088
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.1	-30	8.73	0.0047
9262	1852.40	4.1	-20	5.29	0.0029
9262	1852.40	4.1	-10	-10.25	-0.0055
9262	1852.40	4.1	0	-10.39	-0.0056
9262	1852.40	4.1	10	8.36	0.0045
9262	1852.40	4.1	20	7.42	0.0040
9262	1852.40	4.1	30	11.43	0.0062
9262	1852.40	4.1	40	12.97	0.0070
9262	1852.40	4.1	50	14.60	0.0079
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.35	-30	10.86	0.0059
9262	1852.40	4.35	-20	-5.77	-0.0031
9262	1852.40	4.35	-10	-11.14	-0.0060
9262	1852.40	4.35	0	-8.90	-0.0048
9262	1852.40	4.35	10	-7.63	-0.0041
9262	1852.40	4.35	20	7.32	0.0040
9262	1852.40	4.35	30	11.35	0.0061
9262	1852.40	4.35	40	14.56	0.0079
9262	1852.40	4.35	50	14.66	0.0079

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Band II Results: channel 9400 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9400	1880.00	3.6	-30	7.68	0.0041
9400	1880.00	3.6	-20	8.07	0.0043
9400	1880.00	3.6	-10	6.81	0.0036
9400	1880.00	3.6	0	8.82	0.0047
9400	1880.00	3.6	10	9.28	0.0049
9400	1880.00	3.6	20	9.98	0.0053
9400	1880.00	3.6	30	9.11	0.0048
9400	1880.00	3.6	40	9.05	0.0048
9400	1880.00	3.6	50	7.42	0.0039
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9400	1880.00	4.1	-30	6.26	0.0033
9400	1880.00	4.1	-20	7.75	0.0041
9400	1880.00	4.1	-10	8.36	0.0044
9400	1880.00	4.1	0	8.00	0.0043
9400	1880.00	4.1	10	7.57	0.0040
9400	1880.00	4.1	20	8.27	0.0044
9400	1880.00	4.1	30	10.76	0.0057
9400	1880.00	4.1	40	8.76	0.0047
9400	1880.00	4.1	50	8.73	0.0046
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9400	1880.00	4.35	-30	7.60	0.0040
9400	1880.00	4.35	-20	8.73	0.0046
9400	1880.00	4.35	-10	6.82	0.0036
9400	1880.00	4.35	0	8.04	0.0043
9400	1880.00	4.35	10	9.38	0.0050
9400	1880.00	4.35	20	9.08	0.0048
9400	1880.00	4.35	30	9.31	0.0050
9400	1880.00	4.35	40	7.93	0.0042
9400	1880.00	4.35	50	8.19	0.0044

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

WCDMA Band II Results: channel 9538 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9538	1907.60	3.6	-30	-8.48	-0.0044
9538	1907.60	3.6	-20	8.80	0.0046
9538	1907.60	3.6	-10	13.18	0.0069
9538	1907.60	3.6	0	13.95	0.0073
9538	1907.60	3.6	10	10.54	0.0055
9538	1907.60	3.6	20	10.03	0.0053
9538	1907.60	3.6	30	-9.40	-0.0049
9538	1907.60	3.6	40	-7.29	-0.0038
9538	1907.60	3.6	50	-9.96	-0.0052
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9538	1907.60	4.1	-30	-5.63	-0.0030
9538	1907.60	4.1	-20	10.97	0.0058
9538	1907.60	4.1	-10	12.68	0.0066
9538	1907.60	4.1	0	13.12	0.0069
9538	1907.60	4.1	10	13.17	0.0069
9538	1907.60	4.1	20	9.40	0.0049
9538	1907.60	4.1	30	8.10	0.0042
9538	1907.60	4.1	40	-6.15	-0.0032
9538	1907.60	4.1	50	-8.06	-0.0042
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	21BPPM
9538	1907.60	4.35	-30	-7.40	-0.0039
9538	1907.60	4.35	-20	10.54	0.0055
9538	1907.60	4.35	-10	12.54	0.0066
9538	1907.60	4.35	0	13.26	0.0070
9538	1907.60	4.35	10	13.03	0.0068
9538	1907.60	4.35	20	10.85	0.0057
9538	1907.60	4.35	30	7.98	0.0042
9538	1907.60	4.35	40	-8.73	-0.0046
9538	1907.60	4.35	50	-10.35	-0.0054

APPENDIX 2C – WCDMA Band II/V RADIATED EMISSIONS TEST DATA

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2C	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Radiated Power Test Data Results

The following measurements were performed by Rex Zhang.

Date of Test: July 3, 2014

The environmental tests conditions were: Temperature: 25.8 °C
Relative Humidity: 37.1 %

The BlackBerry® smartphone was standalone, horizontally with LCD facing down and top pointing to the RX antenna when the turntable is at 0 degree position.
Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

WCDMA Band V Call Service Mode

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method					
								Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	ol.	Reading (dBm)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole)		Limit (dBm)	Diff. To Limit (dB)
										(dBm)	(W)		
F0	4132	826.40	V	Dipole	V	-39.88	-29.59	V-V	6.03	23.35	0.22	38.5	15.15
F0	4132	826.40	V	Dipole	H	-29.59		H-H	5.19				
F0	4182	836.40	V	Dipole	V	-39.38	-29.97	V-V	5.83	22.95	0.20	38.5	15.55
F0	4182	836.40	V	Dipole	H	-29.97		H-H	5.03				
F0	4233	846.60	V	Dipole	V	-38.46	-29.39	V-V	6.03	23.16	0.21	38.5	15.34
F0	4233	846.60	V	Dipole	H	-29.39		H-H	4.84				

WCDMA Band V HSUPA Mode

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method					
								Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	ol.	Reading (dBm)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole)		Limit (dBm)	Diff. To Limit (dB)
										(dBm)	(W)		
F0	4132	826.40	V	Dipole	V	-41.15	-31.15	V-V	4.46	21.78	0.15	38.50	16.72
F0	4132	826.40	V	Dipole	H	-31.15		H-H	3.68				
F0	4182	836.40	V	Dipole	V	-40.85	-31.41	V-V	4.39	21.51	0.14	38.50	16.99
F0	4182	836.40	V	Dipole	H	-31.41		H-H	3.45				
F0	4233	846.60	V	Dipole	V	-39.90	-30.80	V-V	4.64	21.77	0.15	38.50	16.73
F0	4233	846.60	V	Dipole	H	-30.80		H-H	3.69				

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 2C	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Radiated Emissions Test Data Results cont'd

WCDMA Band V Call Service Mode

The following measurements were performed by Savtej Sandhu.

Date of Test: June 26, 2014

The environmental test conditions were: Temperature: 23.9 °C
 Relative Humidity: 36.9 %

The BlackBerry® smartphone was standalone, with horizontal down and top pointing to the RX antenna when the turntable is at 0 degree position.

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height, and the frequency range scanned was 30MHz – 1GHz.

Measurements were performed in WCDMA Band V Call mode on channels 4132, 4182, and 4233.

All emissions were at least 25.0 dB below the limit.

The following measurements were performed by Masud Attayi

Date of Test: June 30-July 11, 2014

The environmental test conditions were: Temperature: 23.2 - 25.6 °C
 Relative Humidity: 17.7 - 31.7 %

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height, and a frequency range of 1 GHz to 9 GHz.

The BlackBerry® smartphone was standalone, horizontal with LCD facing up and top pointing to the RX antenna when the turntable is at 0 degree position.

Measurements were performed in WCDMA Band V Call mode on channels 4132, 4182, and 4233.

All emissions were at least 25.0 dB below the limit.

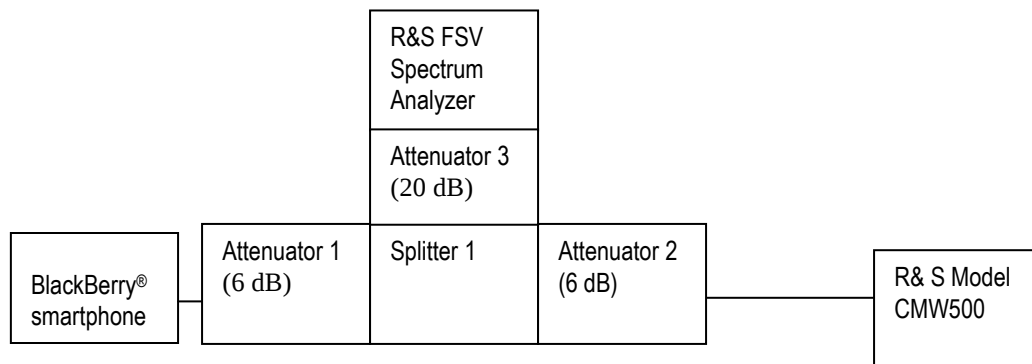
APPENDIX 3A– LTE Band 2 CONDUCTED RF EMISSIONS TEST DATA/PLOTS

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 2 Conducted RF Emission Test Data

This appendix contains measurement data pertaining to conducted spurious emissions, 99% power bandwidth and the channel mask.

Test Setup Diagram



A reference offset of 32.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SERIAL NUMBER</u>
Attenuator 1	Mini-Circuits	BW-S6W2+	0647
Attenuator 2	Mini-Circuits	BW-S6W2+	0648
Attenuator 3	Mini-Circuits	BW-S20-2W263+	1234
Splitter 1	Weinschel	1515	MES 92

Date of Test: June 26-27, 2014

The environmental test conditions were: Temperature: 23.9°C
 Relative Humidity: 34.4 %

The following measurements were performed by Chuan Tran.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 2 Conducted RF Emission Test Data cont'd

Emission Designator Table

Frequency Range (MHz)	Conducted Output Power (dBm)	Emission Designator	Band	Bandwidth (MHz)	Modulation
1850.7-1909.3	21.87	1M07G7D	LTE B2	1.4	QPSK
1850.7-1909.3	20.82	1M07D7W	LTE B2	1.4	16QAM
1851.5-1908.5	21.80	2M69G7D	LTE B2	3	QPSK
1851.5-1908.5	21.08	2M69D7W	LTE B2	3	16QAM
1852.5-1907.5	21.89	4M47G7D	LTE B2	5	QPSK
1852.5-1907.5	20.68	4M49D7W	LTE B2	5	16QAM
1855-1905	21.94	8M95G7D	LTE B2	10	QPSK
1855-1905	21.37	8M93D7W	LTE B2	10	16QAM
1857.5-1902.5	22.00	13M4G7D	LTE B2	15	QPSK
1857.5-1902.5	21.42	13M4D7W	LTE B2	15	16QAM
1860-1900	21.93	17M8G7D	LTE B2	20	QPSK
1860-1900	21.55	17M9D7W	LTE B2	20	16QAM

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 24.232(d), CFR 2.202, RSS - 133 were measured from 30 MHz to 20 GHz.

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz with different number of RBs as per scalable bandwidths for LTE Band 2, the modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth.

QPSK and 16-QAM modulations were applied to each of the bandwidths. Only the worst case measurements are documented in this report.

A minimum RB condition was also measured (RB = 1).

The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.

The worst case –26dBc bandwidth for LTE Band 2 was measured to be 18.75 MHz as shown below. Results were derived in a 200 kHz resolution bandwidth.

On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Test Data for LTE Band 2 selected Frequencies in 20MHz bandwidth (RB = 100)

LTE Band 2 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	QPSK	16QAM
1852.400	18.68	17.84	17.87
1880.000	18.75	17.90	17.94
1907.600	18.75	17.87	17.84

Peak to Average Ratio (PAR)

For each 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20 MHz with different number of RBs as per scalable bandwidths for LTE Band 2, the peak to average ratio was measured on the low, middle and high channels with QPSK and 16-QAM modulation.

On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

The worst case Peak to Average Ratio was 11.20 dB on mid channel in 10MHz bandwidth with 50 RB.

Measurement Plots for LTE Band 2

Refer to the following measurement plots for more detail:

See Figures 3-1a to 3-18a for the plots of the conducted spurious emissions.

See Figures 3-19a to 3-24a and 3-43a to 3-45a for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.

See Figures 3-25a to 3-36a for the plots of the Channel mask.

See Figures 3-37a to 3-42a for the plots of the Peak to Average Ratio.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 2 Conducted RF Emission Test Data (cont'd)

Figure 3-1a: Band 2, Spurious Conducted Emissions, Low channel, 20MHz BW (RB= 100)

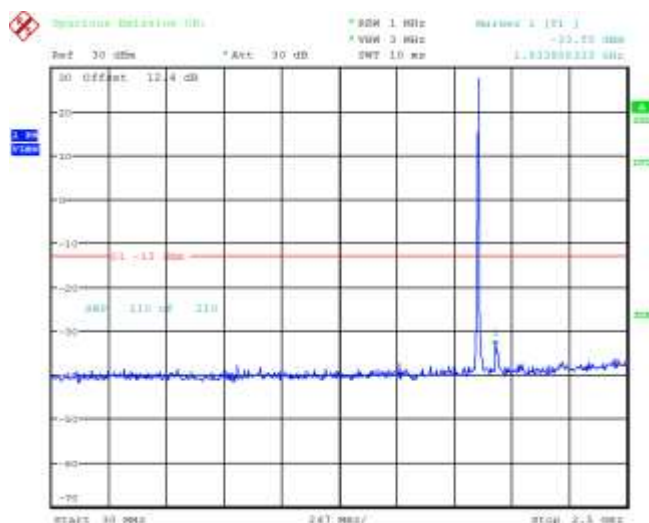


Figure 3-2a: Band 2, Spurious Conducted Emissions, Low channel, 20MHz BW (RB= 100)

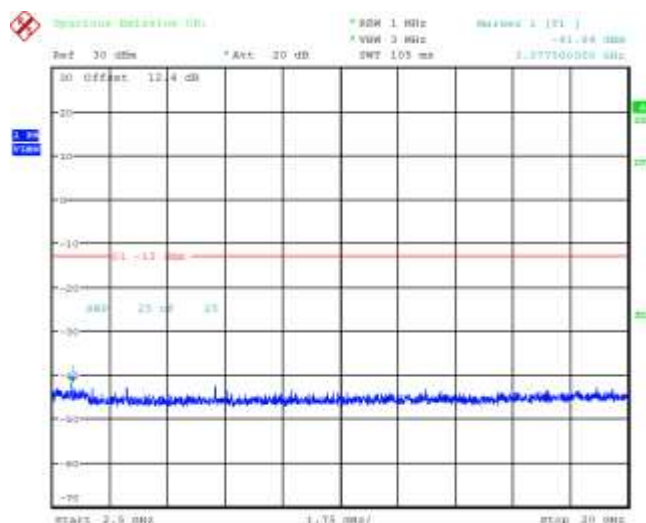


Figure 3-3a: Band 2, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 100)

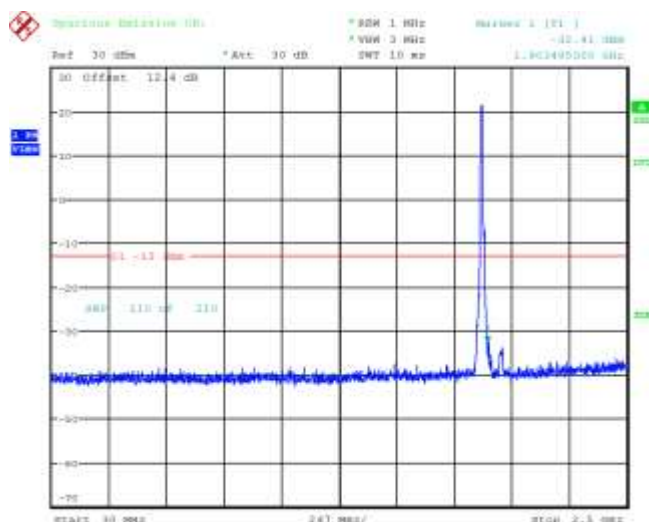
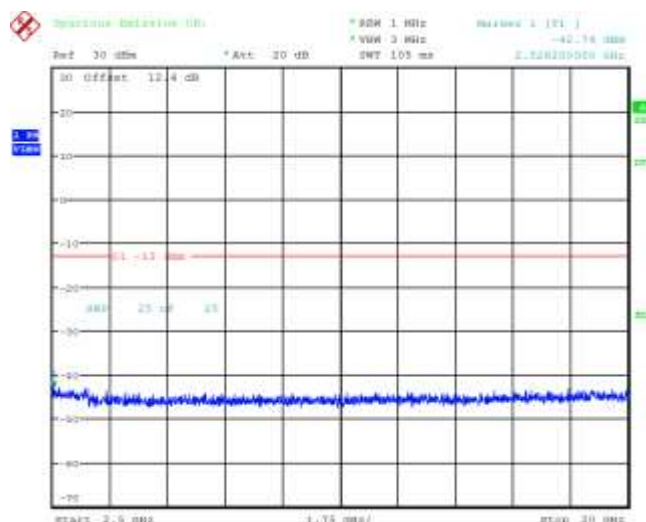


Figure 3-4a: Band 2, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 100)



	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 3-5a: Band 2, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)

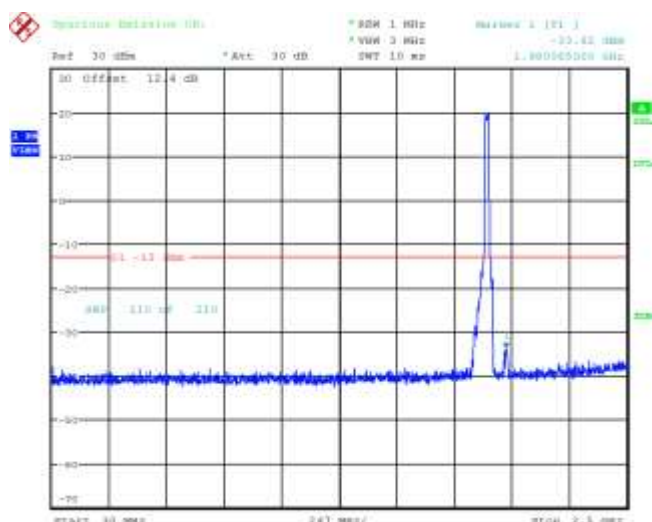


Figure 3-6a: Band 2, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)

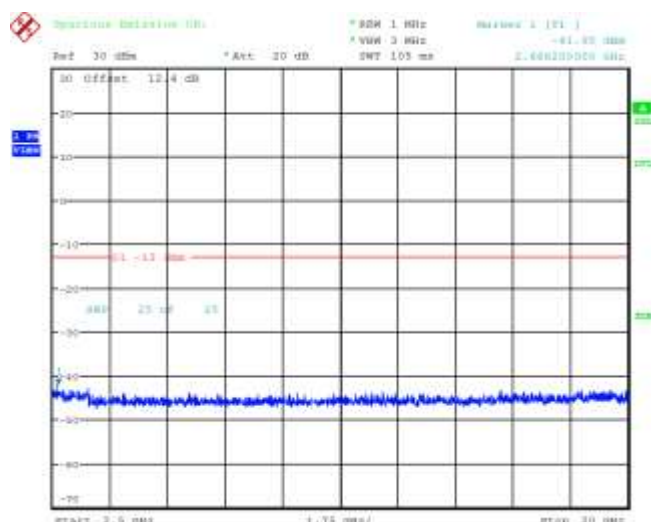


Figure 3-7a: Band 2, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)

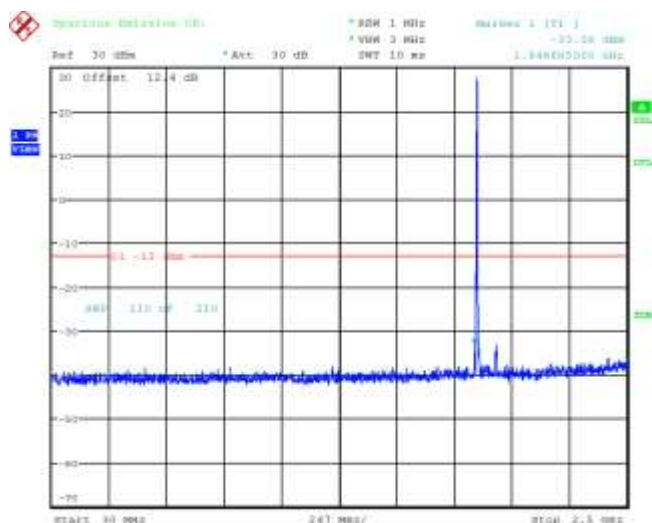
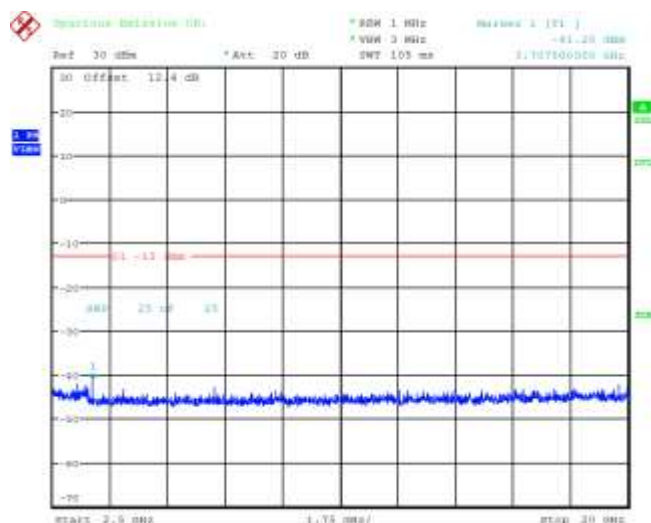


Figure 3-8a: Band 2, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)



	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 3-9a: Band 2, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 50)

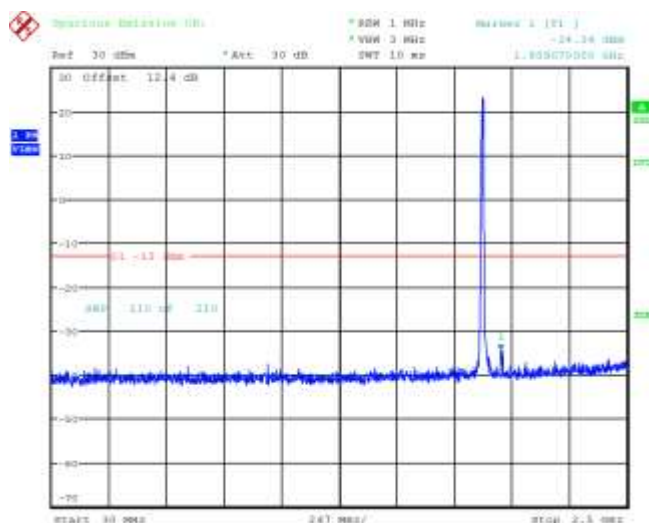


Figure 3-10a: Band 2, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 50)

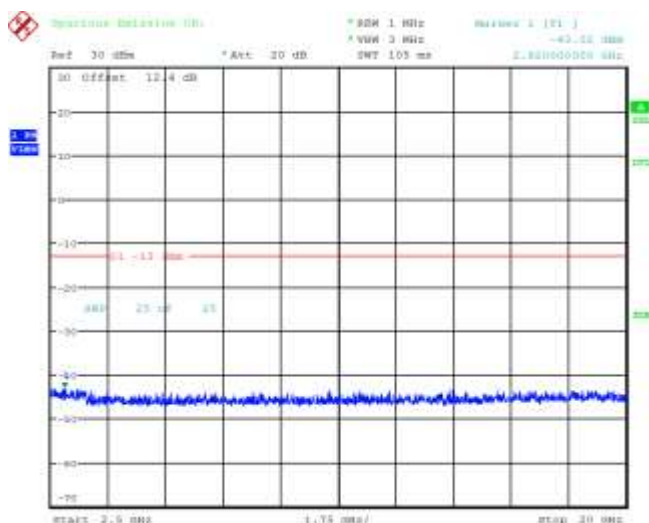


Figure 3-11a: Band 2, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)

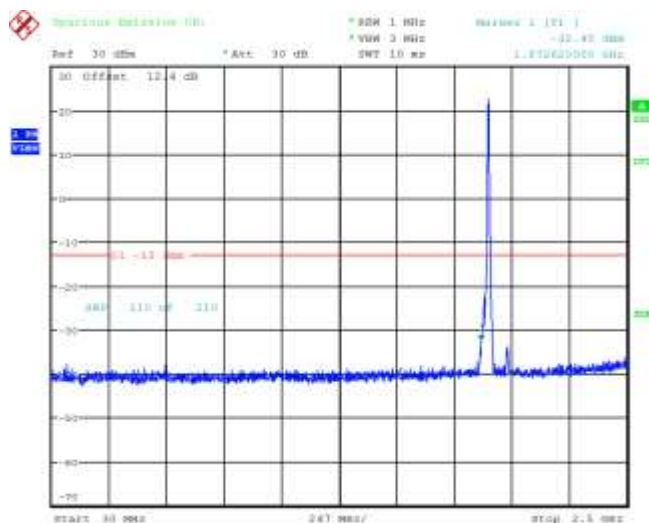
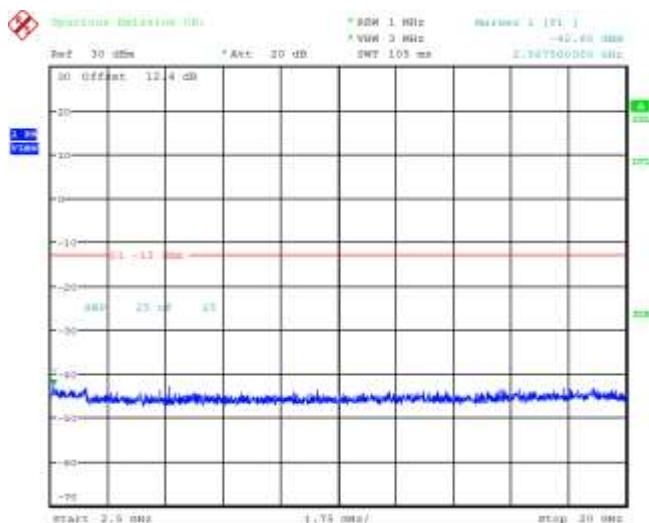


Figure 3-12a: Band 2, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)



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LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 3-13a: Band 2, Spurious Conducted Emissions, Low channel, 1.4MHz BW (RB= 6)

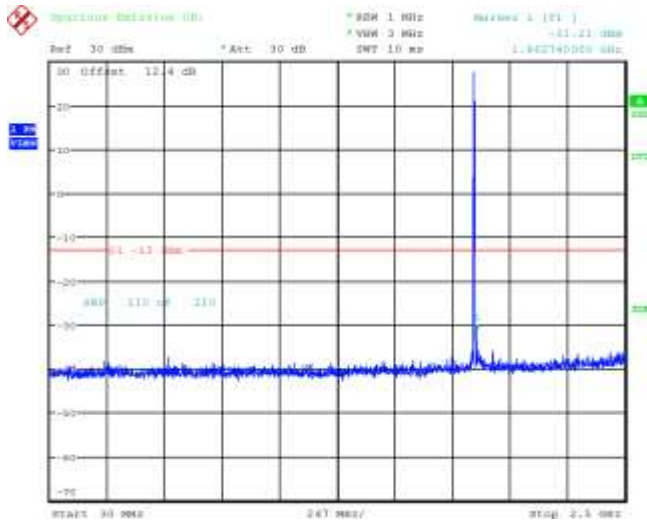


Figure 3-14a: Band 2, Spurious Conducted Emissions, Low channel, 1.4MHz BW (RB= 6)

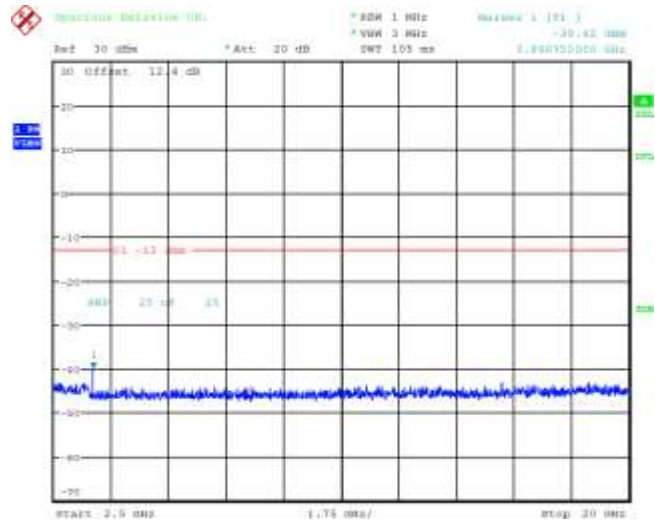


Figure 3-15a: Band 2, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 6)

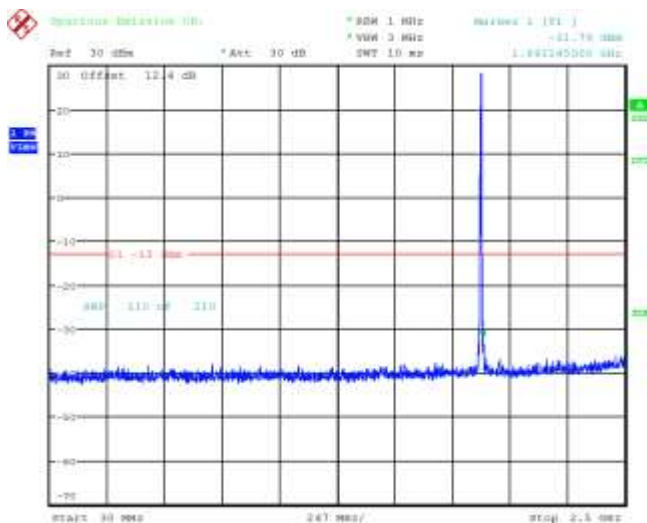
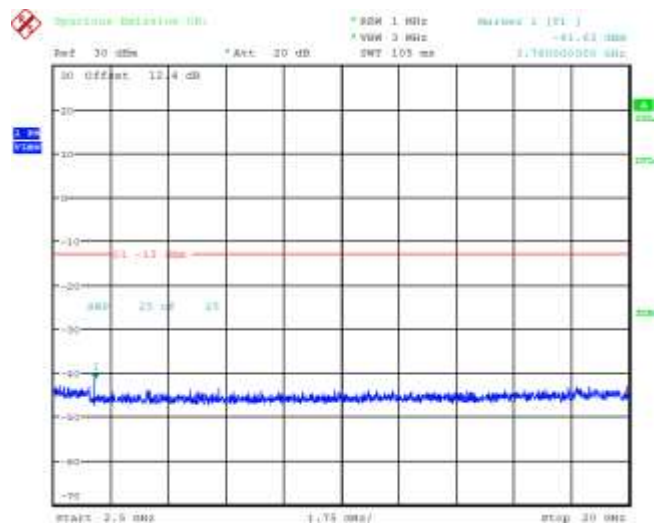


Figure 3-16a: Band 2, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 6)



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LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 3-17a: Band 2, Spurious Conducted Emissions, High Channel, 1.4MHz BW (RB= 6)

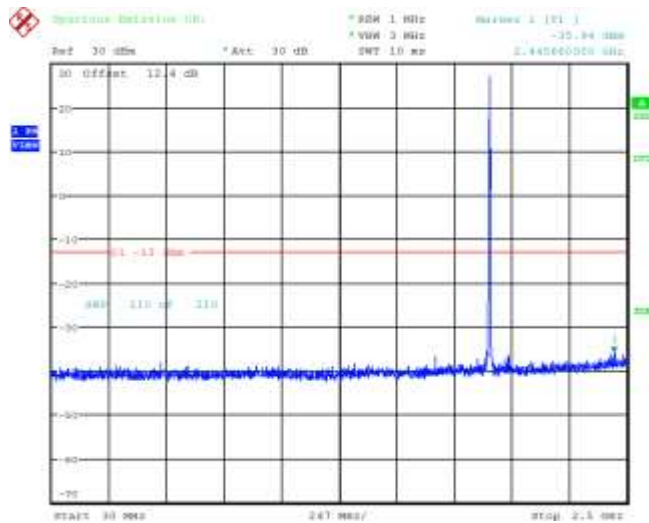


Figure 3-18a: Band 2, Spurious Conducted Emissions, High Channel, 1.4MHz BW (RB= 6)

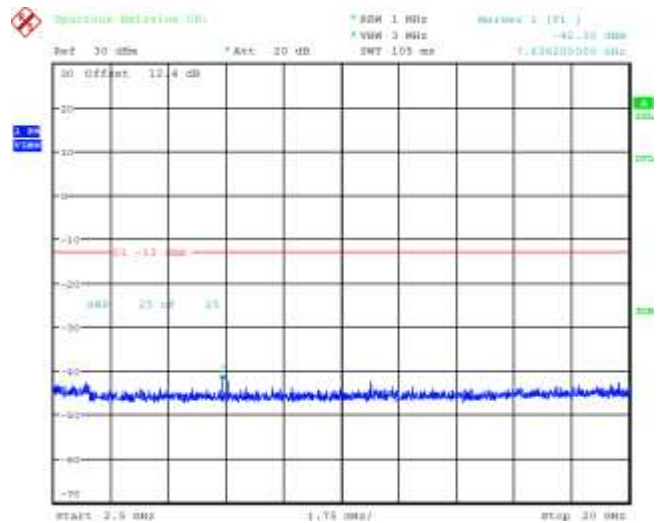


Figure 3-19a: Occupied Bandwidth, Band 2 Low Channel, 20MHz BW (RB= 100)

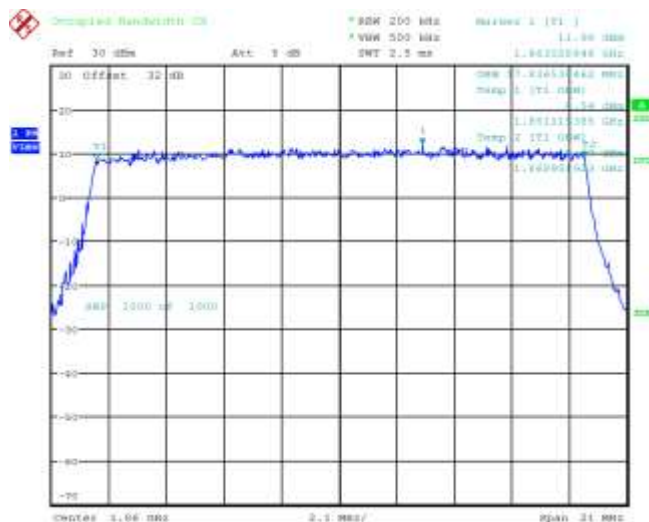
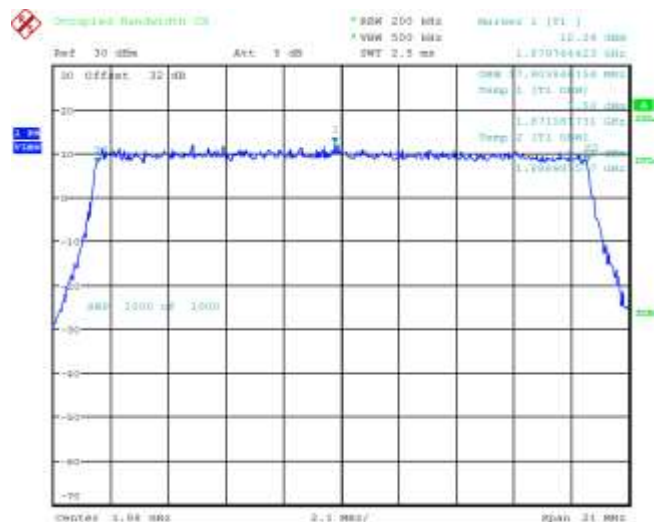


Figure 3-20a: Occupied Bandwidth, Band 2 Middle Channel, 20MHz BW (RB= 100)



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LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 3-21a: Occupied Bandwidth, Band 2 High Channel, 20MHz BW (RB= 100)

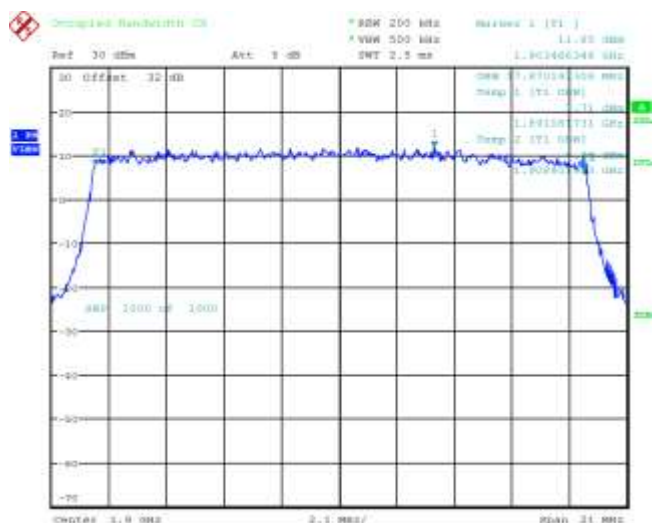


Figure 3-22a: -26 dBc Bandwidth, Band 2 Low Channel, 20MHz BW (RB= 100)

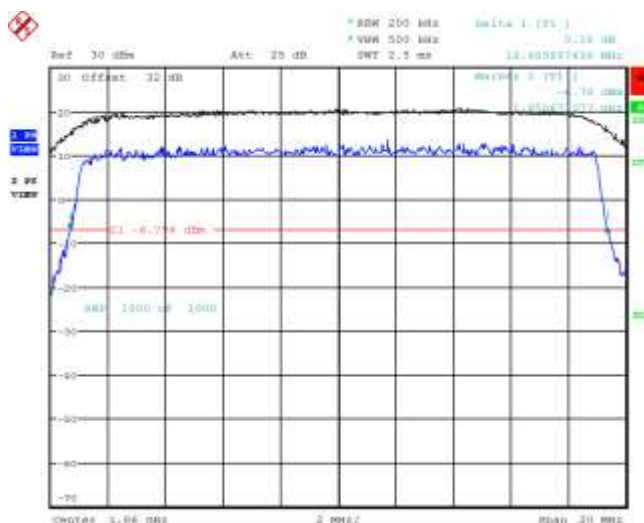


Figure 3-23a: -26 dBc Bandwidth, Band 2 Middle Channel, 20MHz BW (RB= 100)

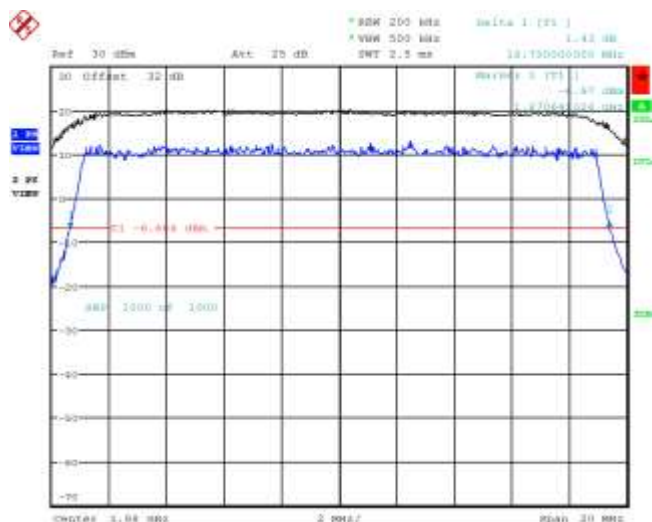
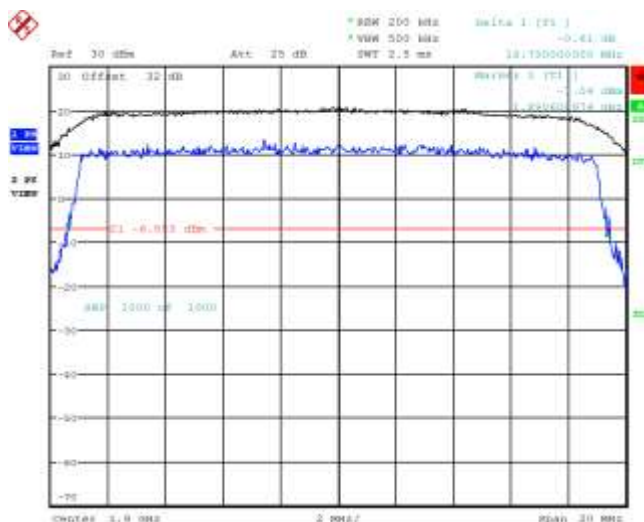


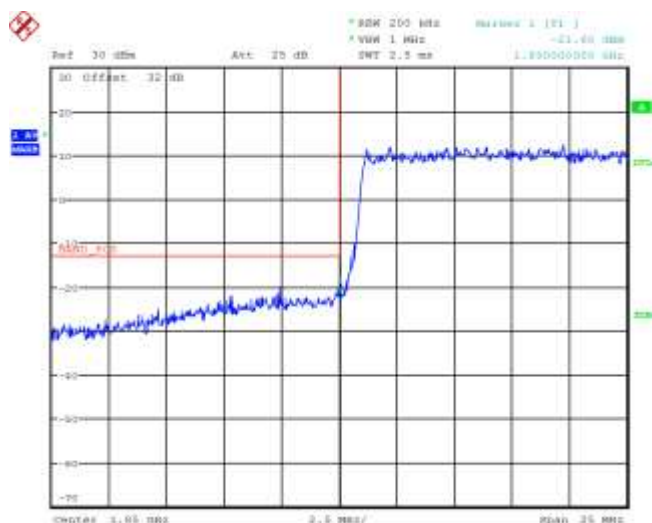
Figure 3-24a: -26 dBc Bandwidth, Band 2 High Channel, 20MHz BW (RB= 100)



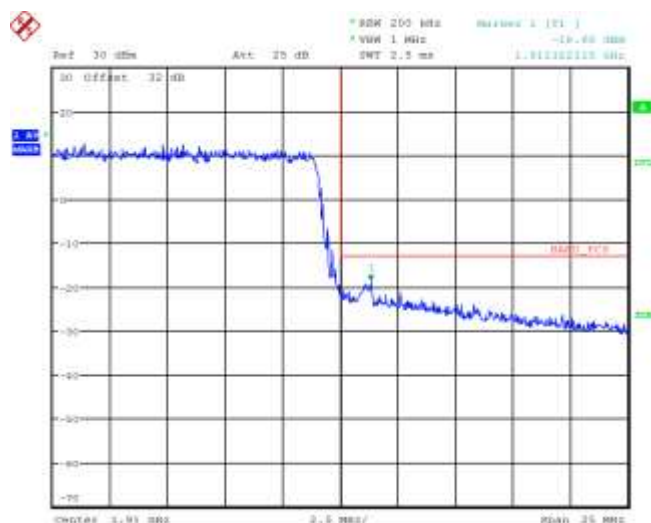
	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3A	
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LTE Band 2 Conducted RF Emission Test Data cont'd

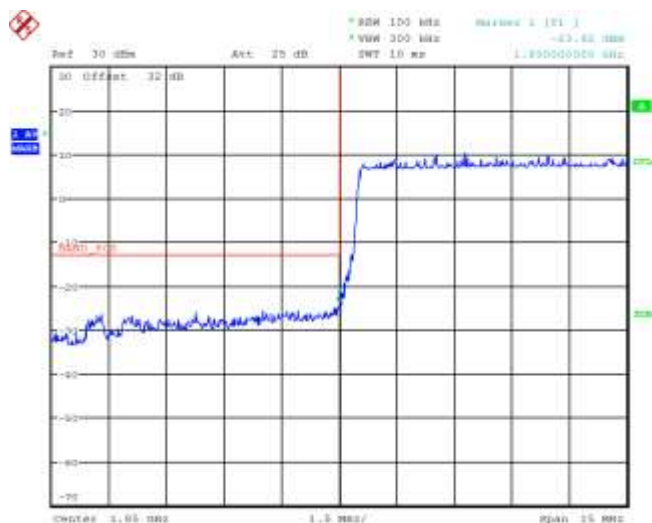
**Figure 3-25a: Band 2 Low Channel Mask, 20MHz
BW, RB = 100**



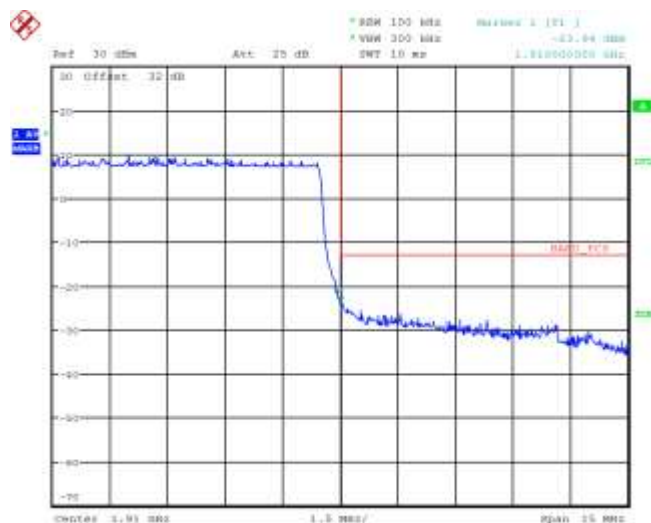
**Figure 3-26a: Band 2 High Channel Mask, 20MHz
BW, RB = 100**



**Figure 3-27a: Band 2 Low Channel Mask, 10MHz
BW, RB = 50**



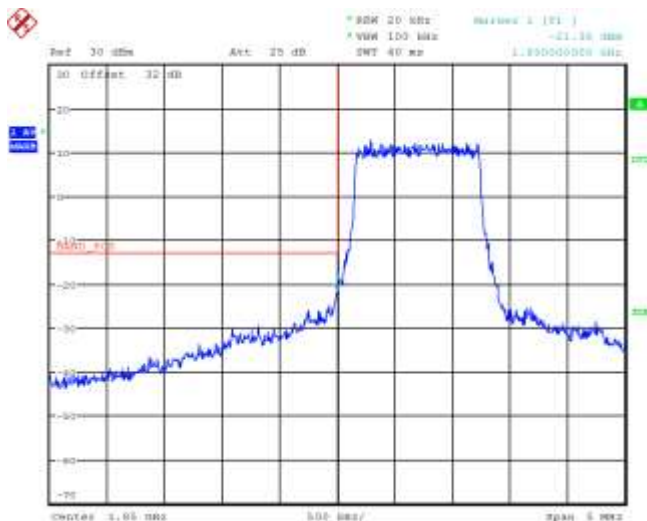
**Figure 3-28a: Band 2 High Channel Mask, 10MHz
BW, RB = 50**



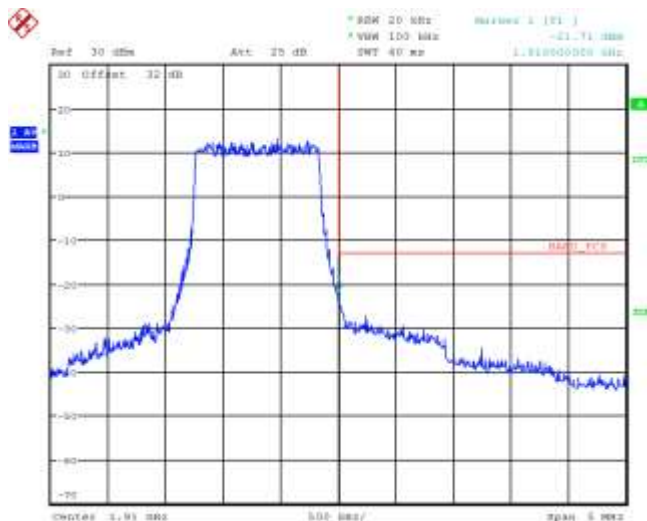
	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3A	
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LTE Band 2 Conducted RF Emission Test Data cont'd

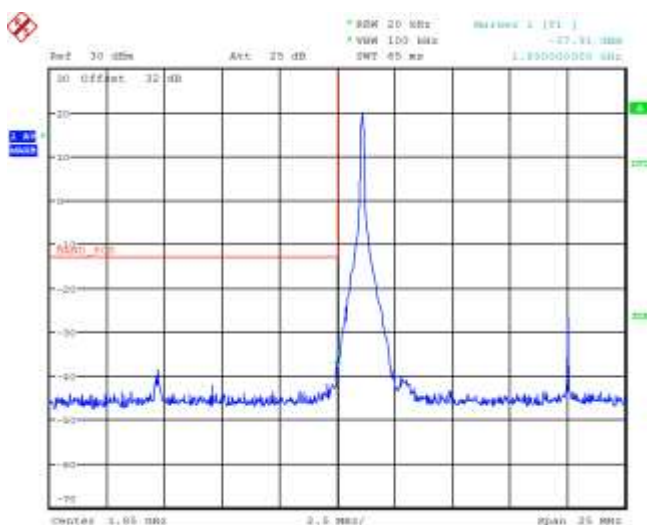
**Figure 3-29a: Band 2 Low Channel Mask, 1.4MHz
BW, RB = 6**



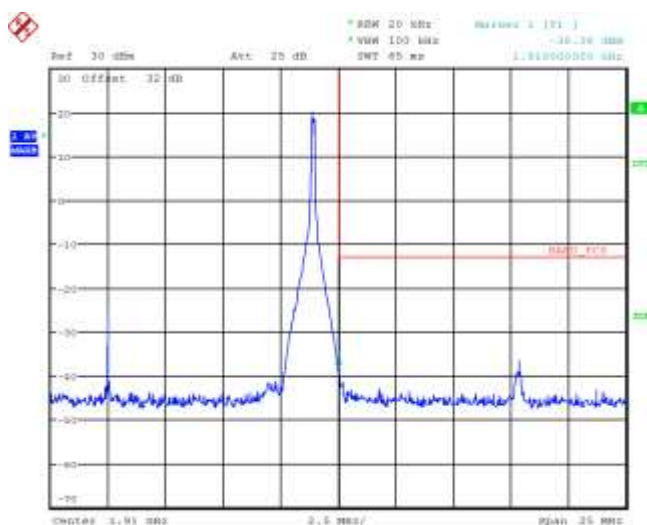
**Figure 3-30a: Band 2 High Channel Mask, 1.4MHz
BW, RB = 6**



**Figure 3-31a: Band 2 Low Channel Mask, 20MHz
BW, RB = 1**



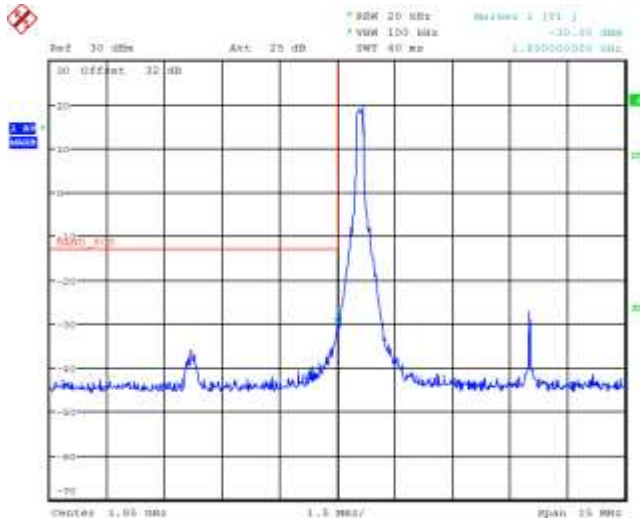
**Figure 3-32a: Band 2 High Channel Mask, 20MHz
BW, RB = 1**



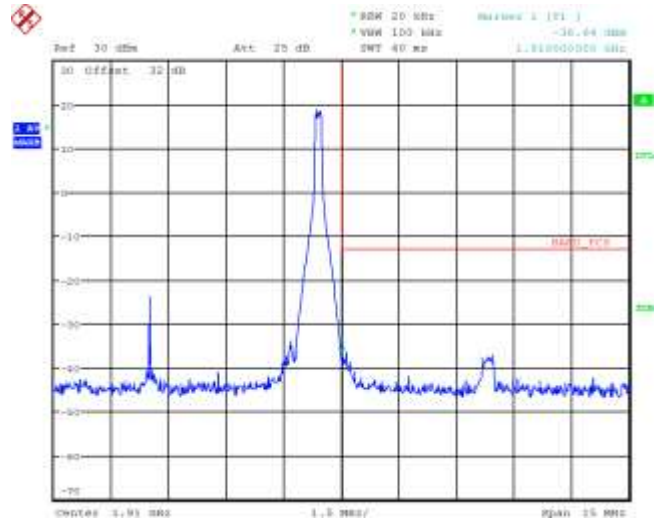
	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3A	
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LTE Band 2 Conducted RF Emission Test Data cont'd

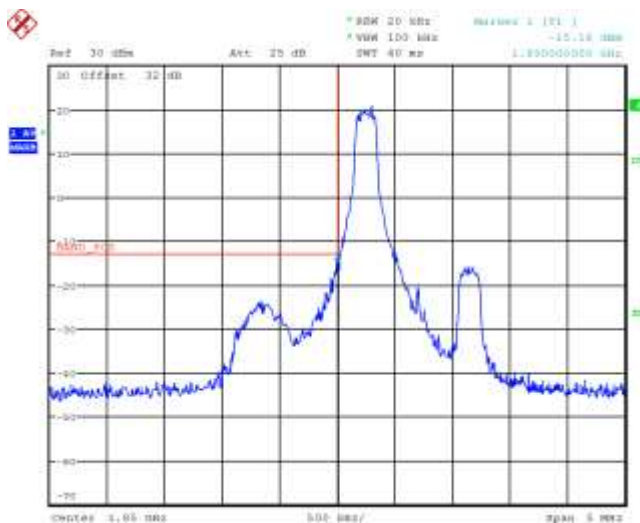
**Figure 3-33a: Band 2 Low Channel Mask, 10MHz
BW, RB = 1**



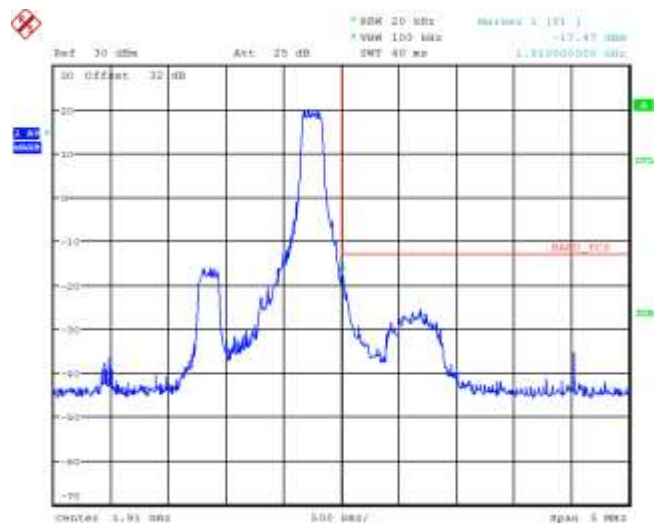
**Figure 3-34a: Band 2 High Channel Mask, 10MHz
BW, RB = 1**



**Figure 3-35a: Band 2 Low Channel Mask, 1.4MHz
BW, RB = 1**



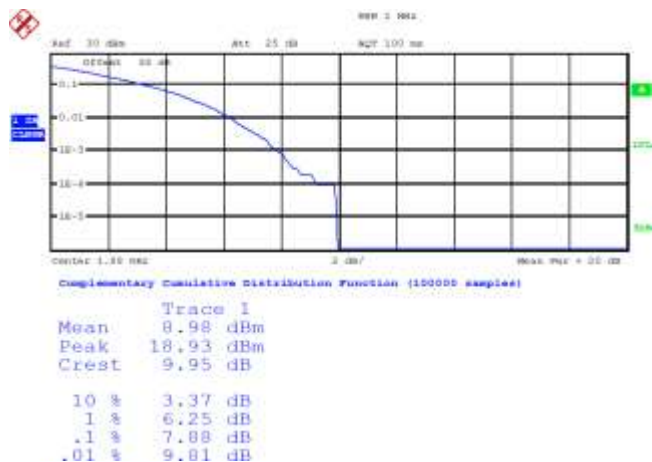
**Figure 3-36a: Band 2 High Channel Mask, 1.4MHz
BW, RB = 1**



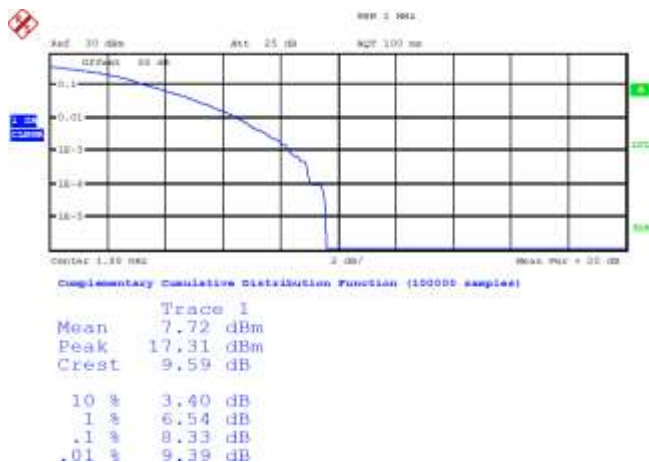
BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3A	
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LTE Band 2 Conducted RF Emission Test Data cont'd

**Figure 3-37a: Band 2, Mid Channel PAR, 20 MHz
BW, RB = 50 QPSK**



**Figure 3-38a: Band 2, Mid Channel PAR, 20 MHz
BW, RB = 100 16-QAM**



**Figure 3-39a: Band 2, Mid Channel PAR, 10 MHz
BW, RB = 25 QPSK**



**Figure 3-40a: Band 2, Mid Channel PAR, 10 MHz
BW, RB = 50 16-QAM**



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LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 3-41a: Band 2, Mid Channel PAR, 1.4 MHz BW, RB = 3 QPSK

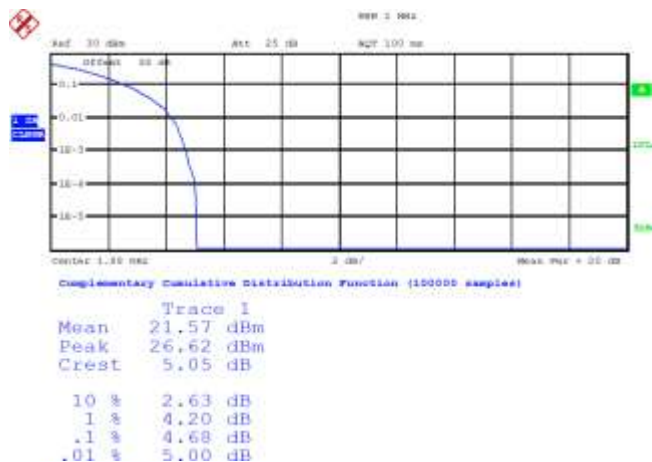
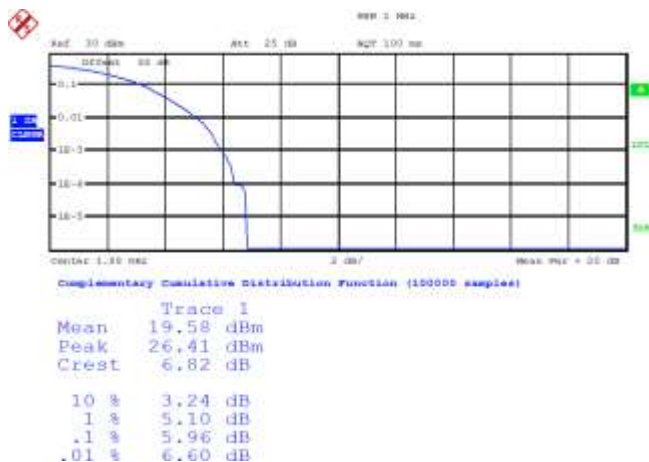


Figure 3-42a: Band 2, Mid Channel PAR, 1.4 MHz BW, RB = 6 16-QAM



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LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 3-43a: Occupied Bandwidth, Band 2 Low Channel, 20MHz BW (RB= 100) 16-QAM

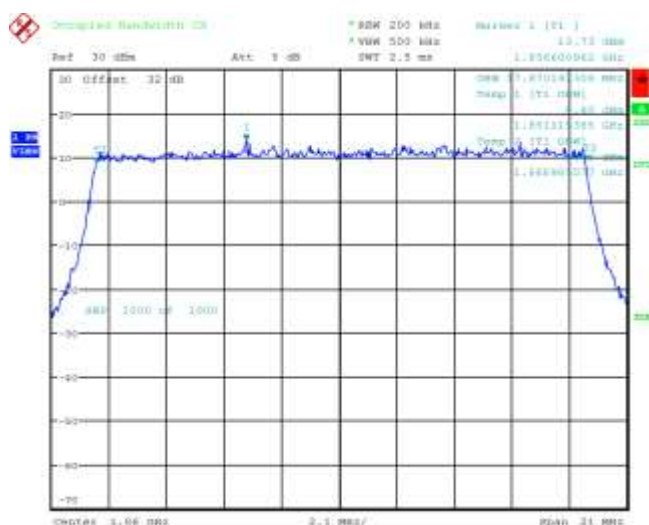


Figure 3-44a: Occupied Bandwidth, Band 2 Mid Channel, 20MHz BW (RB= 100) 16-QAM

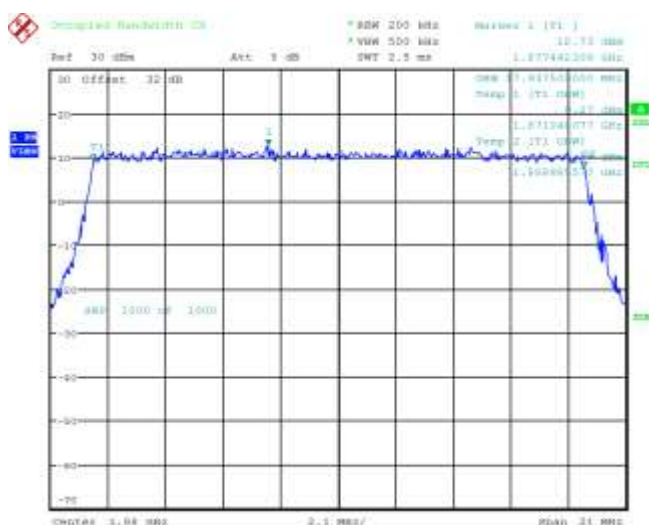
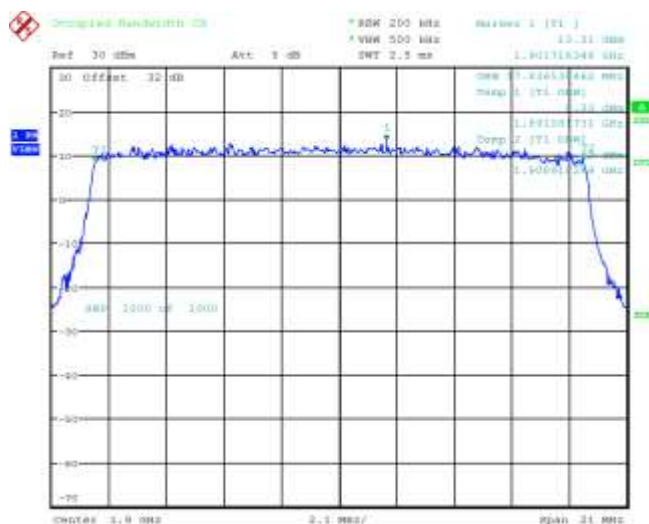


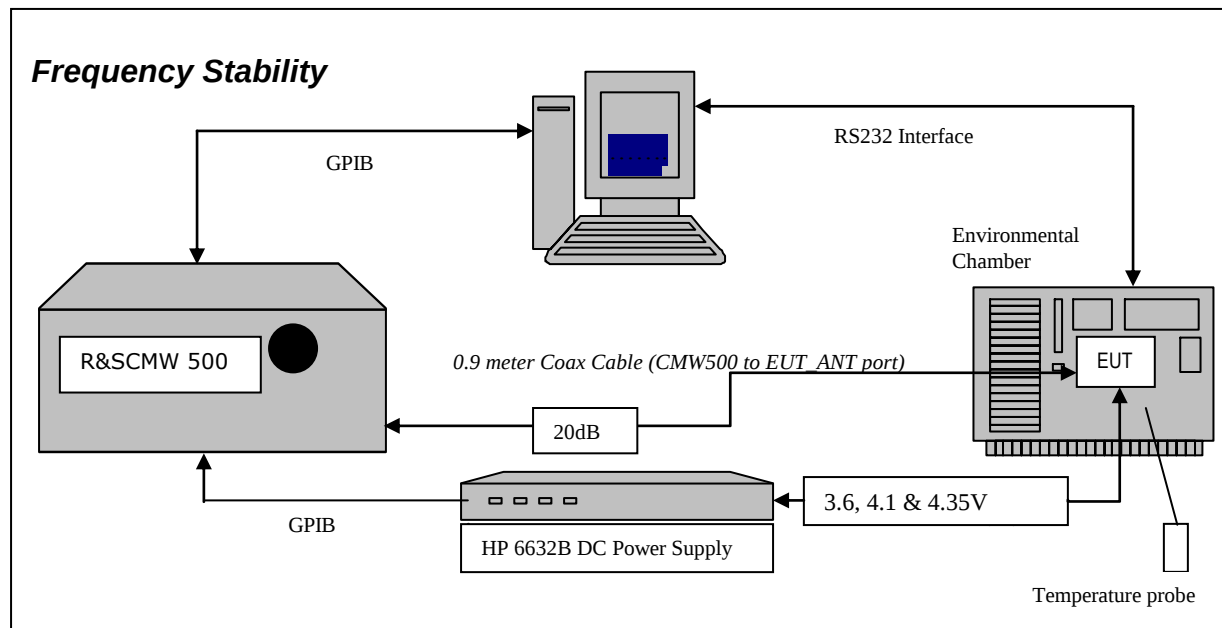
Figure 3-45a: Occupied Bandwidth, Band 2 High Channel, 20MHz BW (RB= 100) 16-QAM



APPENDIX 3B – LTE Band 2 FREQUENCY STABILITY TEST DATA

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Frequency Stability Test Data



The following measurements were performed by Chuan Tran.

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2 Required Measurements

2.1055 Frequency Stability - Procedures

(a,b) Frequency Stability - Temperature Variation

(d) Frequency Stability - Voltage Variation

24.235 *Frequency Stability.*

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

The EUT meets the requirements as stated in CFR 47 chapter 1, Section 24.235, CFR 47 and RSS-133, 6.3 Frequency Stability.

Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-metre coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMW 500 and the EUT antenna port.

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Test Setup:

The EUT was placed in the Temperature chamber and connected to CMW 500 outside as shown in the figure above. Dry air was pumped inside the temperature chamber to maintain a backpressure during the test. The EUT was kept in the off condition at all times except when the following measurements were to be made.

The chamber was switched on and the temperature was set to -30°C. After the chamber stabilized at -30 °C there was a soak period of one hour to alleviate moisture in the chamber, the EUT voltage was enabled. The system software recorded the frequency, power, and associated measurements.

A Computer system controlled the automated software. This application was given the command of activating all machines intrinsic to the temperature and voltage tests controlling the CMW 500 via the GPIB Bus. The Environmental Chamber was instructed through an RS-232 serial line. The EUT dialogue was passed through a serial connection.

The EUT repetitively transmitted 100 bursts for each set of programmed parameters recording temperature, voltage settings, and systematically selected frequencies. The power supply was cycled from minimum voltage 3.6 volts, to 4.1 volts and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 4.1 volts and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 1860.0, 1880.0 and 1900.0 MHz each was measured under bandwidth of 20 MHz with maximum (100) RBs. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million.

After the initial one-hour soak at the beginning of the tests, a period of thirty minutes soak was initialized between each ascending temperature step, before proceeding to the next measurement test cycle.

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Procedure:

The test system software for commencing the Frequency Stability Tests carried through the following cycle.

1. Switch on the HP 6632B power supply; CMW 500 Communications test Set, and Environmental Chamber.
2. Start test program
3. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
4. Set power supply voltage to 3.6 volts.
5. Set up CMW 500 Radio Communication Tester.
6. Command the CMW 500 to switch to the low channel.
7. Enable the voltage to the EUT, and connect a link to the CMW 500 test set.
8. EUT is commanded to Transmit 100 Bursts.
9. Software logs the following data from the CMW 500, power supply and temperature chamber: Traffic Channel Number, Traffic Channel Frequency, Power Level, Chamber Temperature, Supply Voltage, Power and Frequency Error.
10. The CMW 500 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
11. Repeat steps 5 to 10 changing the supply voltage to 4.1 Volts
12. Increase temperature by 10°C and soak for 1/2 hour.
13. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
14. Repeat steps 5 to 10 changing the supply voltage to 4.35 volts

Procedure 5 to 10 was repeated at room temperature (20°C) with the power supply voltage set to 3.6, 4.1 and 4.35 volts

The maximum frequency error in the LTE band 2 measured was **0.0093 PPM.**

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Date of test: June 27, 2014

LTE band 2 results: channels 18600, 18900, & 19199 @ 20°C maximum transmitted power

Traffic Channel Number	LTE Band 2 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	3.6	20	8.25	0.0044
18900	1880.0	3.6	20	11.53	0.0061
19199	1900.0	3.6	20	9.33	0.0049

Traffic Channel Number	LTE Band 2 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	4.1	20	-7.52	-0.0040
18900	1880.0	4.1	20	10.30	0.0055
19199	1900.0	4.1	20	9.51	0.0050

Traffic Channel Number	LTE Band 2 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	4.35	20	-8.70	-0.0047
18900	1880.0	4.35	20	11.03	0.0059
19199	1900.0	4.35	20	-5.88	-0.0031

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LTE band 2 Results: channel 18600 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	3.6	-30	-9.48	-0.0051
18600	1860.0	3.6	-20	-8.45	-0.0045
18600	1860.0	3.6	-10	-8.17	-0.0044
18600	1860.0	3.6	0	-5.83	-0.0031
18600	1860.0	3.6	10	-8.83	-0.0047
18600	1860.0	3.6	20	8.25	0.0044
18600	1860.0	3.6	30	-9.06	-0.0049
18600	1860.0	3.6	40	-11.96	-0.0064
18600	1860.0	3.6	50	-11.12	-0.0060
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	4.1	-30	-8.41	-0.0045
18600	1860.0	4.1	-20	-9.36	-0.0050
18600	1860.0	4.1	-10	-6.48	-0.0035
18600	1860.0	4.1	0	-6.24	-0.0034
18600	1860.0	4.1	10	8.61	0.0046
18600	1860.0	4.1	20	-7.52	-0.0040
18600	1860.0	4.1	30	-6.64	-0.0036
18600	1860.0	4.1	40	-6.19	-0.0033
18600	1860.0	4.1	50	-8.60	-0.0046
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	4.35	-30	-7.40	-0.0040
18600	1860.0	4.35	-20	9.87	0.0053
18600	1860.0	4.35	-10	-8.18	-0.0044
18600	1860.0	4.35	0	-7.60	-0.0041
18600	1860.0	4.35	10	-7.27	-0.0039
18600	1860.0	4.35	20	-8.70	-0.0047
18600	1860.0	4.35	30	-7.62	-0.0041
18600	1860.0	4.35	40	-9.21	-0.0050
18600	1860.0	4.35	50	-8.98	-0.0048

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LTE band 2 Results: channel 18900 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18900	1880.00	3.6	-30	6.08	0.0032
18900	1880.00	3.6	-20	8.74	0.0046
18900	1880.00	3.6	-10	13.13	0.0070
18900	1880.00	3.6	0	8.91	0.0047
18900	1880.00	3.6	10	9.41	0.0050
18900	1880.00	3.6	20	11.53	0.0061
18900	1880.00	3.6	30	5.22	0.0028
18900	1880.00	3.6	40	7.88	0.0042
18900	1880.00	3.6	50	4.19	0.0022
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18900	1880.00	4.1	-30	8.20	0.0044
18900	1880.00	4.1	-20	12.42	0.0066
18900	1880.00	4.1	-10	8.25	0.0044
18900	1880.00	4.1	0	7.93	0.0042
18900	1880.00	4.1	10	8.23	0.0044
18900	1880.00	4.1	20	10.30	0.0055
18900	1880.00	4.1	30	-7.87	-0.0042
18900	1880.00	4.1	40	-6.62	-0.0035
18900	1880.00	4.1	50	10.27	0.0055
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18900	1880.00	4.35	-30	-6.49	-0.0035
18900	1880.00	4.35	-20	9.03	0.0048
18900	1880.00	4.35	-10	7.42	0.0039
18900	1880.00	4.35	0	5.18	0.0028
18900	1880.00	4.35	10	11.12	0.0059
18900	1880.00	4.35	20	11.03	0.0059
18900	1880.00	4.35	30	9.94	0.0053
18900	1880.00	4.35	40	6.12	0.0033
18900	1880.00	4.35	50	8.45	0.0045

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE band 2 Results: channel 19199 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
19199	1900.0	3.6	-30	9.84	0.0052
19199	1900.0	3.6	-20	8.37	0.0044
19199	1900.0	3.6	-10	6.90	0.0036
19199	1900.0	3.6	0	-5.81	-0.0031
19199	1900.0	3.6	10	6.71	0.0035
19199	1900.0	3.6	20	9.33	0.0049
19199	1900.0	3.6	30	5.72	0.0030
19199	1900.0	3.6	40	-8.47	-0.0045
19199	1900.0	3.6	50	-7.42	-0.0039
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
19199	1900.0	4.1	-30	-6.34	-0.0033
19199	1900.0	4.1	-20	10.04	0.0053
19199	1900.0	4.1	-10	8.94	0.0047
19199	1900.0	4.1	0	7.68	0.0040
19199	1900.0	4.1	10	10.11	0.0053
19199	1900.0	4.1	20	9.51	0.0050
19199	1900.0	4.1	30	10.34	0.0054
19199	1900.0	4.1	40	5.02	0.0026
19199	1900.0	4.1	50	-6.22	-0.0033
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
19199	1900.0	4.35	-30	-6.75	-0.0036
19199	1900.0	4.35	-20	6.87	0.0036
19199	1900.0	4.35	-10	8.04	0.0042
19199	1900.0	4.35	0	5.46	0.0029
19199	1900.0	4.35	10	6.59	0.0035
19199	1900.0	4.35	20	-5.88	-0.0031
19199	1900.0	4.35	30	-6.64	-0.0035
19199	1900.0	4.35	40	7.27	0.0038
19199	1900.0	4.35	50	-5.62	-0.0030

APPENDIX 3C – LTE Band 2 RADIATED EMISSIONS TEST DATA

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 3C	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Radiated Power Test Data Results

The following measurements were performed by Rex Zhang.

Date of Test: May 7, 2014

The environmental tests conditions were: Temperature: 25.8 °C
Relative Humidity: 37.1 %

The BlackBerry® smartphone was standalone, USB Down and LCD facing the RX antenna when the turntable is at 0 degree position.

Measurements were performed with QPSK and 16QAM modulations. The smallest test margins are reported below.

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

LTE band 2, 5MHz BW, RB=1, QPSK modulation

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
		Frequency				Reading	Max (V,H)	Pol.	Reading	Corrected Reading		Limit	Diff to Limit
Type	Ch	(MHz)	Band	Type	Pol.	(dBuV)	(dBuV)	Tx-Rx	(dBm)	(dBm)	(W)		
F0	18625	1852.50	2	Horn	V	-25.86	-25.86	V-V	-14.11	26.37	0.43	33.00	6.63
F0	18625	1852.50	2	Horn	H	-33.13		H-H	-13.18				
F0	18900	1880.00	2	Horn	V	-25.69	-25.69	V-V	-13.31	26.66	0.46	33.00	6.34
F0	18900	1880.00	2	Horn	H	-33.08		H-H	-12.63				
F0	19174	1907.40	2	Horn	V	-24.52	-24.52	V-V	-12.18	27.86	0.61	33.00	5.14
F0	19174	1907.40	2	Horn	H	-32.44		H-H	-11.73				

LTE band 2, 5MHz BW, RB=1, 16-QAM modulation

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
		Frequency				Reading	Max (V,H)	Pol.	Reading	Corrected Reading		Limit	Diff to Limit
Type	Ch	(MHz)	Band	Type	Pol.	(dBuV)	(dBuV)	Tx-Rx	(dBm)	(dBm)	(W)	(dBm)	(dB)
F0	18625	1852.50	2	Horn	V	-26.78	-26.78	V-V	-14.91	25.53	0.36	33.00	7.47
F0	18625	1852.50	2	Horn	H	-34.51		H-H	-14.02				
F0	18900	1880.00	2	Horn	V	-26.81	-26.81	V-V	-14.43	25.59	0.36	33.00	7.41
F0	18900	1880.00	2	Horn	H	-34.06		H-H	-13.70				
F0	19174	1907.40	2	Horn	V	-25.82	-25.82	V-V	-13.52	26.82	0.48	33.00	6.18
F0	19174	1907.40	2	Horn	H	-33.99		H-H	-12.77				

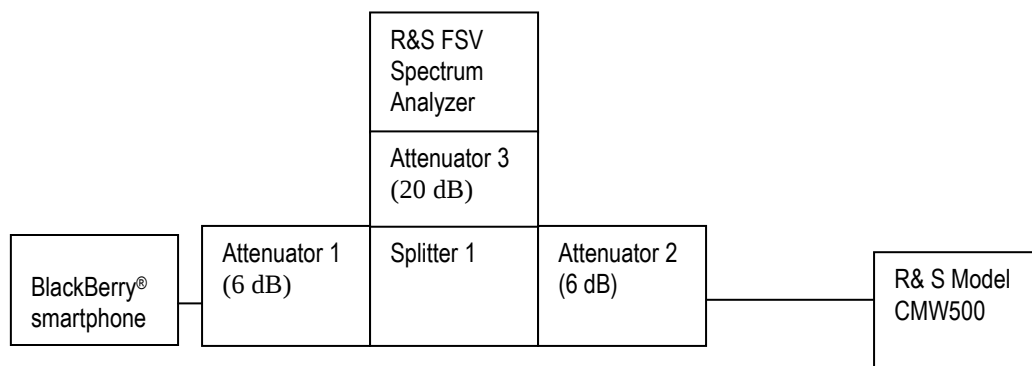
APPENDIX 4A– LTE Band 5 CONDUCTED RF EMISSIONS TEST DATA/PLOTS

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 5 Conducted RF Emission Test Data

This appendix contains measurement data pertaining to conducted spurious emissions, 99% power bandwidth and the channel mask.

Test Setup Diagram



A reference offset of 31.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SERIAL NUMBER</u>
Attenuator 1	Mini-Circuits	BW-S6W2+	0647
Attenuator 2	Mini-Circuits	BW-S6W2+	0648
Attenuator 3	Mini-Circuits	BW-S20-2W263+	1234
Splitter 1	Weinschel	1515	MES 92

Date of Test: June 26-27, 2014

The environmental test conditions were: Temperature: 22.5 °C
 Relative Humidity: 19.2 %

The following measurements were performed by Chuan Tran.

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LTE Band 5 Conducted RF Emission Test Data cont'd

Emission Designator Table

Frequency Range (MHz)	Conducted Output Power (dBm)	Emission Designator	Band	Bandwidth (MHz)	Modulation
824.7-848.2	23.00	1M08G7D	LTE B5	1.4	QPSK
824.7-848.2	21.92	1M08D7W	LTE B5	1.4	16QAM
825.5-847.5	23.88	2M69G7D	LTE B5	3	QPSK
825.5-847.5	22.59	2M68D7W	LTE B5	3	16QAM
826.5-846.4	23.14	4M47G7D	LTE B5	5	QPSK
826.5-846.4	22.47	4M47D7W	LTE B5	5	16QAM
829-844	23.10	8M93G7D	LTE B5	10	QPSK
829-844	22.74	8M92D7W	LTE B5	10	16QAM

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 22.917 and RSS-132, 4.5 were measured from 30 MHz to 20 GHz.

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each 1.4MHz, 3MHz, 5MHz, 10MHz with different number of RBs as per scalable bandwidths for LTE band 5, the modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth.

QPSK and 16-QAM modulations were applied to each of the bandwidths. Only the worst case measurements are documented in this report.

A minimum RB condition was also measured (RB = 1).

The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.

The worst case –26dBc bandwidth for LTE band 5 was measured to be 9.34 MHz. Results were derived in a 100 kHz resolution bandwidth.

On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
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Test Data for LTE Band 5 selected Frequencies in 10MHz BW (RB = 50)

LTE Band 5 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	QPSK	16-QAM
829.0	9.32	8.96	8.96
836.5	9.34	8.96	8.96
843.9	9.31	8.96	8.97

Measurement Plots for LTE Band 5

See Figures 4-1a to 4-18a for the plots of the conducted spurious emissions.

See Figures 4-19a to 4-36a and 4-45a to 4-47a for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.

See Figures 4-37a to 4-44a for the plots of the Channel mask.

BlackBerry.	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 4-1a: Band 5, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)

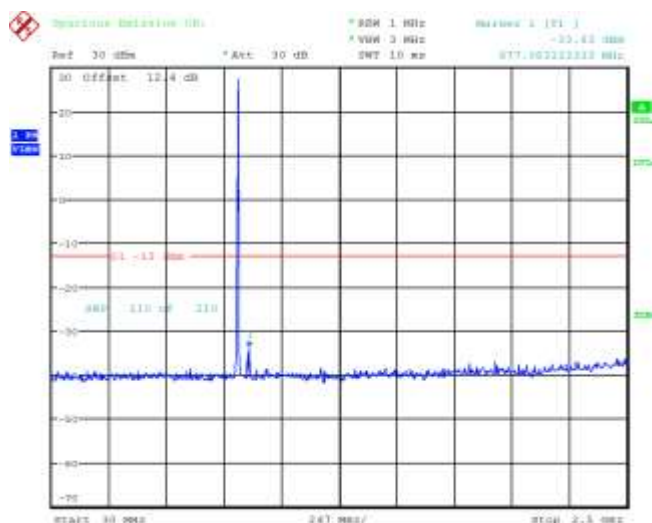


Figure 4-2a: Band 5, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)

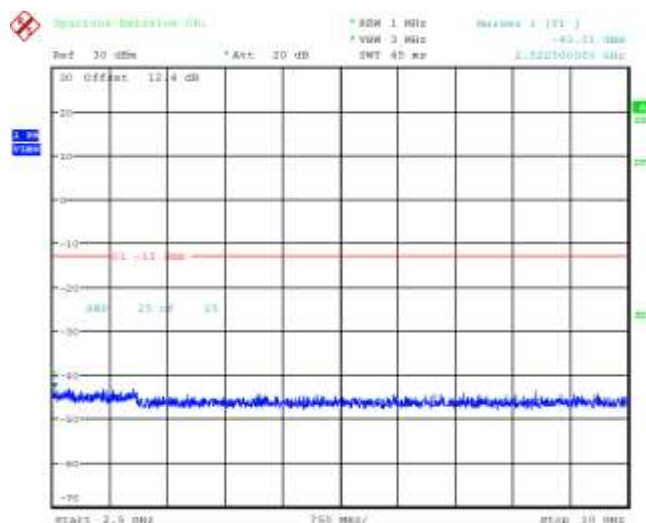


Figure 4-3a: Band 5, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 25)

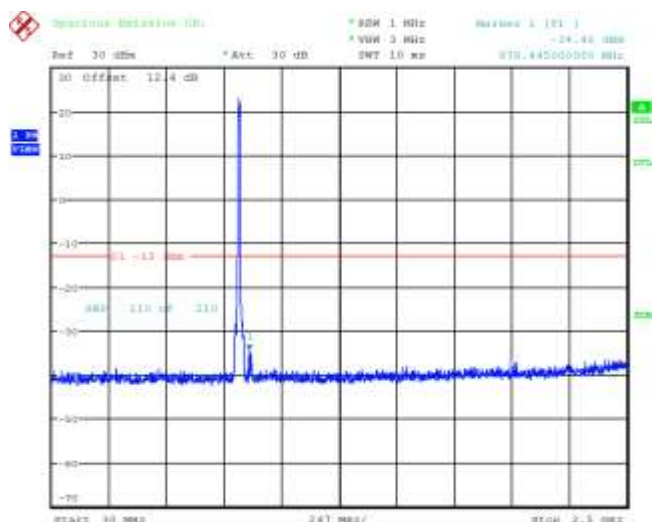
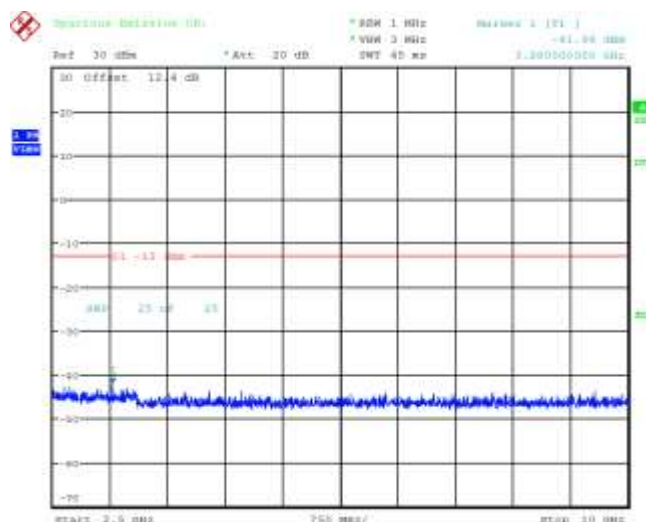


Figure 4-4a: Band 5, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 25)



BlackBerry.	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
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LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 4-5a: Band 5, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)

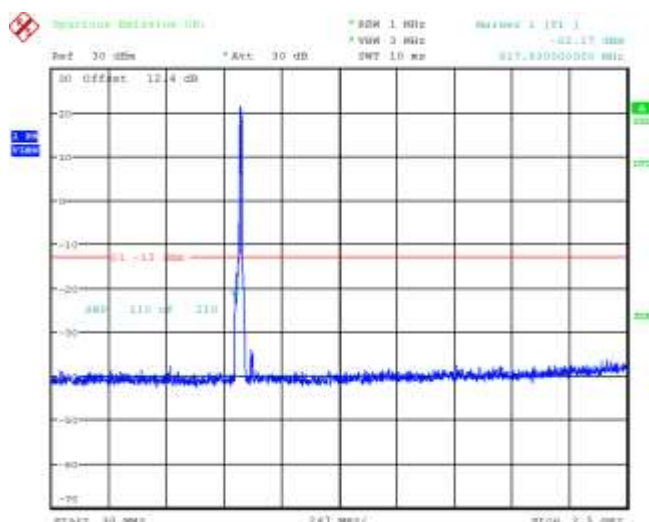


Figure 4-6a: Band 5, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)

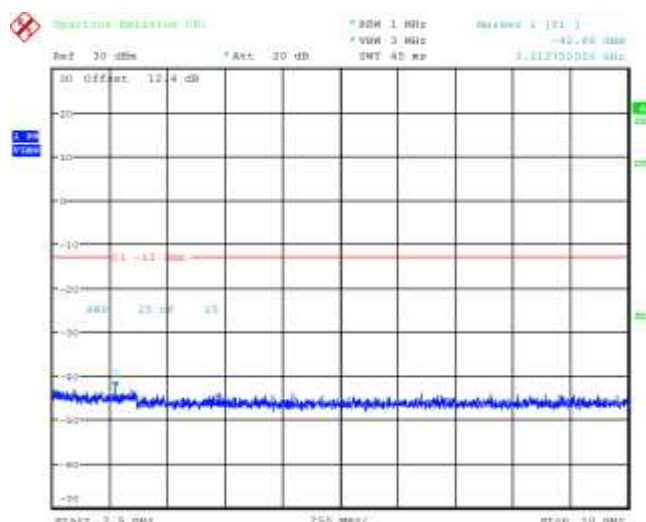


Figure 4-7a: Band 5, Spurious Conducted Emissions, Low channel, 5MHz BW (RB= 1)

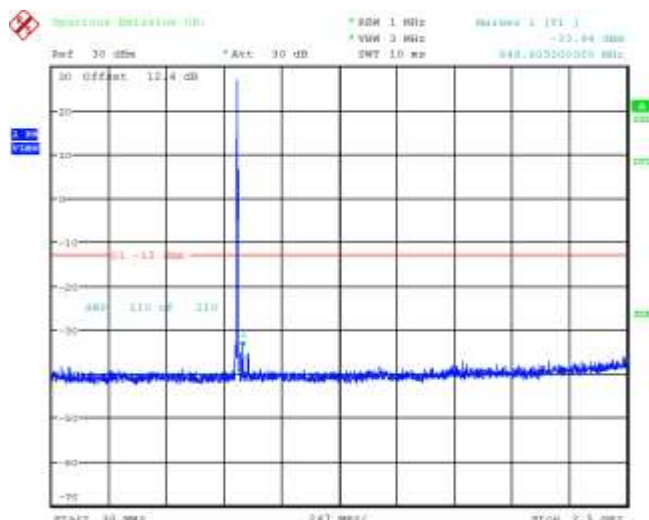
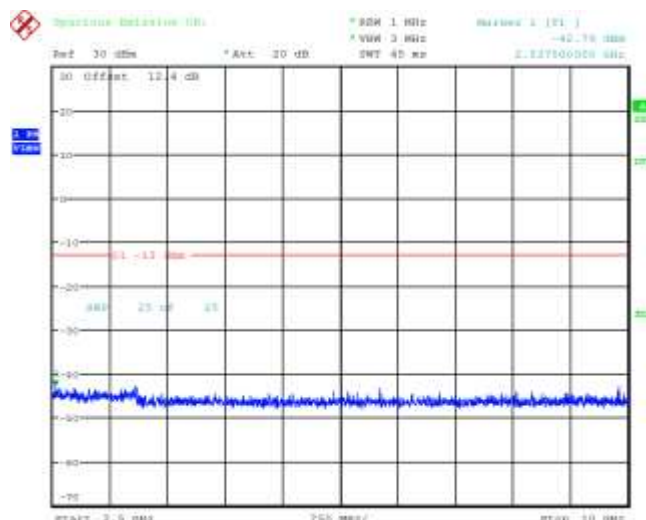


Figure 4-8a: Band 5, Spurious Conducted Emissions, Low channel, 5MHz BW (RB= 1)



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Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 4-9a: Band 5, Spurious Conducted Emissions, Middle Channel, 5MHz BW (RB= 15)

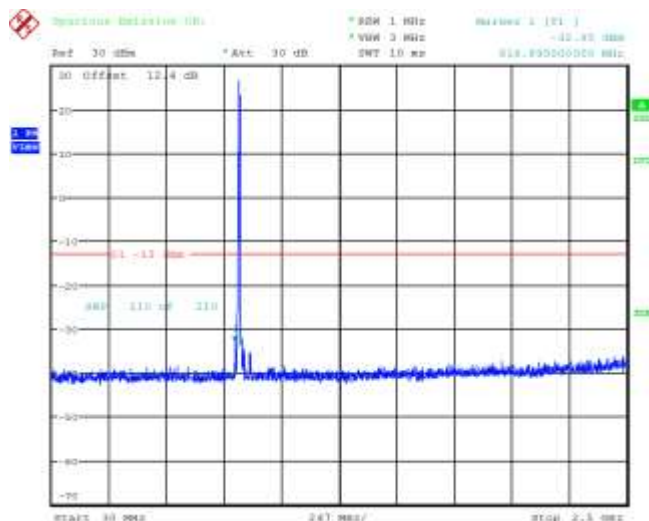


Figure 4-10a: Band 5, Spurious Conducted Emissions, Middle Channel, 5MHz BW (RB= 15)

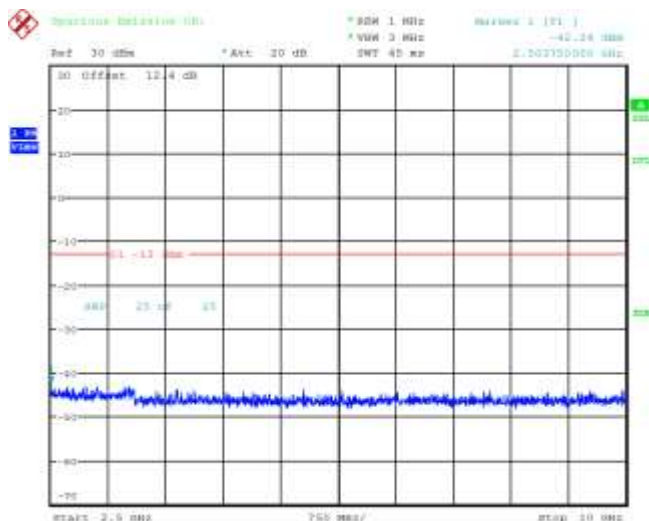


Figure 4-11a: Band 5, Spurious Conducted Emissions, High channel, 5MHz BW (RB= 25)

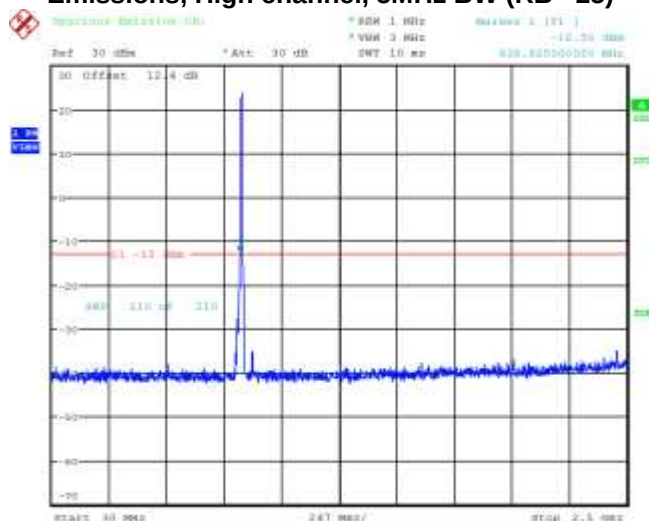
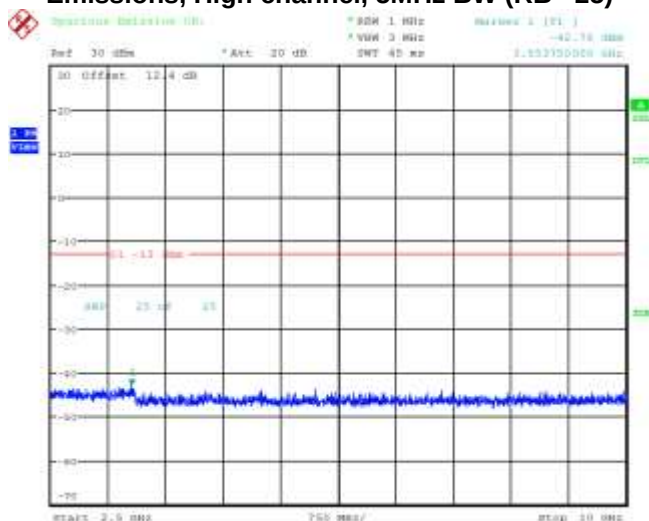


Figure 4-12a: Band 5, Spurious Conducted Emissions, High channel, 5MHz BW (RB= 25)



BlackBerry.	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
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LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 4-13a: Band 5, Spurious Conducted Emissions, Low Channel, 1.4MHz BW (RB= 1)

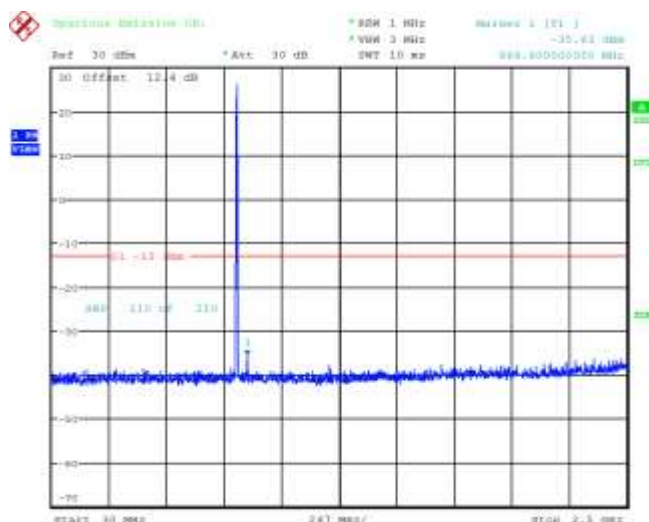


Figure 4-14a: Band 5, Spurious Conducted Emissions, Low Channel, 1.4MHz BW (RB= 1)

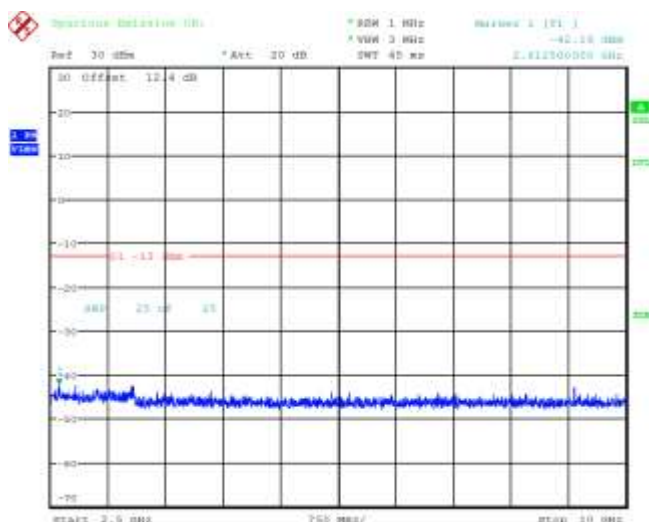


Figure 4-15a: Band 5, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 3)

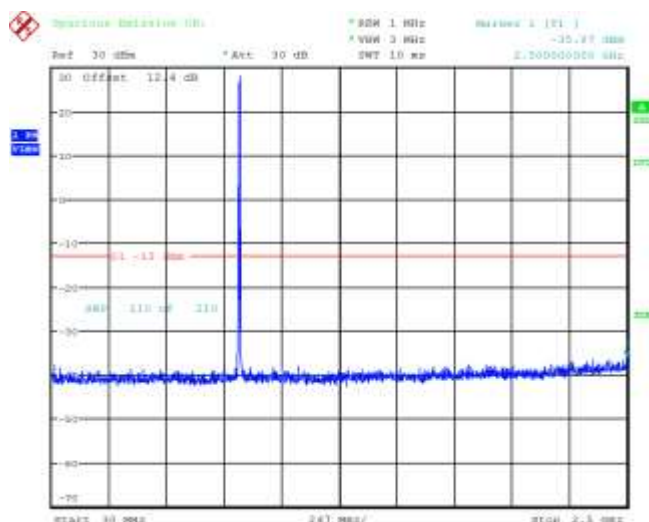
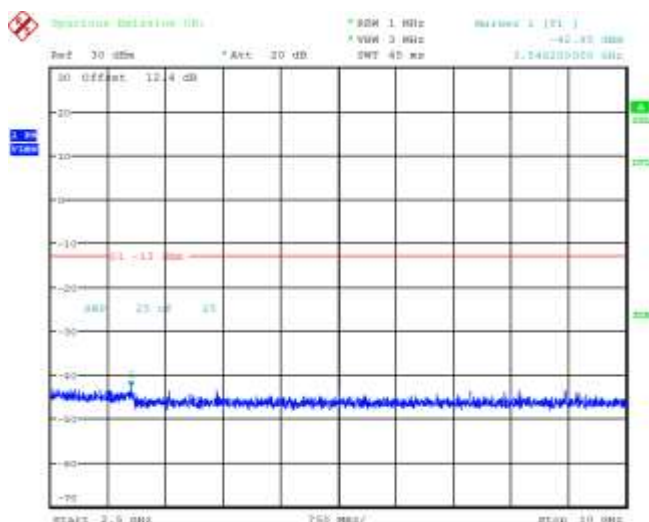


Figure 4-16a: Band 5, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 3)



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LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 4-17a: Band 5, Spurious Conducted Emissions, High channel, 1.4MHz BW (RB= 6)

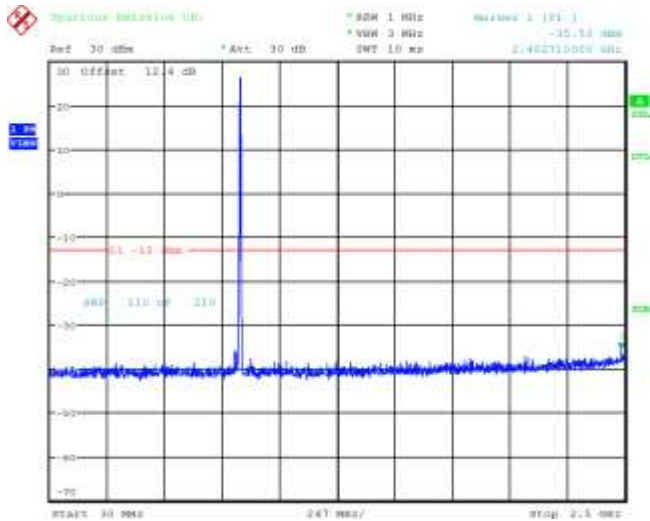
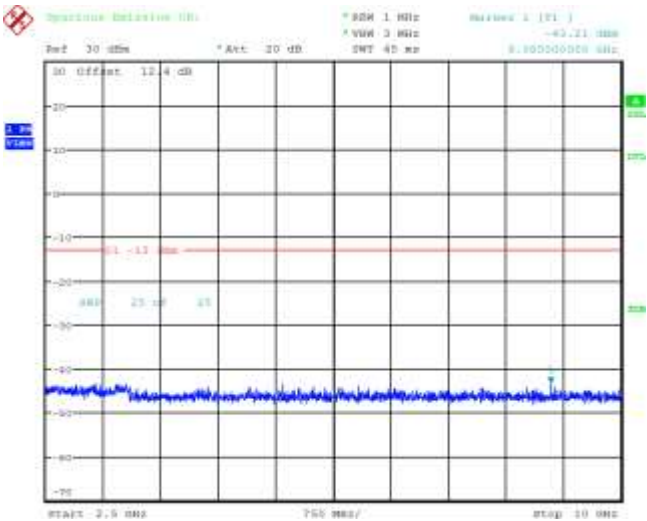


Figure 4-18a: Band 5, Spurious Conducted Emissions, High channel, 1.4MHz BW (RB= 6)



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
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LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 4-19a: Occupied Bandwidth, Band 5 Low Channel, 10MHz BW, RB=50

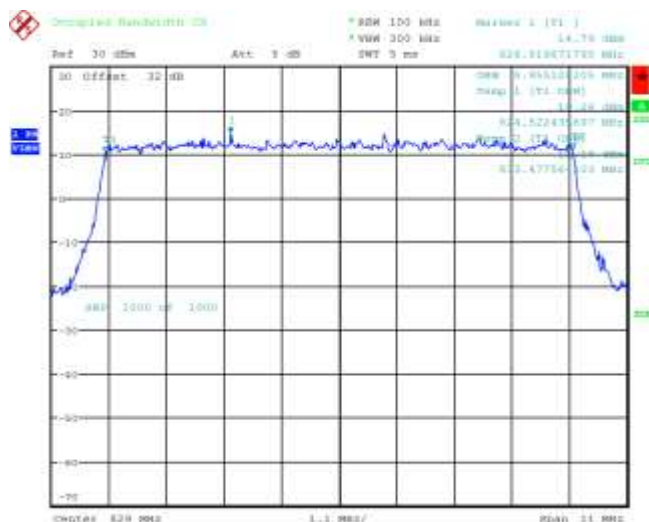
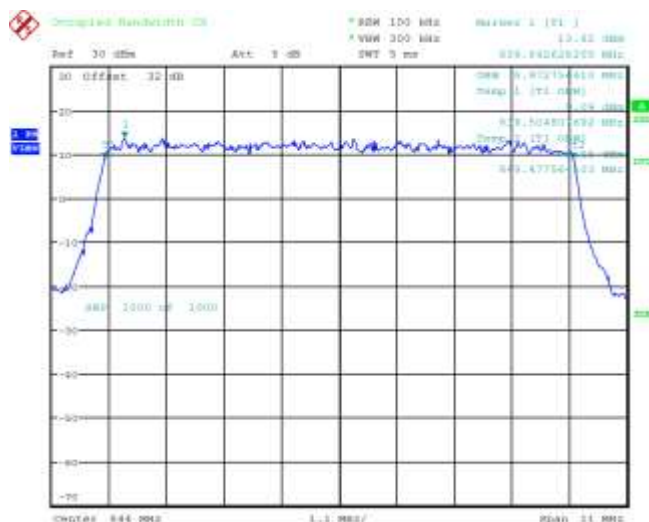


Figure 4-20a: Occupied Bandwidth, Band 5 Middle Channel, 10MHz BW, RB=50



Figure 4-21a: Occupied Bandwidth, Band 5 High Channel, 10MHz BW, RB=50



BlackBerry.	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
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LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 4-22a: Occupied Bandwidth, Band 5 Low Channel, 5MHz BW, RB=25

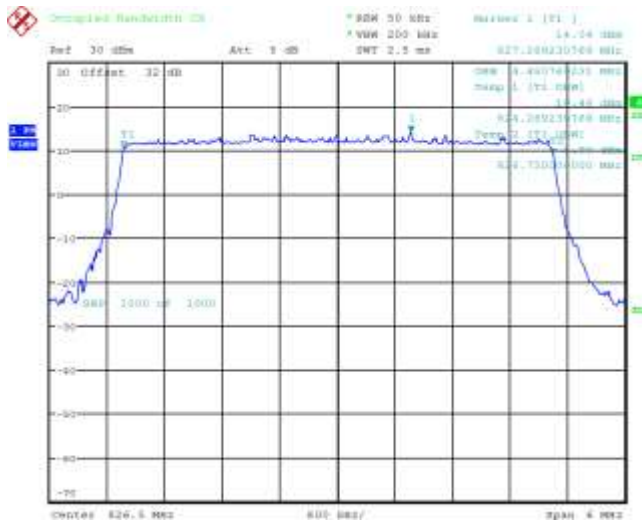


Figure 4-23a: Occupied Bandwidth, Band 5 Middle Channel, 5MHz BW, RB=25

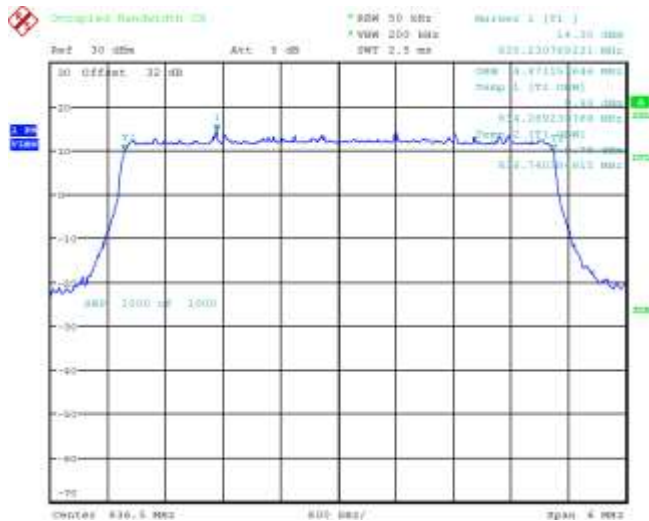
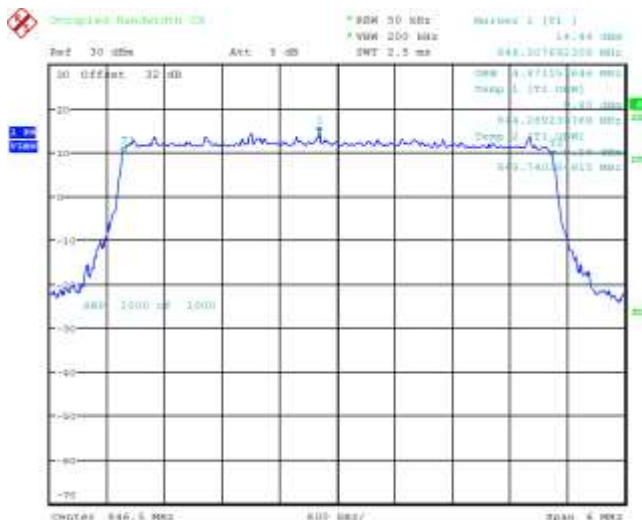


Figure 4-24a: Occupied Bandwidth, Band 5 High Channel, 5MHz BW, RB=25



	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 4-28a: -26 dBc Bandwidth, Band 5 Low Channel, 10MHz BW, RB=50

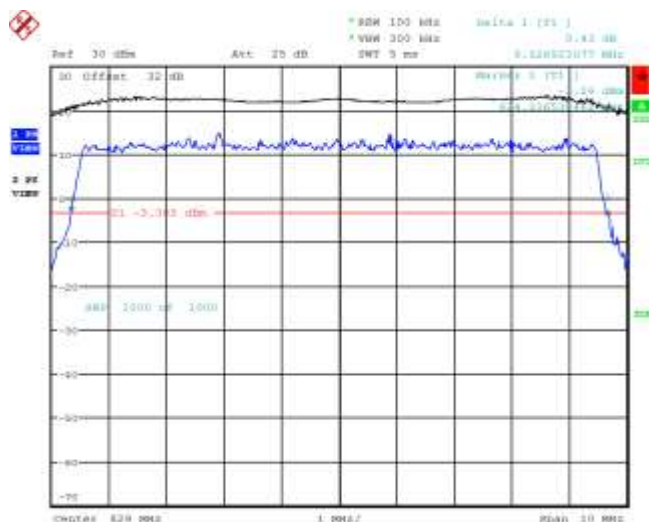


Figure 4-29a: -26 dBc Bandwidth, Band 5 Middle Channel, 10MHz BW, RB=50

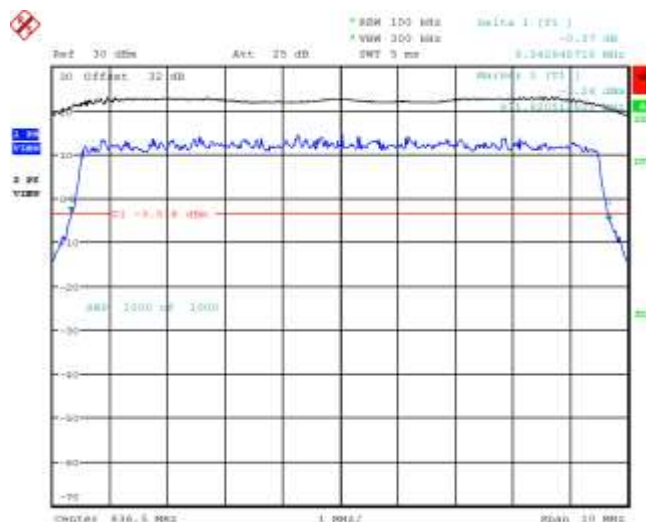


Figure 4-30a: -26 dBc Bandwidth, Band 5 High Channel, 10MHz BW, RB=50

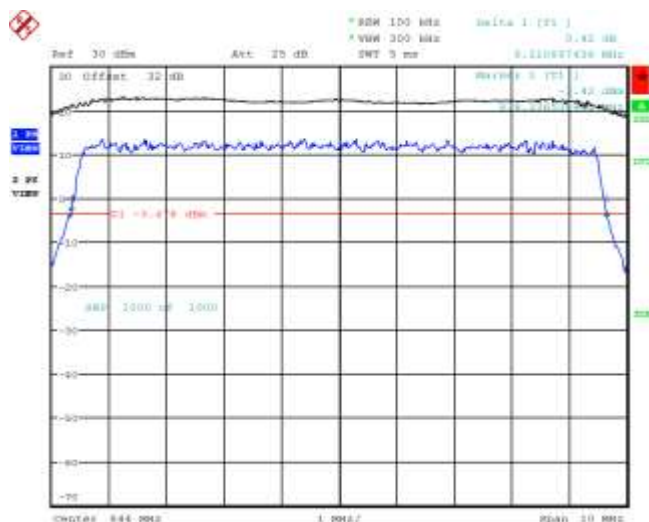
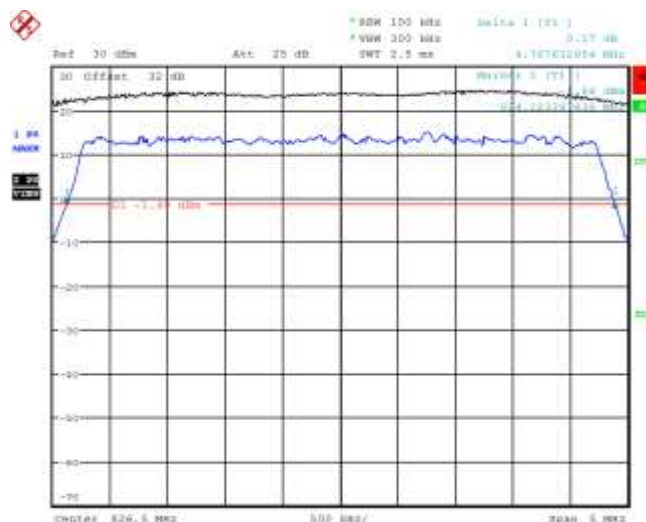


Figure 4-31a: -26 dBc Bandwidth, Band 5 Low Channel, 5MHz BW, RB=25



	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 4-32a: -26 dBc Bandwidth, Band 5 Middle Channel, 5MHz BW, RB=25

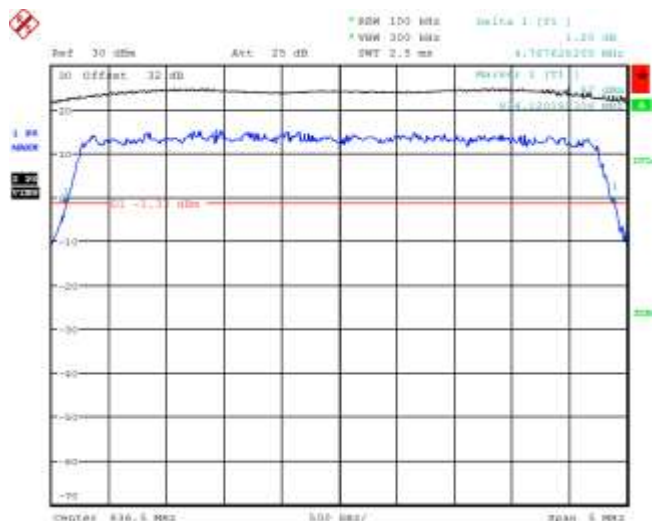


Figure 4-33a: -26 dBc Bandwidth, Band 5 High Channel, 5MHz BW, RB=25

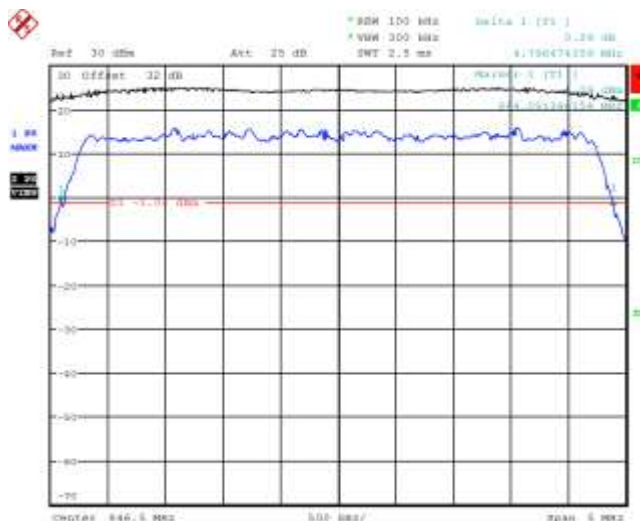


Figure 4-34a: -26 dBc Bandwidth, Band 5 Low Channel, 1.4MHz BW, RB=6

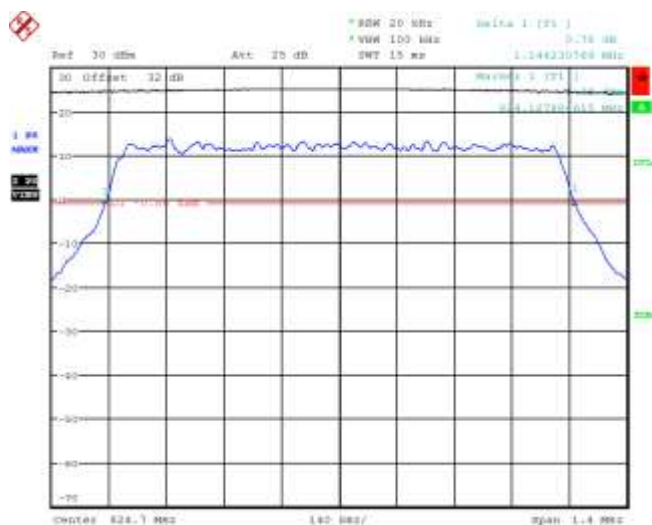
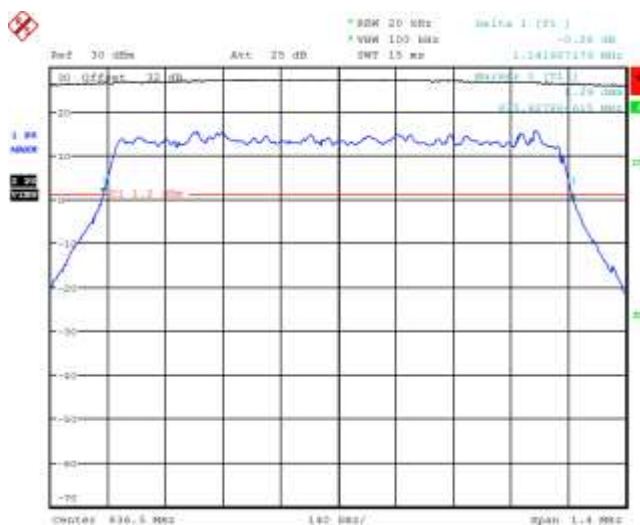


Figure 4-35a: -26 dBc Bandwidth, Band 5 Middle Channel, 1.4MHz BW, RB=6



	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 4-36a: -26 dBc Bandwidth, Band 5 High Channel, 1.4MHz BW, RB=6

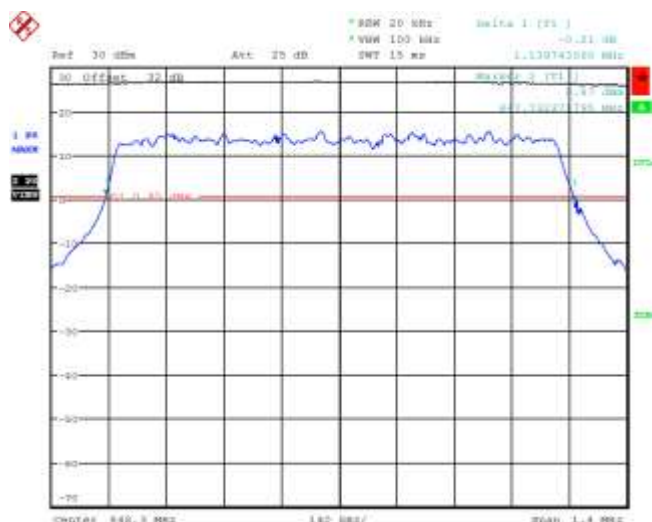


Figure 4-37a: Band 5 Low Channel Mask, 10MHz BW, RB=50

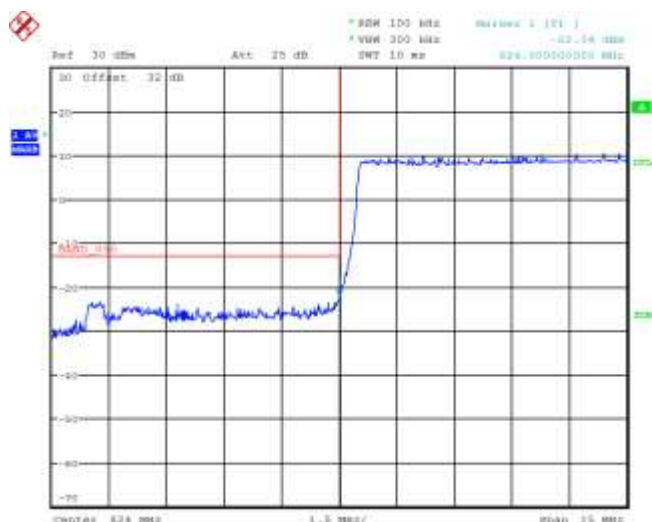
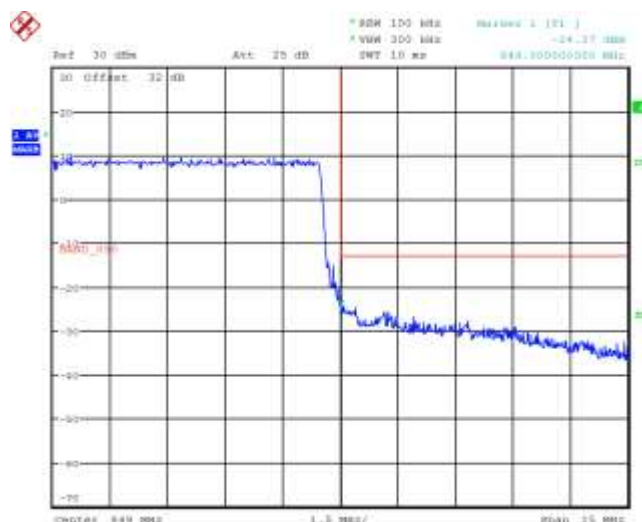


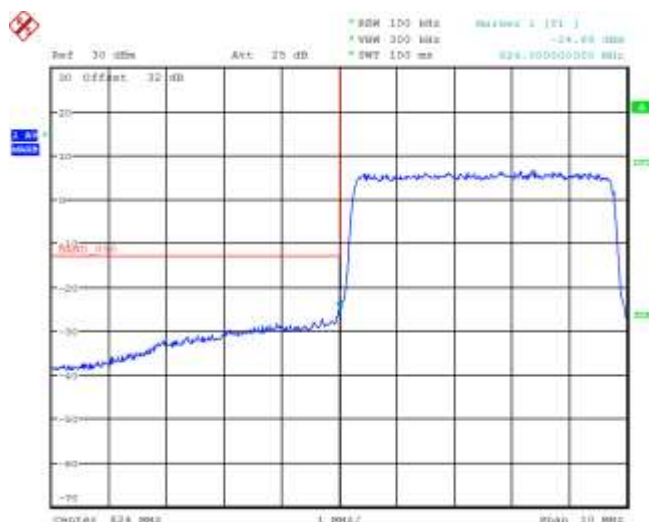
Figure 4-38a: Band 5 High Channel Mask, 10MHz BW, RB=50



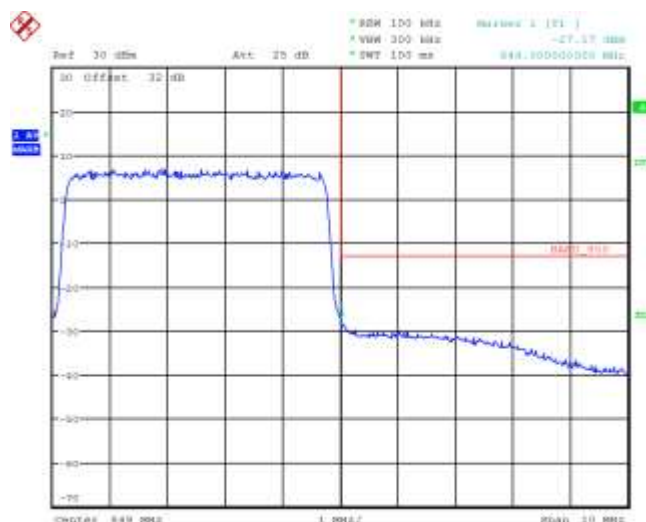
BlackBerry.	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 5 Conducted RF Emission Test Data cont'd

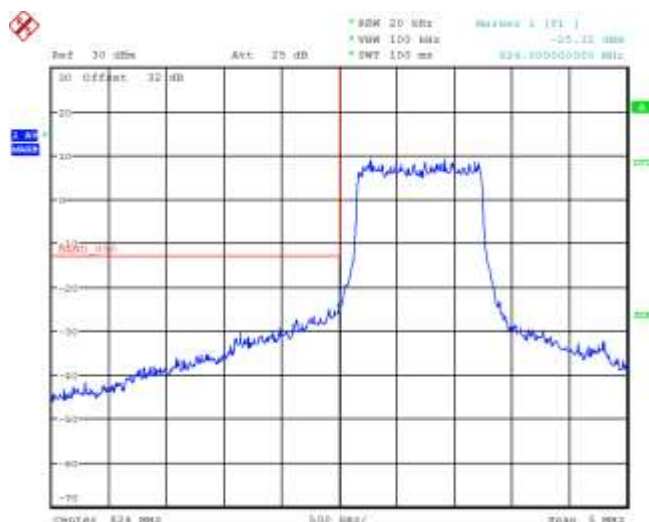
**Figure 4-39a: Band 5 Low Channel Mask, 5MHz
BW, RB=25**



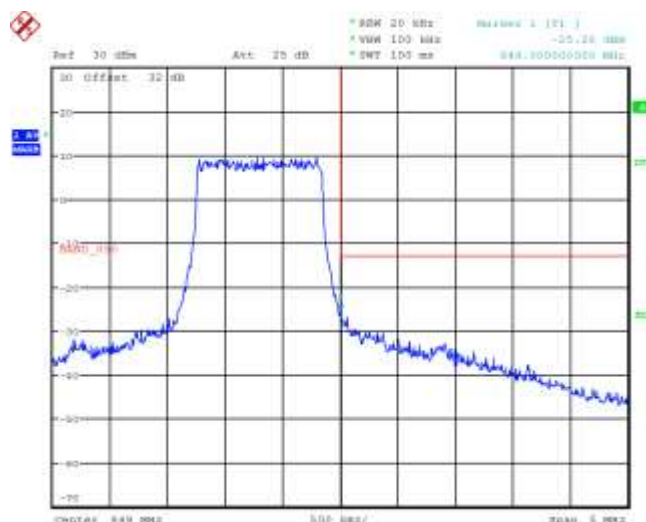
**Figure 4-40a: Band 5 High Channel Mask, 5MHz
BW, RB=25**



**Figure 4-41a: Band 5 Low Channel Mask, 1.4MHz
BW, RB=6**



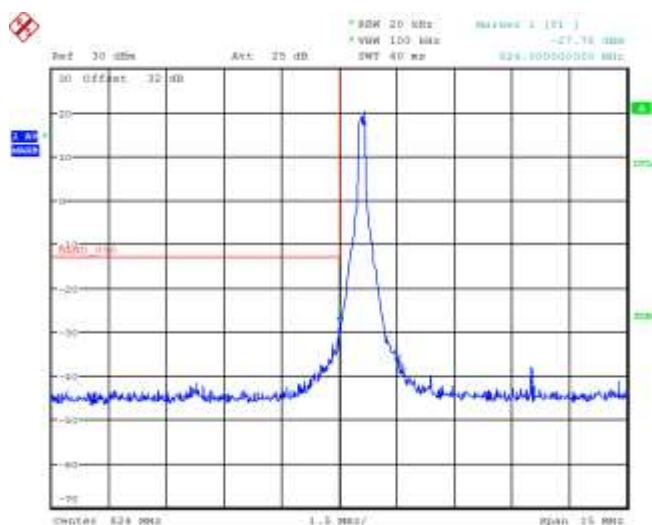
**Figure 4-42a: Band 5 High Channel Mask, 1.4MHz
BW, RB=6**



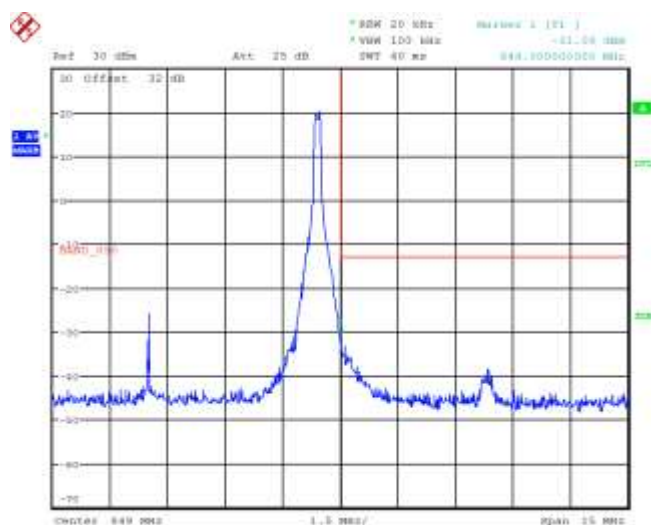
BlackBerry.	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 5 Conducted RF Emission Test Data cont'd

**Figure 4-43d: Band 5 Low Channel Mask, 10MHz
BW, RB=1**



**Figure 4-44a: Band 5 High Channel Mask, 10MHz
BW, RB=1**



BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4A	
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LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 3-45a: Occupied Bandwidth, Band 5 Low Channel, 10MHz BW (RB= 50) 16-QAM

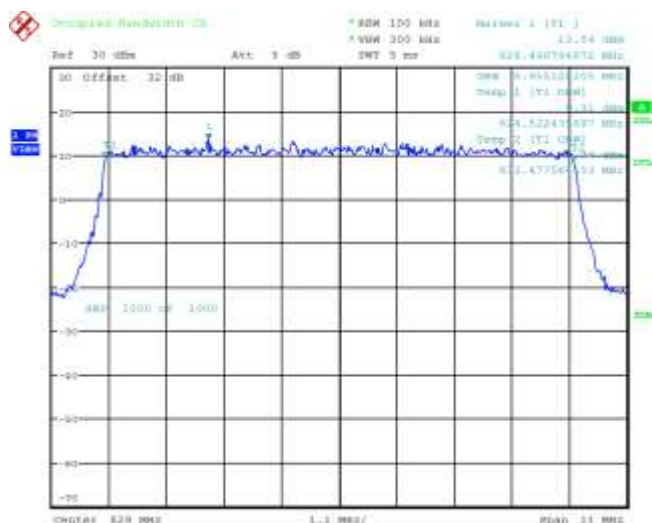


Figure 3-46a: Occupied Bandwidth, Band 5 Mid Channel, 20MHz BW (RB= 50) 16-QAM

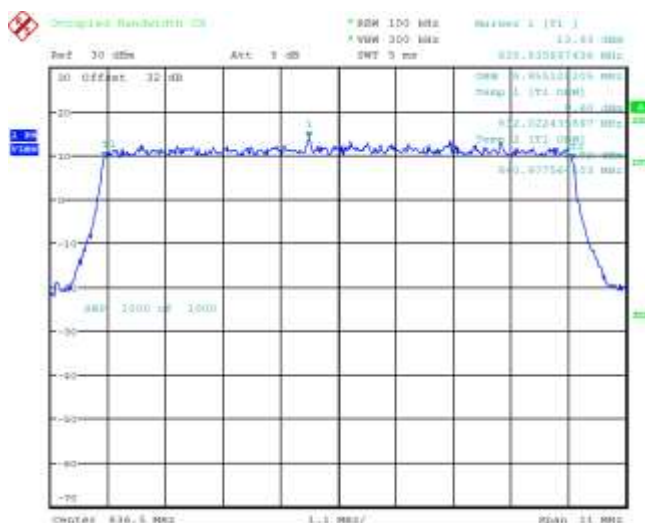
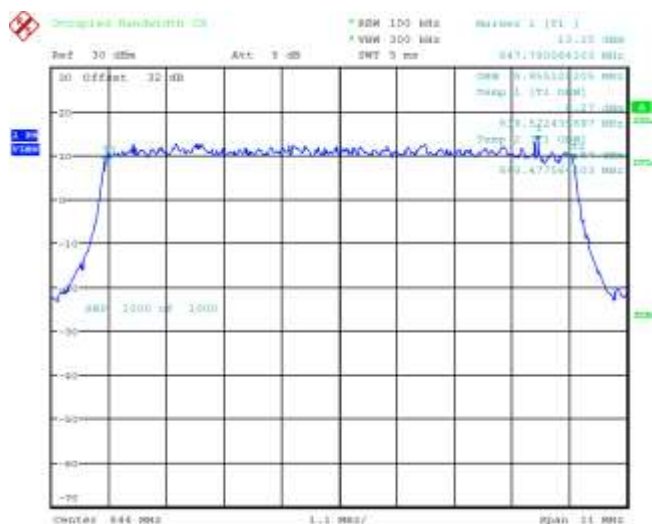


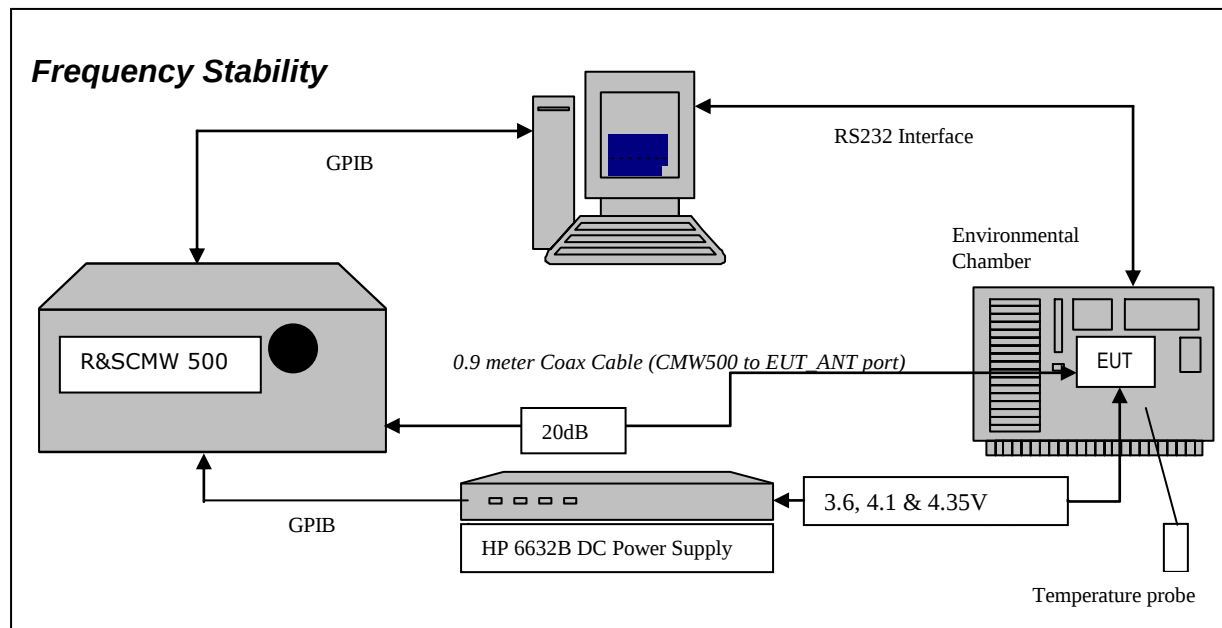
Figure 3-47a: Occupied Bandwidth, Band 5 High Channel, 10MHz BW (RB= 50) 16-QAM



APPENDIX 4B – LTE Band 5 FREQUENCY STABILITY TEST DATA

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 5 Frequency Stability Test Data



The following measurements were performed by Chuan Tran.

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2 Required Measurements

2.1055 Frequency Stability - Procedures

(a,b) Frequency Stability - Temperature Variation

(d) Frequency Stability - Voltage Variation

24.236 *Frequency Stability.*

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

The EUT meets the requirements as stated in CFR 47 chapter 1, Section 27.54, CFR 47 and RSS-139, 6.3 Frequency Stability.

Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-metre coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMW 500 and the EUT antenna port.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Test Setup:

The EUT was placed in the Temperature chamber and connected to CMW 500 outside as shown in the figure above. Dry air was pumped inside the temperature chamber to maintain a backpressure during the test. The EUT was kept in the off condition at all times except when the following measurements were to be made.

The chamber was switched on and the temperature was set to -30°C. After the chamber stabilized at -30 °C there was a soak period of one hour to alleviate moisture in the chamber, the EUT voltage was enabled. The system software recorded the frequency, power, and associated measurements.

A Computer system controlled the automated software. This application was given the command of activating all machines intrinsic to the temperature and voltage tests controlling the CMW 500 via the GPIB Bus. The Environmental Chamber was instructed through an RS-232 serial line. The EUT dialogue was passed through a serial connection.

The EUT repetitively transmitted 100 bursts for each set of programmed parameters recording temperature, voltage settings, and systematically selected frequencies. The power supply was cycled from minimum voltage 3.6 volts, 4.1 volts and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 4.1 volts and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 829.0 MHz, 836.5 MHz and 844.0 MHz each was measured under 10 MHz bandwidth with maximum (50) RBs. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million.

After the initial one-hour soak at the beginning of the tests, a period of thirty minutes soak was initialized between each ascending temperature step, before proceeding to the next measurement test cycle.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Procedure:

The test system software for commencing the Frequency Stability Tests carried through the following cycle.

15. Switch on the HP 6632B power supply; CMW 500 Communications test Set, and Environmental Chamber.
16. Start test program
17. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
18. Set power supply voltage to 3.6 volts.
19. Set up CMW 500 Radio Communication Tester.
20. Command the CMW 500 to switch to the low channel.
21. Enable the voltage to the EUT, and connect a link to the CMW 500 test set.
22. EUT is commanded to Transmit 100 Bursts.
23. Software logs the following data from the CMW 500, power supply and temperature chamber: Traffic Channel Number, Traffic Channel Frequency, Power Level, Chamber Temperature, Supply Voltage, Power and Frequency Error.
24. The CMW 500 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
25. Repeat steps 5 to 10 changing the supply voltage to 4.1 Volts
26. Increase temperature by 10°C and soak for 1/2 hour.
27. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
28. Repeat steps 5 to 10 changing the supply voltage to 4.35 volts

Procedure 5 to 10 was repeated at room temperature (20°C) with the power supply voltage set to 3.6, 4.1 and 4.35 volts

The maximum frequency error in the LTE Band 5 measured was **0.0180PPM**.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 5 results: channels 20400, 20525 and 20649 @ 20°C maximum transmitted power

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20450	829.0	3.6	20	-4.36	-0.0053
20525	836.5	3.6	20	-3.60	-0.0043
20600	844.0	3.6	20	4.09	0.0048

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20450	829.0	4.1	20	-4.43	-0.0053
20525	836.5	4.1	20	-3.56	-0.0043
20600	844.0	4.1	20	4.09	0.0048

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20450	829.0	4.35	20	-13.88	-0.0167
20525	836.5	4.35	20	-3.25	-0.0039
20600	844.0	4.35	20	-7.75	-0.0092

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE band 5 Results: channel 20400 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20450	829.0	3.6	-30	-5.61	-0.0068
20450	829.0	3.6	-20	-3.75	-0.0045
20450	829.0	3.6	-10	-3.20	-0.0039
20450	829.0	3.6	0	-4.85	-0.0059
20450	829.0	3.6	10	-5.09	-0.0061
20450	829.0	3.6	20	-4.36	-0.0053
20450	829.0	3.6	30	-4.18	-0.0050
20450	829.0	3.6	40	-4.09	-0.0049
20450	829.0	3.6	50	-3.76	-0.0045
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20450	829.0	4.1	-30	5.66	0.0068
20450	829.0	4.1	-20	4.23	0.0051
20450	829.0	4.1	-10	4.16	0.0050
20450	829.0	4.1	0	-4.11	-0.0050
20450	829.0	4.1	10	-4.52	-0.0055
20450	829.0	4.1	20	-4.43	-0.0053
20450	829.0	4.1	30	-4.73	-0.0057
20450	829.0	4.1	40	-4.33	-0.0052
20450	829.0	4.1	50	-5.83	-0.0070
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20450	829.0	4.35	-30	-4.18	-0.0050
20450	829.0	4.35	-20	8.97	0.0108
20450	829.0	4.35	-10	3.73	0.0045
20450	829.0	4.35	0	-18.98	-0.0229
20450	829.0	4.35	10	3.55	0.0043
20450	829.0	4.35	20	-13.88	-0.0167
20450	829.0	4.35	30	-4.85	-0.0059
20450	829.0	4.35	40	-19.25	-0.0232
20450	829.0	4.35	50	-3.79	-0.0046

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE band 5 Results: channel 20525 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20525	836.5	3.6	-30	-3.45	-0.0041
20525	836.5	3.6	-20	-3.36	-0.0040
20525	836.5	3.6	-10	-4.26	-0.0051
20525	836.5	3.6	0	-3.52	-0.0042
20525	836.5	3.6	10	-4.89	-0.0058
20525	836.5	3.6	20	-3.60	-0.0043
20525	836.5	3.6	30	-6.15	-0.0074
20525	836.5	3.6	40	-4.94	-0.0059
20525	836.5	3.6	50	-6.52	-0.0078
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20525	836.5	4.1	-30	-2.83	-0.0034
20525	836.5	4.1	-20	-6.58	-0.0079
20525	836.5	4.1	-10	-3.92	-0.0047
20525	836.5	4.1	0	-3.66	-0.0044
20525	836.5	4.1	10	-3.58	-0.0043
20525	836.5	4.1	20	-3.56	-0.0043
20525	836.5	4.1	30	-5.55	-0.0066
20525	836.5	4.1	40	-5.36	-0.0064
20525	836.5	4.1	50	-4.41	-0.0053
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20525	836.5	4.35	-30	-3.38	-0.0040
20525	836.5	4.35	-20	-4.05	-0.0048
20525	836.5	4.35	-10	-3.45	-0.0041
20525	836.5	4.35	0	-4.32	-0.0052
20525	836.5	4.35	10	17.75	0.0212
20525	836.5	4.35	20	-3.25	-0.0039
20525	836.5	4.35	30	-5.35	-0.0064
20525	836.5	4.35	40	-4.32	-0.0052
20525	836.5	4.35	50	-5.46	-0.0065

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE band 5 Results: channel 20649 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20600	844.0	3.6	-30	-3.71	-0.0044
20600	844.0	3.6	-20	3.45	0.0041
20600	844.0	3.6	-10	-7.34	-0.0087
20600	844.0	3.6	0	4.35	0.0052
20600	844.0	3.6	10	-4.29	-0.0051
20600	844.0	3.6	20	4.09	0.0048
20600	844.0	3.6	30	-4.56	-0.0054
20600	844.0	3.6	40	-4.84	-0.0057
20600	844.0	3.6	50	2.95	0.0035
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20600	844.0	4.1	-30	3.62	0.0043
20600	844.0	4.1	-20	2.95	0.0035
20600	844.0	4.1	-10	3.46	0.0041
20600	844.0	4.1	0	4.19	0.0050
20600	844.0	4.1	10	4.66	0.0055
20600	844.0	4.1	20	4.09	0.0048
20600	844.0	4.1	30	-5.11	-0.0061
20600	844.0	4.1	40	-4.23	-0.0050
20600	844.0	4.1	50	-4.95	-0.0059
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20600	844.0	4.35	-30	5.05	0.0060
20600	844.0	4.35	-20	3.29	0.0039
20600	844.0	4.35	-10	-3.28	-0.0039
20600	844.0	4.35	0	-3.53	-0.0042
20600	844.0	4.35	10	-3.99	-0.0047
20600	844.0	4.35	20	-7.75	-0.0092
20600	844.0	4.35	30	-4.22	-0.0050
20600	844.0	4.35	40	-3.92	-0.0046
20600	844.0	4.35	50	-3.79	-0.0045

APPENDIX 4C – LTE Band 5 RADIATED EMISSIONS TEST DATA

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 4C		
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW	

Radiated Power Test Data Results

The following measurements were performed by Rex Zhang.

Date of Test: July 17, 2014

The environmental tests conditions were: Temperature: 25.0 °C
Relative Humidity: 29.5 %

The BlackBerry® smartphone was standalone USB Down and LCD Screen pointing to the RX antenna when the turntable is at 0 degree position.

Measurements were performed with QPSK and 16QAM modulations. The smallest test margins are reported below.

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

LTE band 5, 5MHz BW, RB=1, QPSK modulation

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole)		Limit (dBm)	Diff to Limit (dB)
F0	20425	826.50	5	Dipole	V	-38.77	-31.33	V-V	4.40	21.82	0.15	38.50	16.68
F0	20425	826.50	5	Dipole	H	-31.33		H-H	3.53				
F0	20525	836.50	5	Dipole	V	-38.62	-30.72	V-V	5.09	22.24	0.17	38.50	16.26
F0	20525	836.50	5	Dipole	H	-30.72		H-H	4.07				
F0	20624	846.40	5	Dipole	V	-38.97	-30.51	V-V	4.96	22.16	0.16	38.50	16.34
F0	20624	846.40	5	Dipole	H	-30.51		H-H	3.86				

LTE band 5, 5MHz BW, RB=1, 16-QAM modulation

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole)		Limit (dBm)	Diff to Limit (dB)
F0	20425	826.50	5	Dipole	V	-40.04	-32.54	V-V	3.14	20.56	0.11	38.50	17.94
F0	20425	826.50	5	Dipole	H	-32.54		H-H	2.29				
F0	20525	836.50	5	Dipole	V	-39.51	-31.76	V-V	4.04	21.19	0.13	38.50	17.31
F0	20525	836.50	5	Dipole	H	-31.76		H-H	3.09				
F0	20624	846.40	5	Dipole	V	-40.01	-31.67	V-V	3.81	21.01	0.13	38.50	17.49
F0	20624	846.40	5	Dipole	H	-31.67		H-H	2.71				

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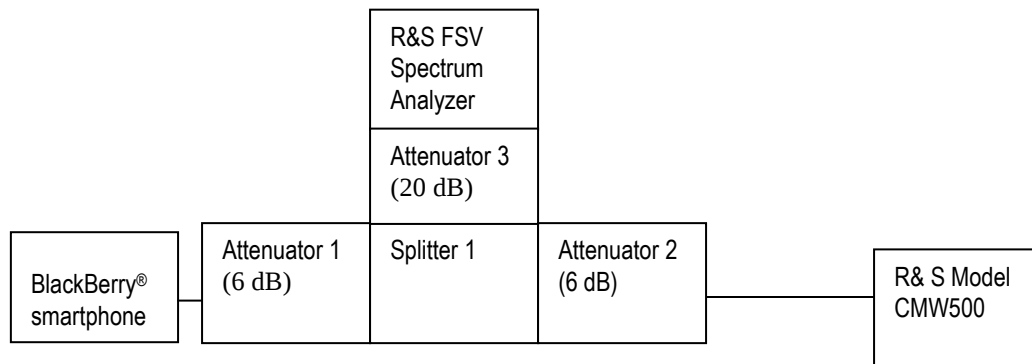
APPENDIX 5A– LTE Band 4 CONDUCTED RF EMISSIONS TEST DATA/PLOTS

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 4 Conducted RF Emission Test Data

This appendix contains measurement data pertaining to conducted spurious emissions, 99% power bandwidth and the channel mask.

Test Setup Diagram



A reference offset of 31.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SERIAL NUMBER</u>
Attenuator 1	Mini-Circuits	BW-S6W2+	0647
Attenuator 2	Mini-Circuits	BW-S6W2+	0648
Attenuator 3	Mini-Circuits	BW-S20-2W263+	1234
Splitter 1	Weinschel	1515	MES 92

Date of Test: June 26 - 27, 2014

The environmental test conditions were: Temperature: 23.2°C
 Relative Humidity: 21.1 %

The following measurements were performed by Chuan Tran.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 4 Conducted RF Emission Test Data cont'd

Emission Designator Table

Frequency Range (MHz)	Conducted Output Power (dBm)	Emission Designator	Band	Bandwidth (MHz)	Modulation
1710.7-1754.3	21.80	1M08G7D	LTE B4	1.4	QPSK
1710.7-1754.3	20.50	1M08D7W	LTE B4	1.4	16QAM
1711.5-1753.5	21.70	2M69G7D	LTE B4	3	QPSK
1711.5-1753.5	21.30	2M69D7W	LTE B4	3	16QAM
1712.5-1752.5	21.90	4M48G7D	LTE B4	5	QPSK
1712.5-1752.5	21.40	4M47D7W	LTE B4	5	16QAM
1715-1750	21.70	8M95G7D	LTE B4	10	QPSK
1715-1750	21.30	8M95D7W	LTE B4	10	16QAM
1717.5-1747.5	21.70	13M4G7D	LTE B4	15	QPSK
1717.5-1747.5	21.40	13M4D7W	LTE B4	15	16QAM
1720-1745	21.90	17M9G7D	LTE B4	20	QPSK
1720-1745	21.50	17M9D7W	LTE B4	20	16QAM

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 27.53, RSS-139, 6.5 were measured from 30 MHz to 20 GHz.

–26 dBc Bandwidth and Occupied Bandwidth (99%)

The modulation spectrum was measured by both methods of 99% power bandwidth and – 26 dBc bandwidth For each 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz with different number of RBs for LTE band 4,.

QPSK and 16-QAM modulations were applied to each of the bandwidths. Only the worst case measurements are documented in this report.

A minimum RB condition was also measured (RB = 1).

The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.

The worst case –26dBc bandwidth for LTE band 4 was measured to be 18.97 MHz. Results were derived in a 200 kHz resolution bandwidth.

On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Test Data for LTE Band 4 selected Frequencies in 20MHz BW (RB = 100)

LTE Band 4 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	QPSK	16-QAM
1720.0	18.71	17.87	17.87
1732.5	18.97	17.90	17.87
1745.0	18.71	17.90	17.94

Peak to Average Ratio (PAR)

For each 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz with different number of RBs as per scalable bandwidths for LTE band 4, the peak to average ratio was measured on the low, middle and high channels with QPSK modulation.

On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

The worst case Peak to Average Ratio was 10.90 dB on middle channel in 10MHz bandwidth with 50 RBs.

Measurement Plots for LTE Band 4

See Figures 5-1a to 5-18a for the plots of the conducted spurious emissions.

See Figures 5-19a to 5-34a and 5-51a to 5-53a for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.

See Figures 5-35a to 5-44a for the plots of the Channel mask.

See Figures 5-45a to 5-50a for the plots of the Peak to Average Ratios.

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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-5a: Band 4, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)

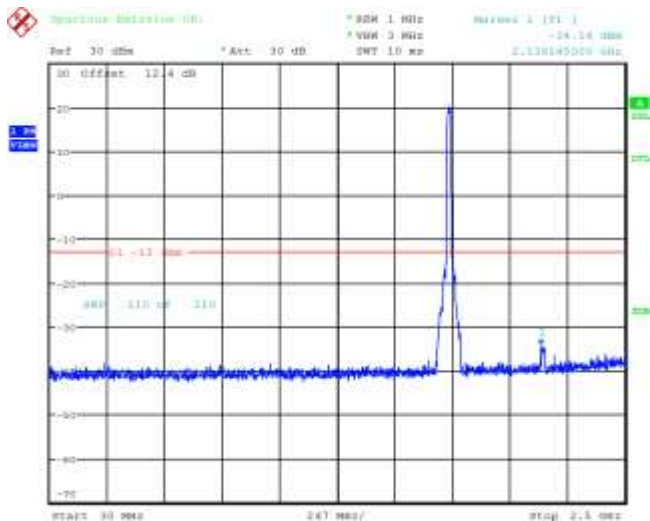


Figure 5-6a: Band 4, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)

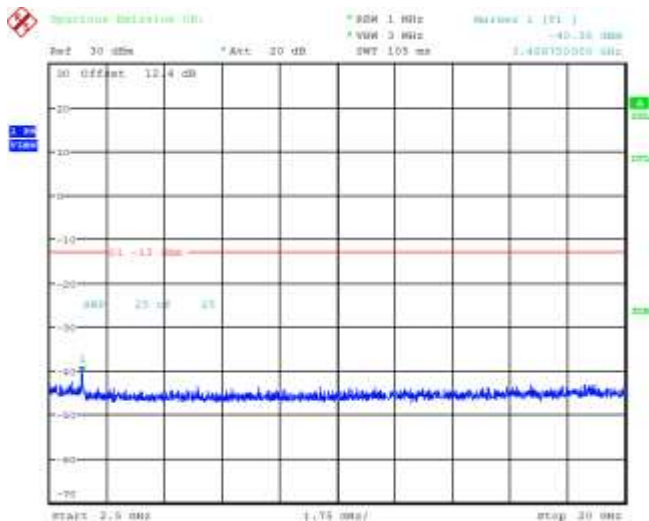


Figure 5-7a: Band 4, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)

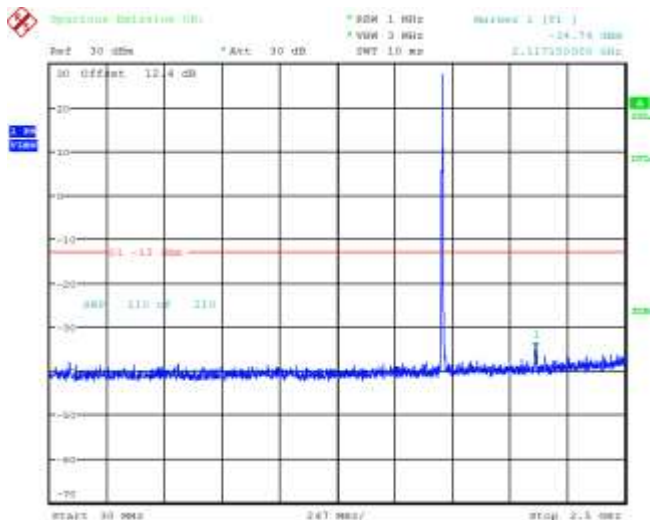
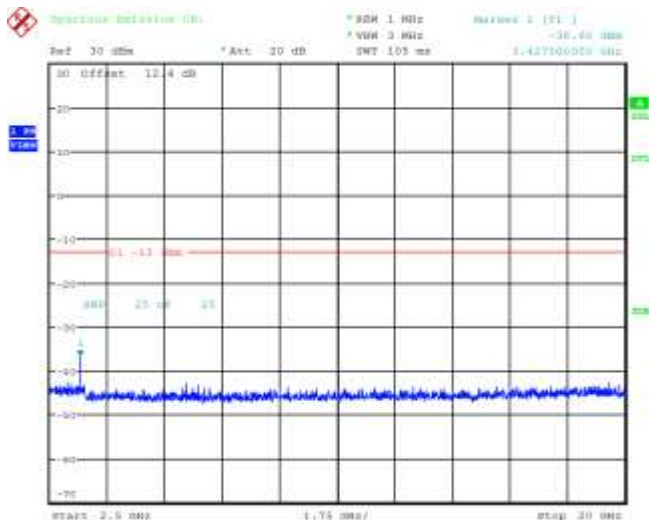


Figure 5-8a: Band 4, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-9a: Band 4, Spurious Conducted Emissions, Middle Channel, 10MHz BW (RB= 25)

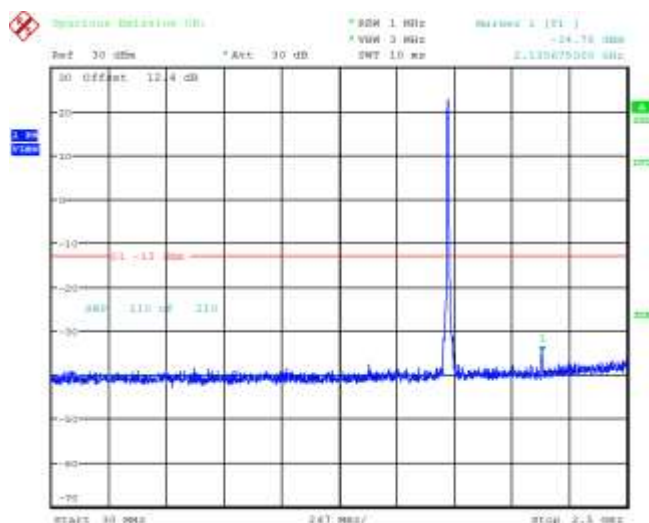


Figure 5-10a: Band 4, Spurious Conducted Emissions, Middle Channel, 10MHz BW (RB= 25)

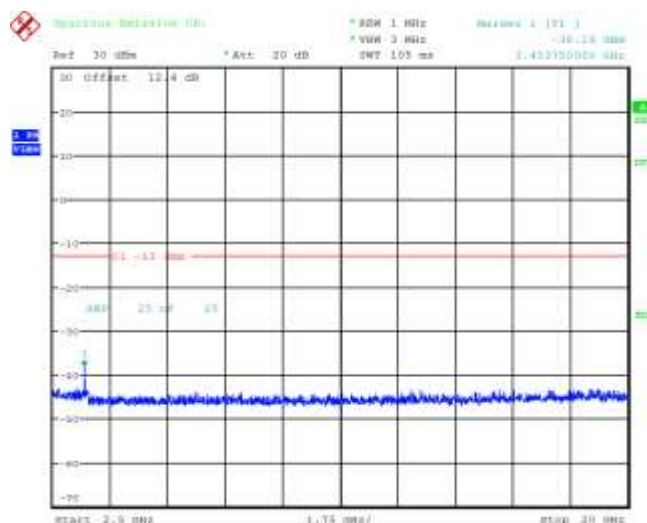


Figure 5-11a: Band 4, Spurious Conducted Emissions, High channel, 10MHz BW (RB= 50)

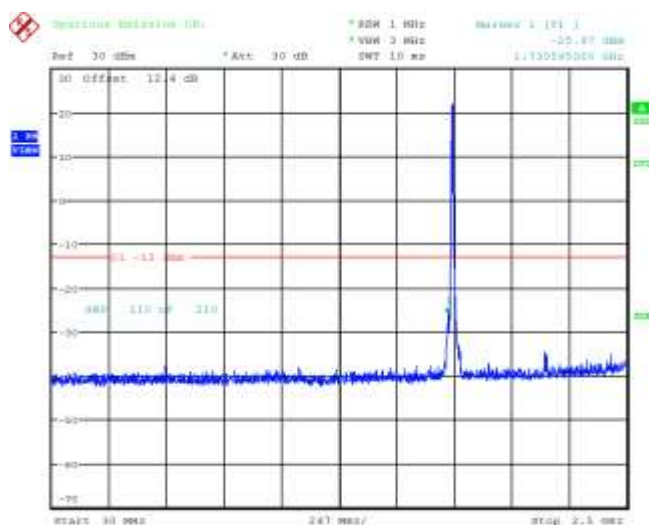
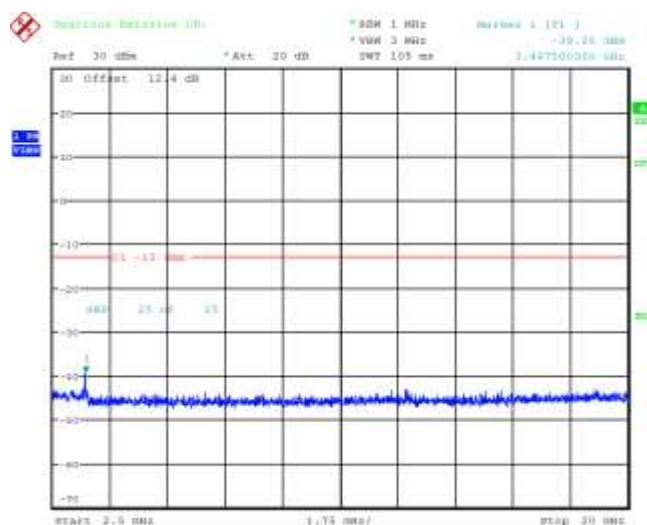


Figure 5-12a: Band 4, Spurious Conducted Emissions, High channel, 10MHz BW (RB= 50)



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-13a: Band 4, Spurious Conducted Emissions, Low Channel, 1.4MHz BW (RB= 1)

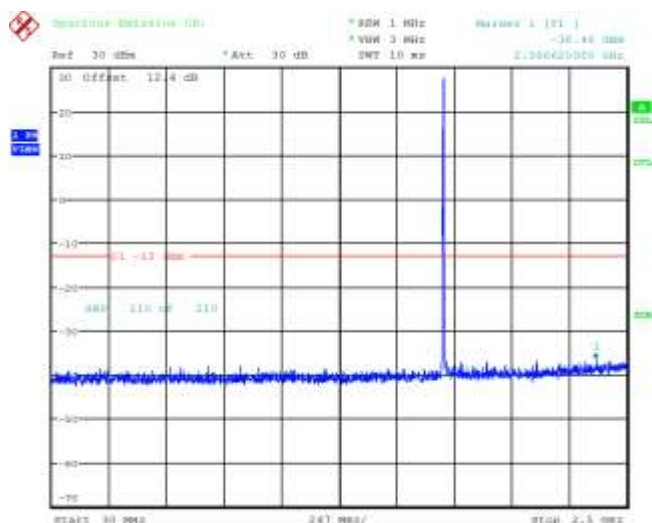


Figure 5-14a: Band 4, Spurious Conducted Emissions, Low Channel, 1.4MHz BW (RB= 1)

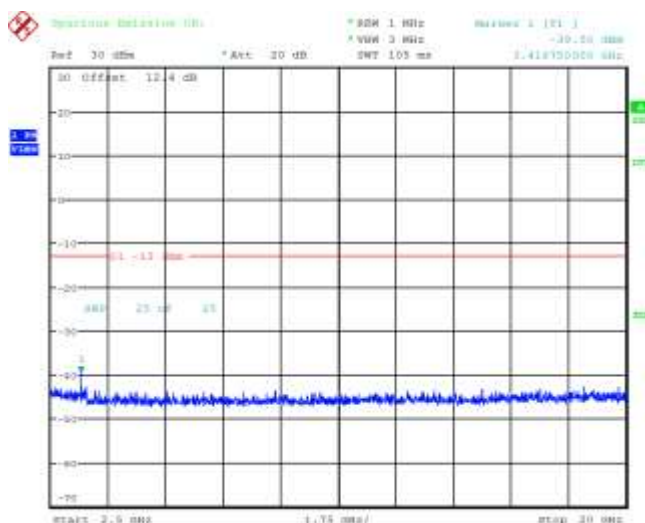


Figure 5-15a: Band 4, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 3)

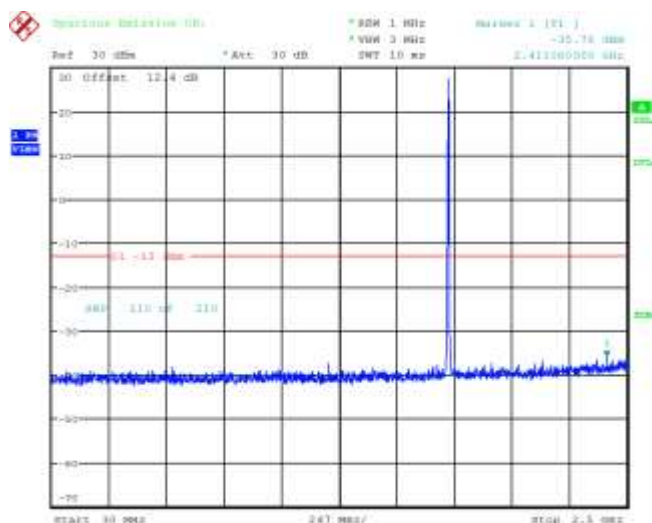
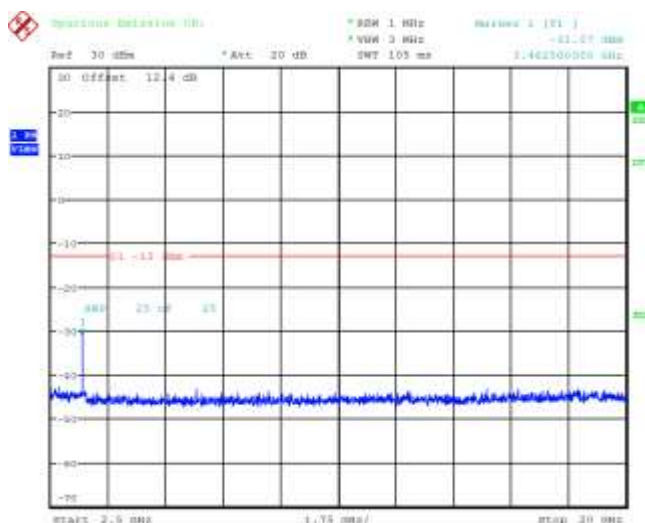


Figure 5-16a: Band 4, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 3)



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-17a: Band 4, Spurious Conducted Emissions, High channel, 1.4MHz BW (RB= 6)

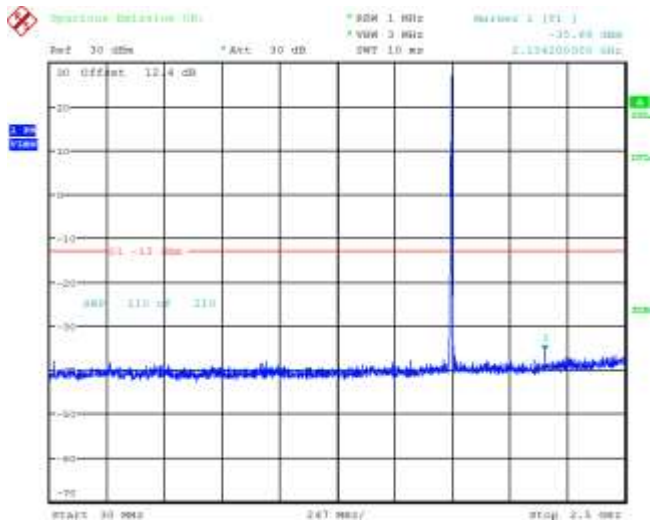
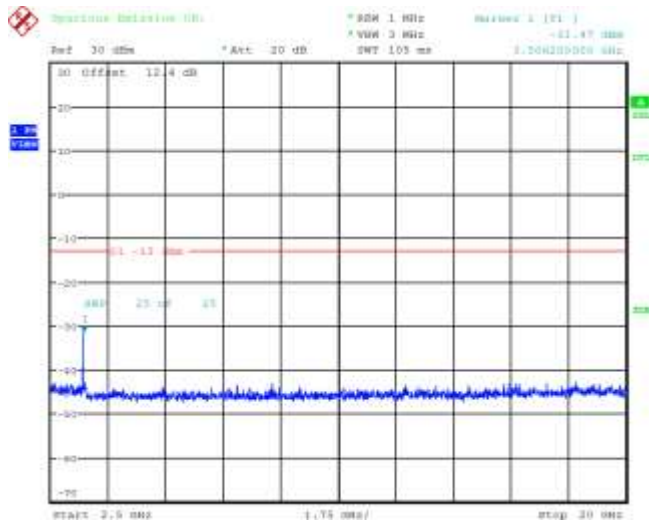


Figure 5-18a: Band 4, Spurious Conducted Emissions, High channel, 1.4MHz BW (RB= 6)



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-19a: Occupied Bandwidth, Band 4 Low Channel, 20MHz BW, RB=100

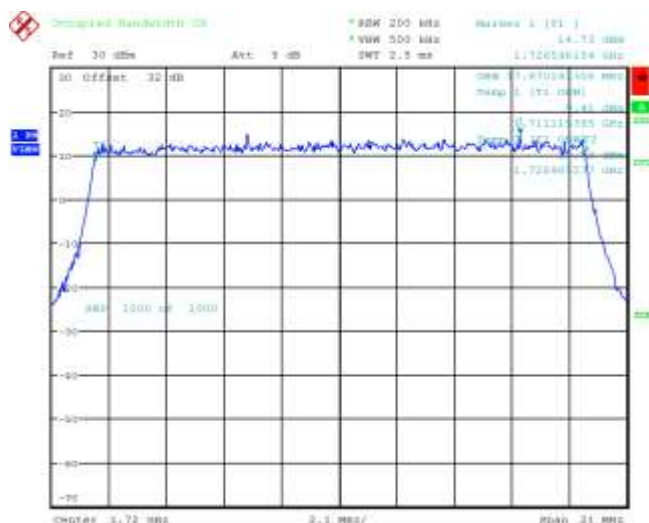


Figure 5-20a: Occupied Bandwidth, Band 4 Middle Channel, 20MHz BW, RB=100

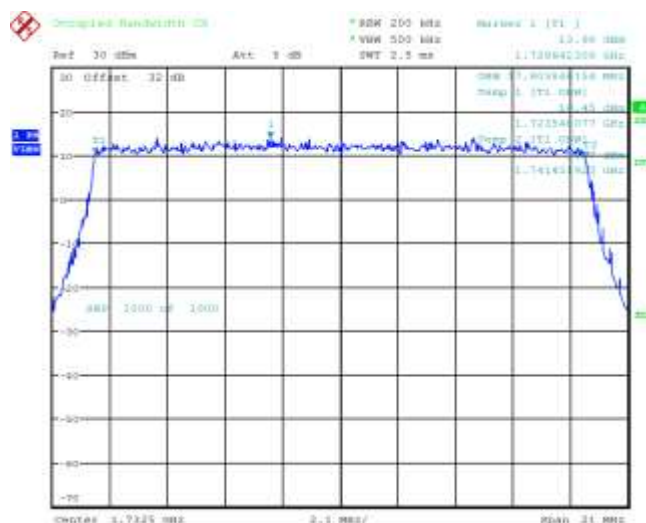
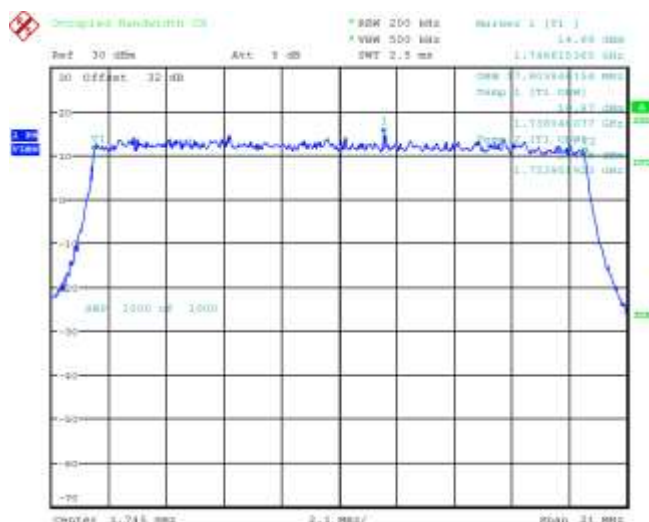


Figure 5-21a: Occupied Bandwidth, Band 4 High Channel, 20MHz BW, RB=100



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-22a: Occupied Bandwidth, Band 4 Low Channel, 10MHz BW, RB=50

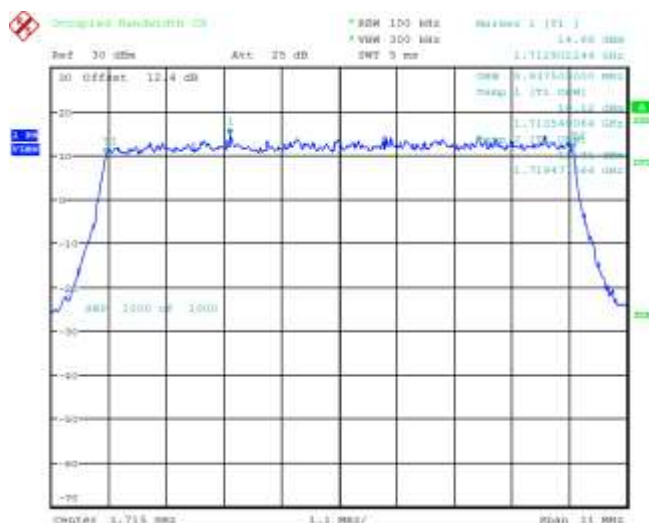


Figure 5-23a: Occupied Bandwidth, Band Middle Channel, 10MHz BW, RB=50

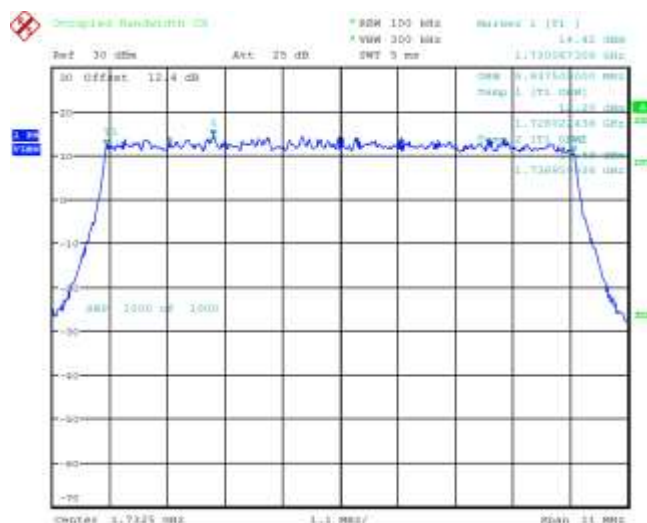


Figure 5-24a: Occupied Bandwidth, Band 4 High Channel, 10MHz BW, RB=50



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-25a: Occupied Bandwidth, Band 4 Low Channel, 1.4MHz BW, RB=6

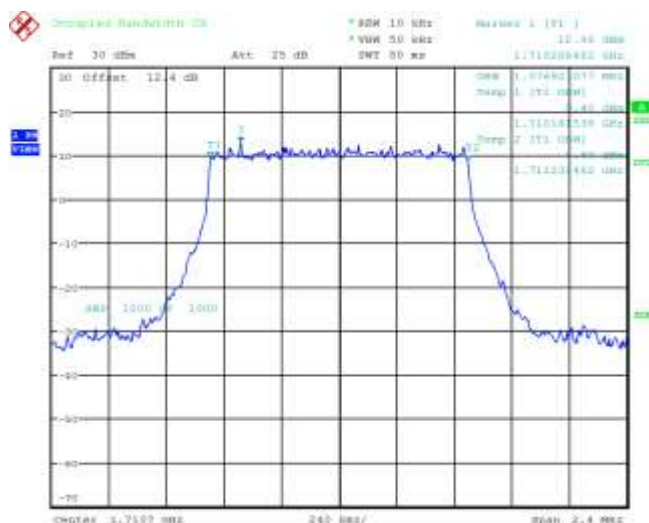


Figure 5-26a: Occupied Bandwidth, Band 4 Middle Channel, 1.4MHz BW, RB=6

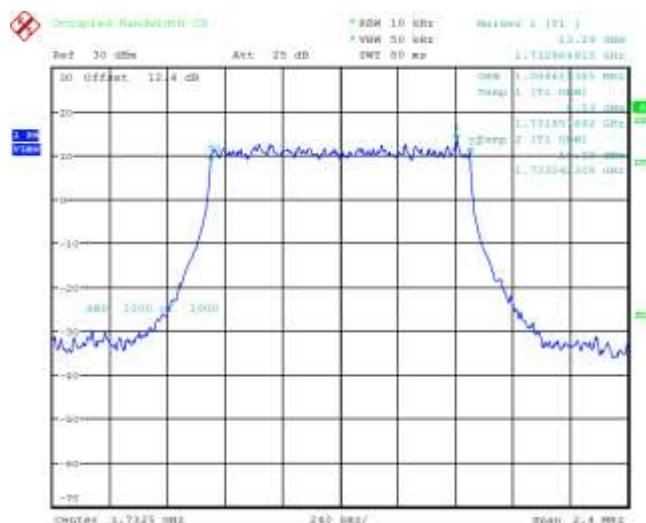
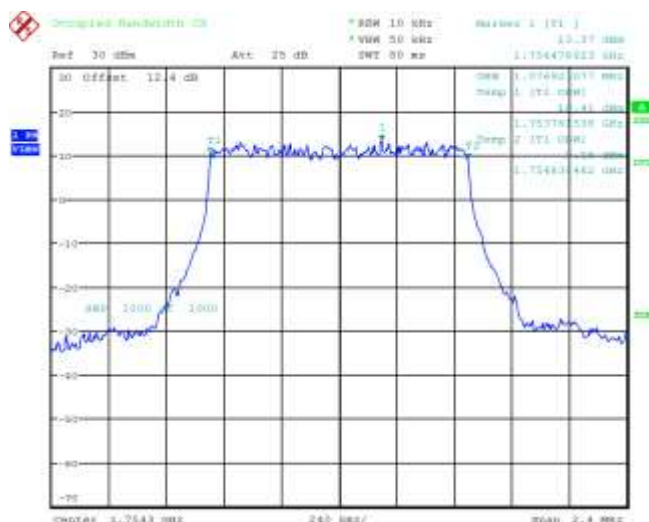


Figure 5-27a: Occupied Bandwidth, Band 4 High Channel, 1.4MHz BW, RB=6



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-28a: -26 dBc Bandwidth, Band 4 Low Channel, 20MHz BW, RB=100

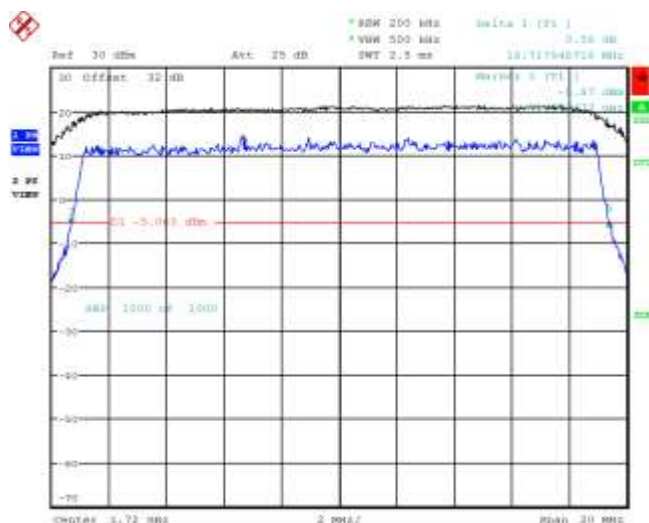


Figure 5-29a: -26 dBc Bandwidth, Band 4 Middle Channel, 20MHz BW, RB=100

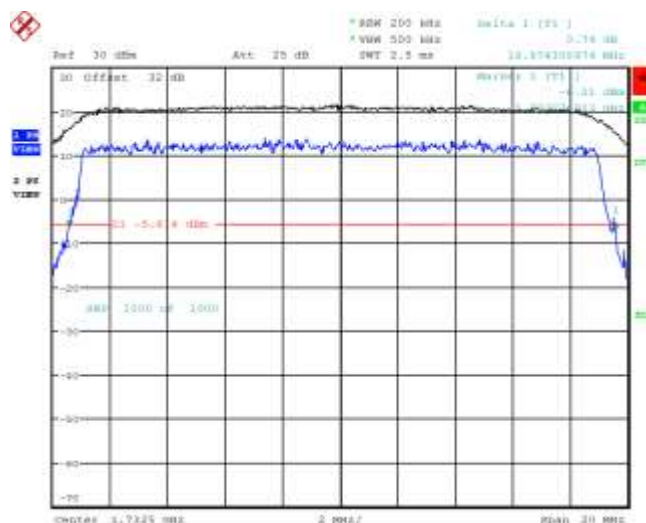


Figure 5-30a: -26 dBc Bandwidth, Band 4 High Channel, 20MHz BW, RB=100

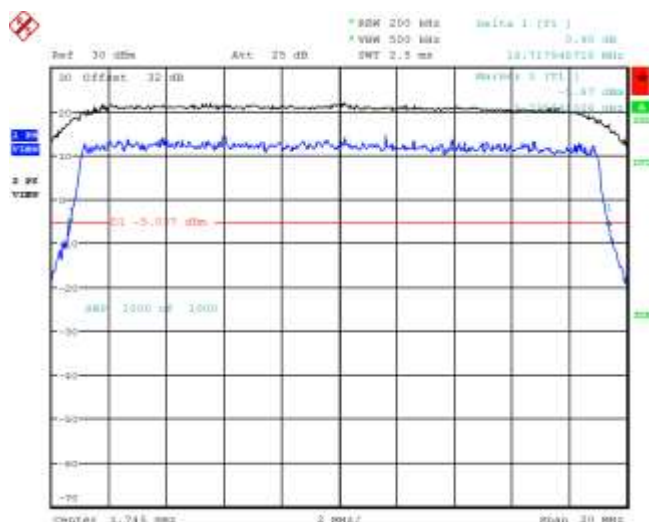
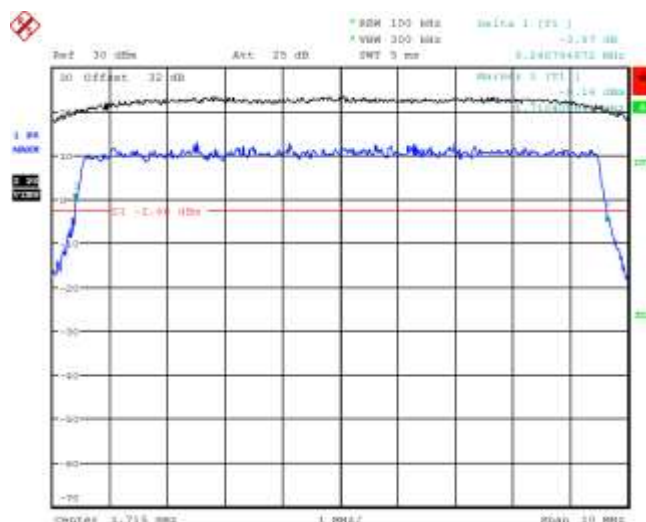


Figure 5-31a: -26 dBc Bandwidth, Band 4 Low Channel, 10MHz BW, RB=50



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-32a: -26 dBc Bandwidth, Band 4 Middle Channel, 10MHz BW, RB=50

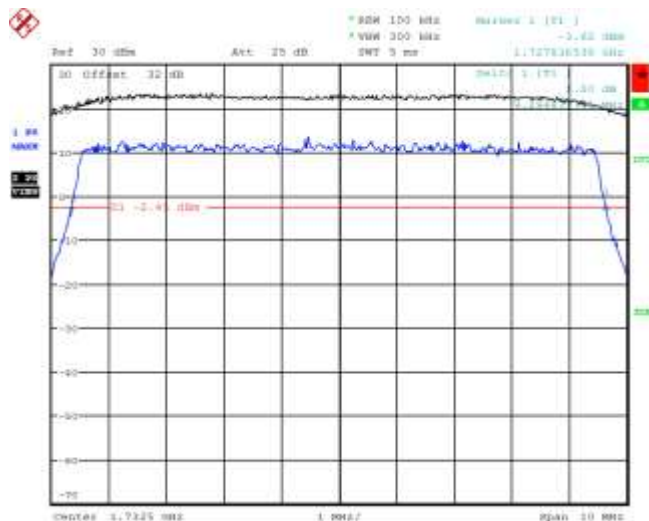


Figure 5-33a: -26 dBc Bandwidth, Band 4 High Channel, 10MHz BW, RB=50

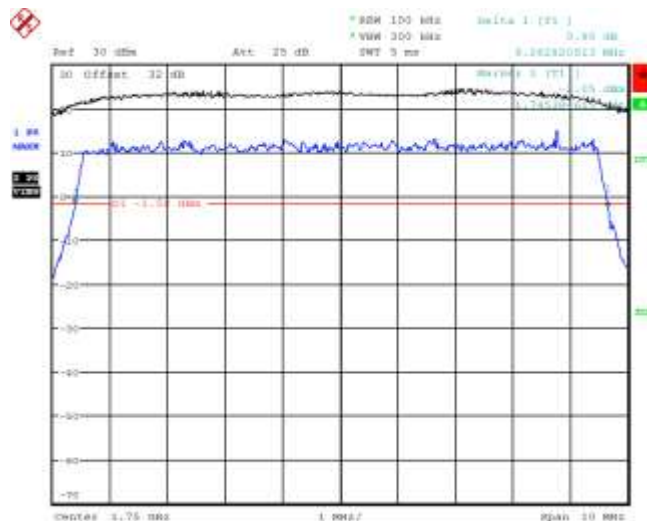


Figure 5-34a: -26 dBc Bandwidth, Band 4 Low Channel, 1.4MHz BW, RB=6

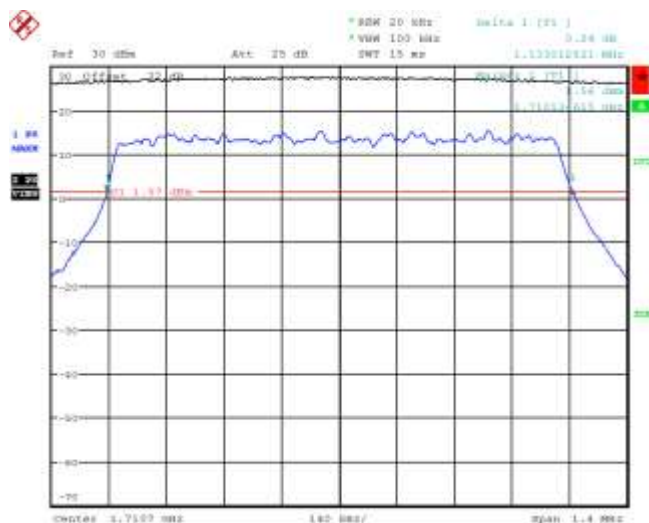
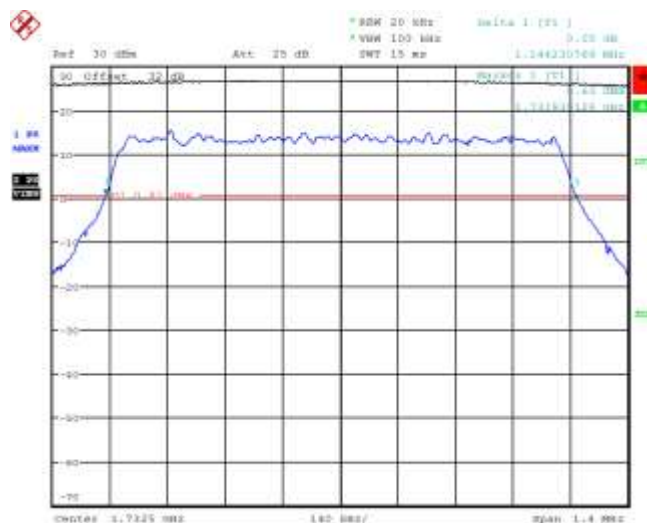


Figure 5-35a: -26 dBc Bandwidth, Band 4 Middle Channel, 1.4MHz BW, RB=6



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-36a: -26 dBc Bandwidth, Band 4 High Channel, 1.4MHz BW, RB=6

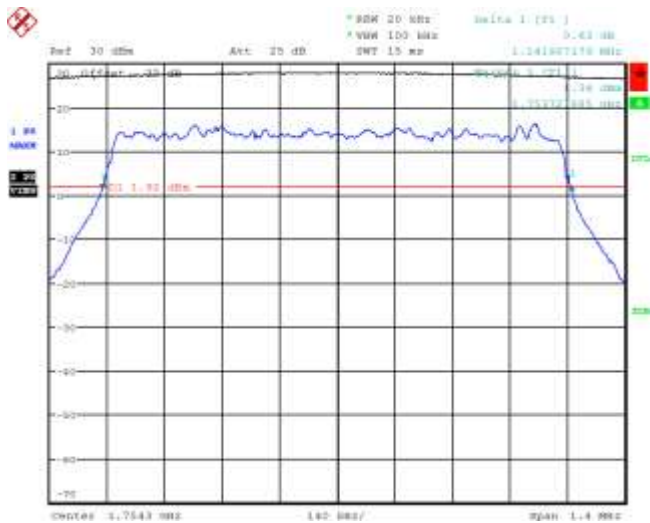


Figure 5-37a: Band 4 Low Channel Mask, 20MHz BW, RB=100

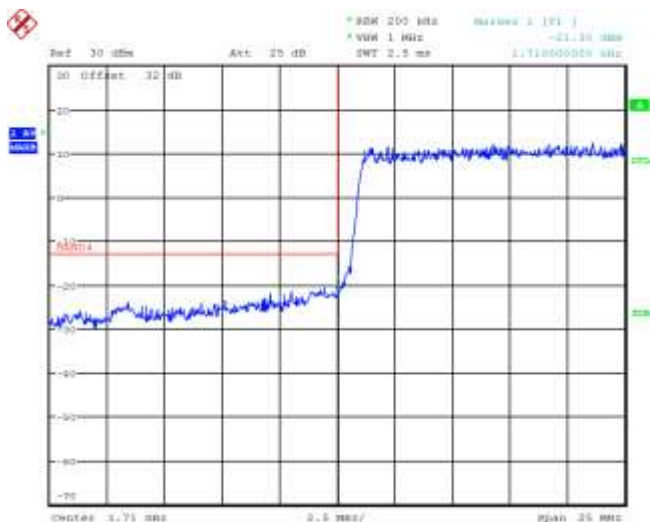
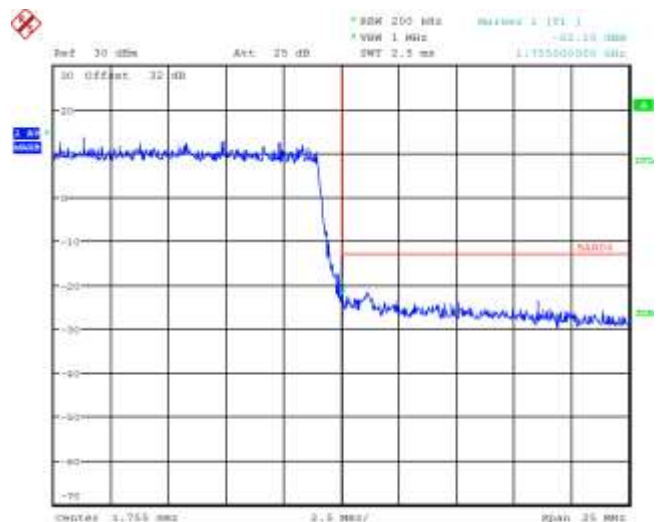


Figure 5-38a: Band 4 High Channel Mask, 20MHz BW, RB=100



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-39a: Band 4 Low Channel Mask, 10MHz BW, RB=50

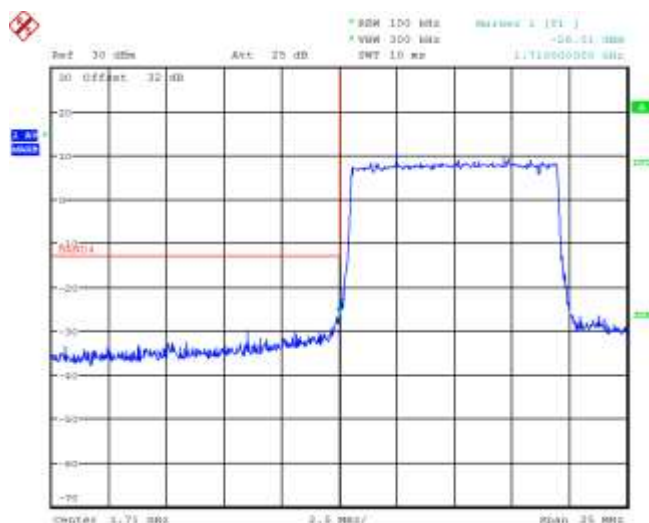


Figure 5-40a: Band 4 High Channel Mask, 10MHz BW, RB=50

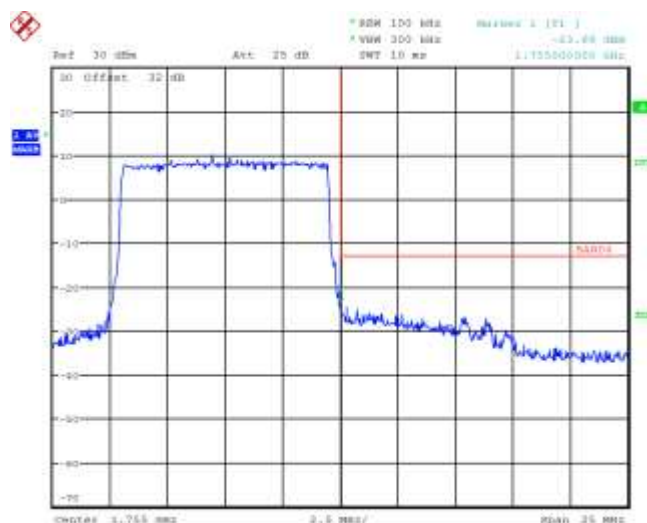


Figure 5-41a: Band 4 Low Channel Mask, 1.4MHz BW, RB=6

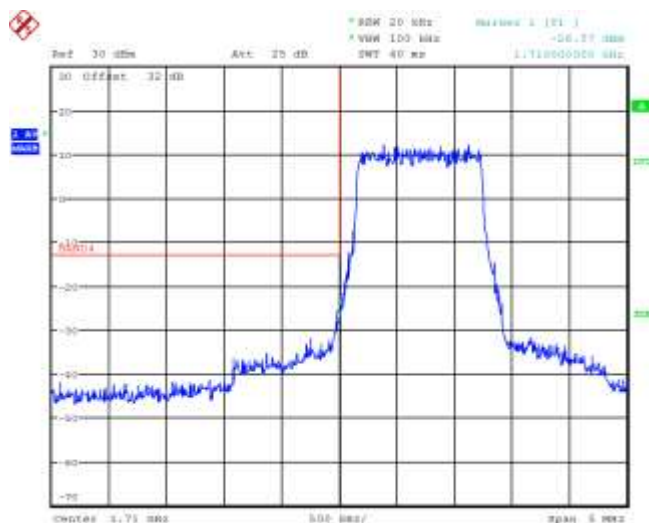
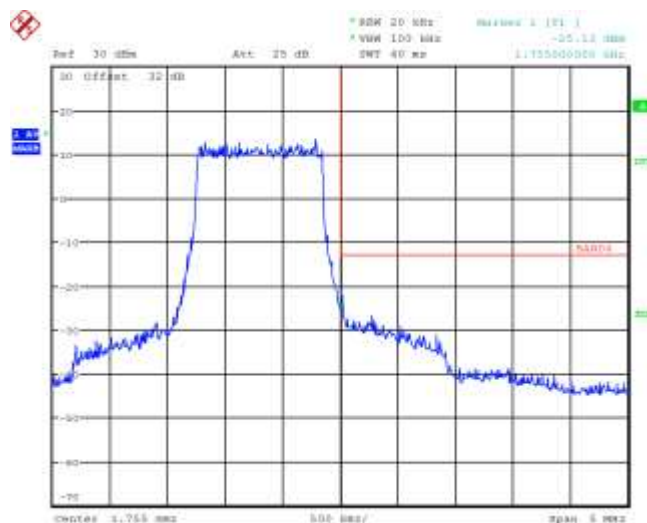


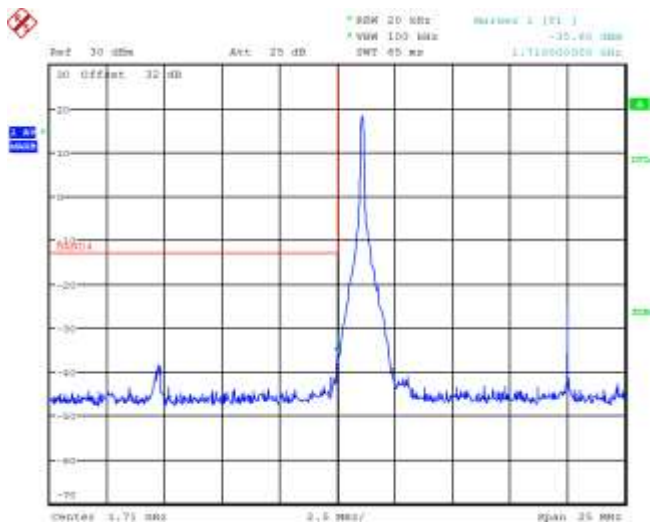
Figure 5-42a: Band 4 High Channel Mask, 1.4MHz BW, RB=6



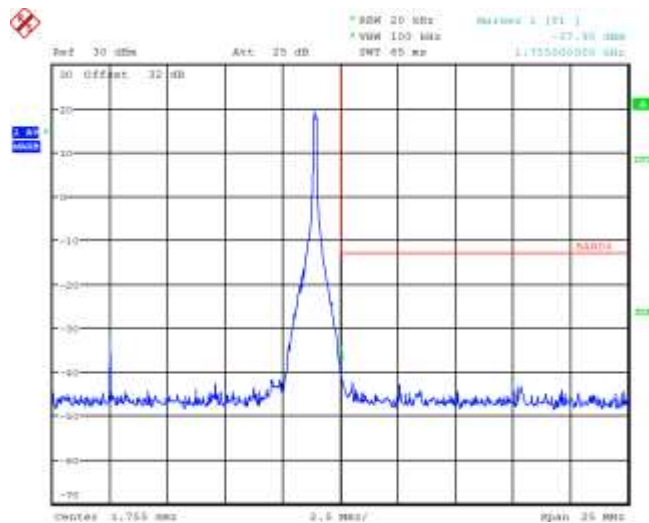
	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5A	
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LTE Band 4 Conducted RF Emission Test Data cont'd

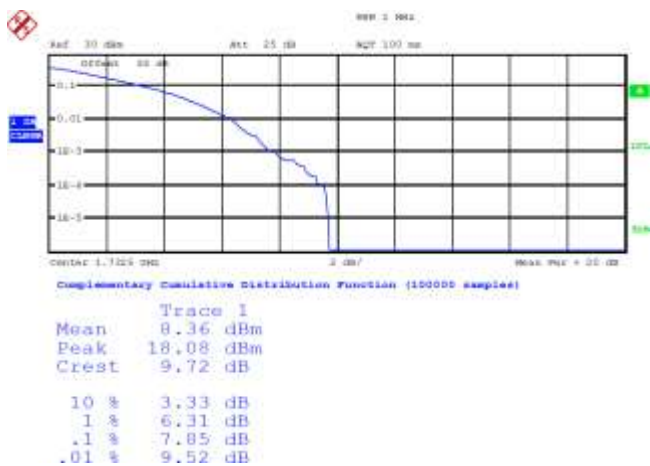
**Figure 5-43a: Band 4 Low Channel Mask, 20MHz
BW, RB=1**



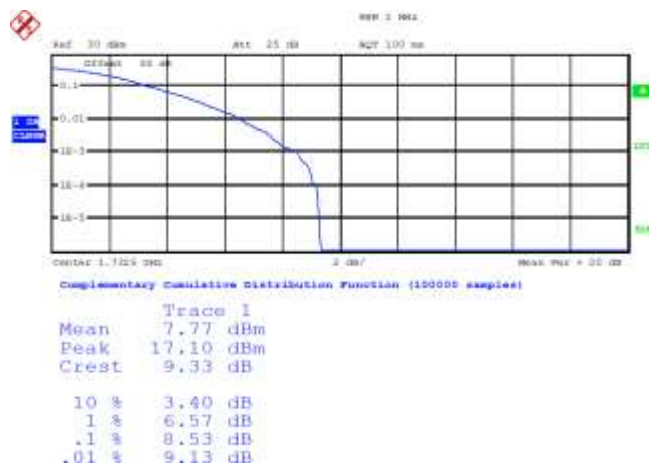
**Figure 5-44a: Band 4 High Channel Mask, 20MHz
BW, RB=1**



**Figure 5-45a: Band 4 Mid Channel PAR, 20MHz
BW, RB=50, QPSK**



**Figure 5-46a: Band 4 Middle Channel Mask, 20MHz
BW, RB=100, 16-QAM**



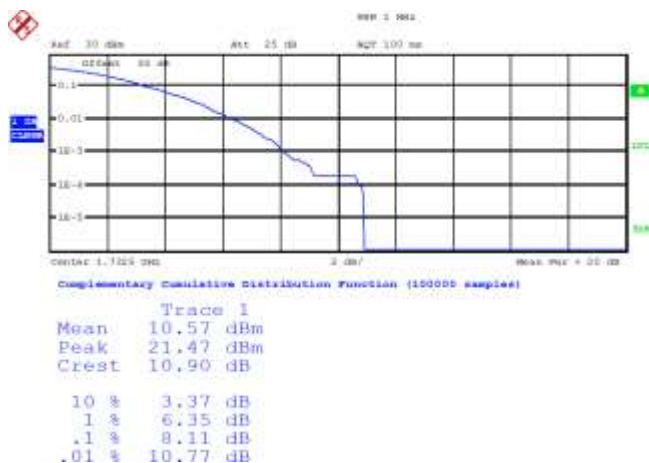
	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 4 Conducted RF Emission Test Data cont'd

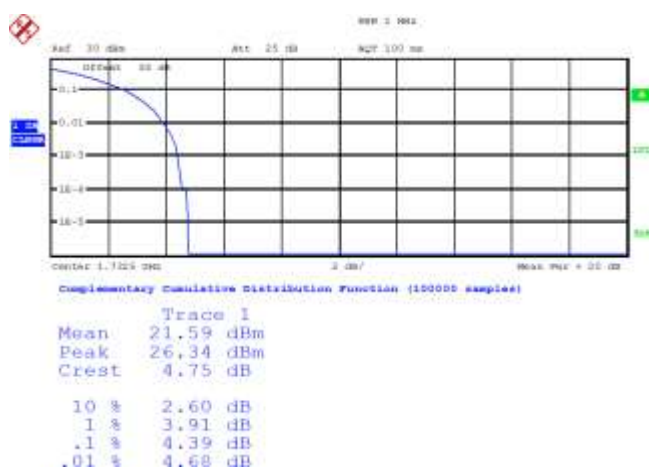
**Figure 5-47a: Band 4 Mid Channel PAR, 10MHz
BW, RB=25, QPSK**



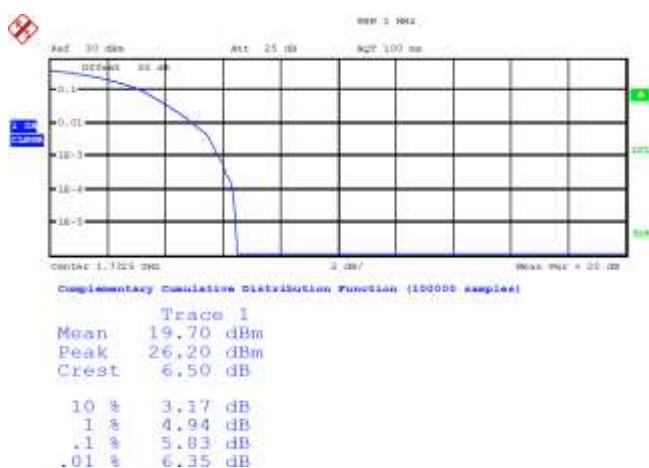
**Figure 5-48a: Band 4 Mid Channel PAR, 10MHz
BW, RB=50, 16-QAM**



**Figure 5-49a: Band 4 Mid Channel PAR, 1.4MHz
BW, RB=3, QPSK**



**Figure 5-50a: Band 4 Middle Channel Mask, 5MHz
BW, RB=6, 16-QAM**



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LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-51a: Occupied Bandwidth, Band 4 Low Channel, 20MHz BW (RB= 100) 16-QAM

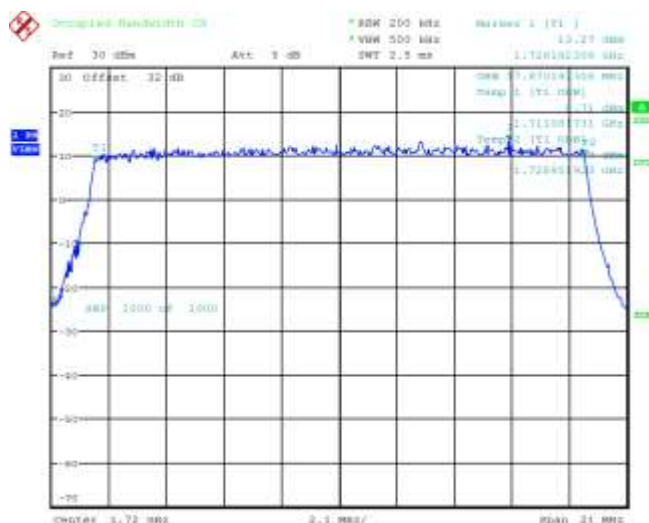


Figure 5-52a: Occupied Bandwidth, Band 4 Mid Channel, 20MHz BW (RB= 100) 16-QAM

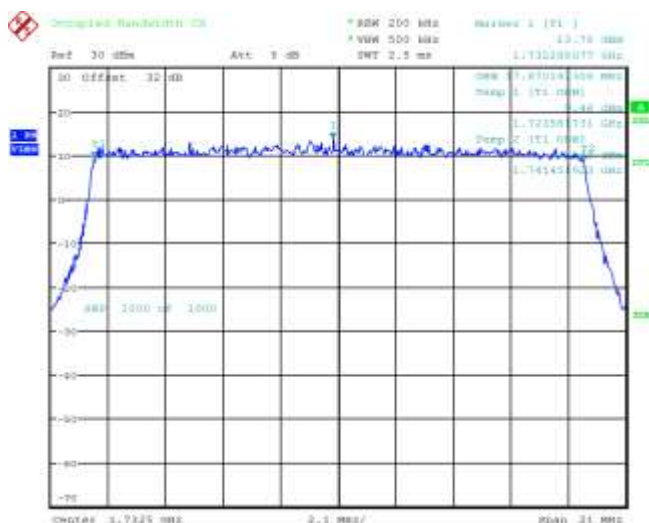
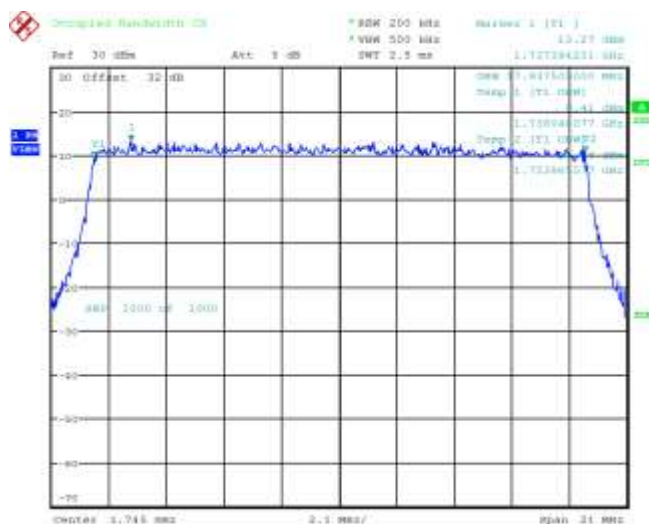


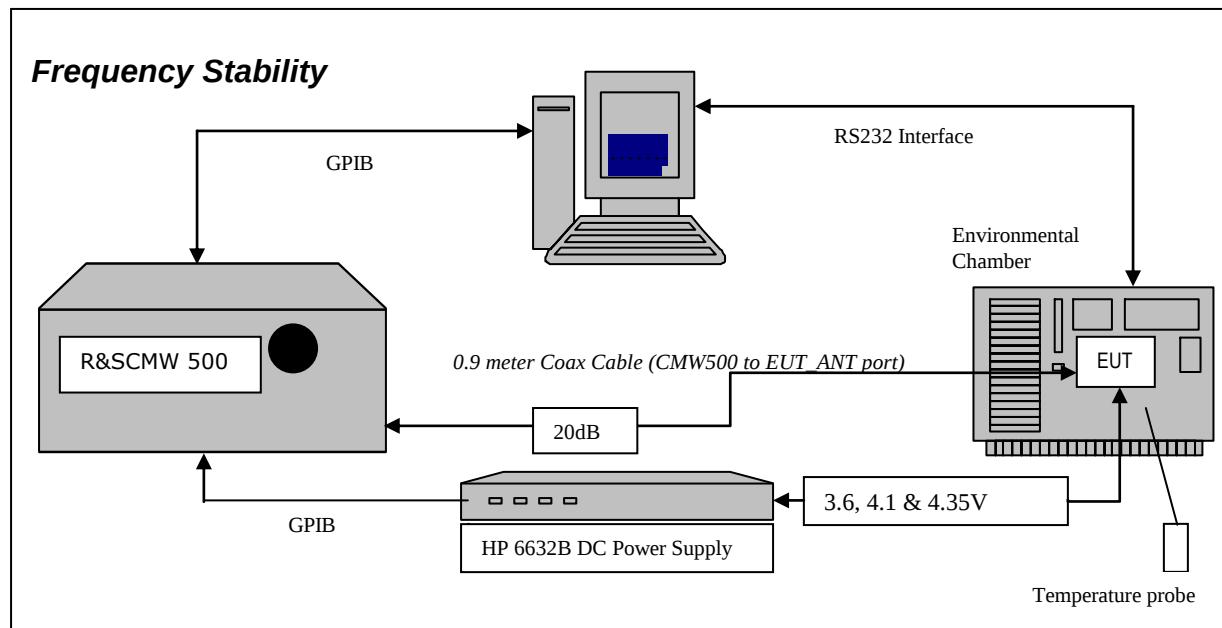
Figure 5-53a: Occupied Bandwidth, Band 4 High Channel, 20MHz BW (RB= 100) 16-QAM



APPENDIX 5B – LTE Band 4 FREQUENCY STABILITY TEST DATA

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 4 Frequency Stability Test Data



The following measurements were performed by Chuan Tran.

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2 Required Measurements

2.1055 Frequency Stability - Procedures

(a,b) Frequency Stability - Temperature Variation

(d) Frequency Stability - Voltage Variation

The EUT meets the requirements as stated in CFR 47 chapter 1, Section 27.54, CFR 47 and RSS-139, 6.3 Frequency Stability.

Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-metre coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMW 500 and the EUT antenna port.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Test Setup:

The EUT was placed in the Temperature chamber and connected to CMW 500 outside as shown in the figure above. Dry air was pumped inside the temperature chamber to maintain a backpressure during the test. The EUT was kept in the off condition at all times except when the following measurements were to be made.

The chamber was switched on and the temperature was set to -30°C. After the chamber stabilized at -30 °C there was a soak period of one hour to alleviate moisture in the chamber, the EUT voltage was enabled. The system software recorded the frequency, power, and associated measurements.

A Computer system controlled the automated software. This application was given the command of activating all machines intrinsic to the temperature and voltage tests controlling the CMW 500 via the GPIB Bus. The Environmental Chamber was instructed through an RS-232 serial line. The EUT dialogue was passed through a serial connection.

The EUT repetitively transmitted 100 bursts for each set of programmed parameters recording temperature, voltage settings, and systematically selected frequencies. The power supply was cycled from minimum voltage 3.6 volts, to 4.1 volts and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 4.1 volts and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 1720.0 MHz, 1732.5 MHz and 1745.0 MHz each was measured under 20 MHz bandwidth with maximum (100) RBs. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million.

After the initial one-hour soak at the beginning of the tests, a period of thirty minutes soak was initialized between each ascending temperature step, before proceeding to the next measurement test cycle.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Procedure:

The test system software for commencing the Frequency Stability Tests carried through the following cycle.

29. Switch on the HP 6632B power supply; CMW 500 Communications test Set, and Environmental Chamber.
30. Start test program
31. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
32. Set power supply voltage to 3.6 volts.
33. Set up CMW 500 Radio Communication Tester.
34. Command the CMW 500 to switch to the low channel.
35. Enable the voltage to the EUT, and connect a link to the CMW 500 test set.
36. EUT is commanded to Transmit 100 Bursts.
37. Software logs the following data from the CMW 500, power supply and temperature chamber: Traffic Channel Number, Traffic Channel Frequency, Power Level, Chamber Temperature, Supply Voltage, Power and Frequency Error.
38. The CMW 500 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
39. Repeat steps 5 to 10 changing the supply voltage to 4.1 Volts
40. Increase temperature by 10°C and soak for 1/2 hour.
41. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
42. Repeat steps 5 to 10 changing the supply voltage to 4.35 volts

Procedure 5 to 10 was repeated at room temperature (20°C) with the power supply voltage set to 3.6, 4.1 and 4.35 volts

The maximum frequency error in the LTE band 4 measured was **-0.0118PPM**.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 4 results: channels 20050, 20175 and 20300 @ 20°C maximum transmitted power

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	3.6	20	-6.59	-0.0038
20175	1732.5	3.6	20	10.17	0.0059
20300	1745.0	3.6	20	6.95	0.0040

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	4.1	20	4.94	0.0029
20175	1732.5	4.1	20	8.74	0.0050
20300	1745.0	4.1	20	6.95	0.0040

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	4.35	20	6.82	0.0040
20175	1732.5	4.35	20	9.64	0.0056
20300	1745.0	4.35	20	8.57	0.0049

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE band 4 Results: channel 20050 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	3.6	-30	-7.30	-0.0042
20050	1720.0	3.6	-20	-6.22	-0.0036
20050	1720.0	3.6	-10	-6.35	-0.0037
20050	1720.0	3.6	0	9.44	0.0055
20050	1720.0	3.6	10	-5.71	-0.0033
20050	1720.0	3.6	20	-6.59	-0.0038
20050	1720.0	3.6	30	7.34	0.0043
20050	1720.0	3.6	40	-7.12	-0.0041
20050	1720.0	3.6	50	-6.55	-0.0038
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	4.1	-30	-5.74	-0.0033
20050	1720.0	4.1	-20	5.85	0.0034
20050	1720.0	4.1	-10	-7.97	-0.0046
20050	1720.0	4.1	0	5.11	0.0030
20050	1720.0	4.1	10	4.36	0.0025
20050	1720.0	4.1	20	4.94	0.0029
20050	1720.0	4.1	30	-7.70	-0.0045
20050	1720.0	4.1	40	-6.67	-0.0039
20050	1720.0	4.1	50	-7.78	-0.0045
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	4.35	-30	-8.96	-0.0052
20050	1720.0	4.35	-20	-6.35	-0.0037
20050	1720.0	4.35	-10	6.85	0.0040
20050	1720.0	4.35	0	-1.37	-0.0008
20050	1720.0	4.35	10	1.11	0.0006
20050	1720.0	4.35	20	6.82	0.0040
20050	1720.0	4.35	30	-6.49	-0.0038
20050	1720.0	4.35	40	-7.14	-0.0042
20050	1720.0	4.35	50	-6.39	-0.0037

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE band 4 Results: channel 20175 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20175	1732.5	3.6	-30	-4.88	-0.0028
20175	1732.5	3.6	-20	6.88	0.0040
20175	1732.5	3.6	-10	9.17	0.0053
20175	1732.5	3.6	0	3.55	0.0020
20175	1732.5	3.6	10	3.69	0.0021
20175	1732.5	3.6	20	10.17	0.0059
20175	1732.5	3.6	30	7.04	0.0041
20175	1732.5	3.6	40	8.30	0.0048
20175	1732.5	3.6	50	12.13	0.0070
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20175	1732.5	4.1	-30	8.77	0.0051
20175	1732.5	4.1	-20	8.96	0.0052
20175	1732.5	4.1	-10	9.00	0.0052
20175	1732.5	4.1	0	-2.36	-0.0014
20175	1732.5	4.1	10	6.45	0.0037
20175	1732.5	4.1	20	8.74	0.0050
20175	1732.5	4.1	30	8.00	0.0046
20175	1732.5	4.1	40	7.70	0.0044
20175	1732.5	4.1	50	7.37	0.0043
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20175	1732.5	4.35	-30	-5.55	-0.0032
20175	1732.5	4.35	-20	-6.87	-0.0040
20175	1732.5	4.35	-10	7.17	0.0041
20175	1732.5	4.35	0	2.11	0.0012
20175	1732.5	4.35	10	-2.26	-0.0013
20175	1732.5	4.35	20	9.64	0.0056
20175	1732.5	4.35	30	5.41	0.0031
20175	1732.5	4.35	40	7.34	0.0042
20175	1732.5	4.35	50	-7.14	-0.0041

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5B	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE band 4 Results: channel 20300 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20300	1745.0	3.6	-30	-6.19	-0.0035
20300	1745.0	3.6	-20	8.61	0.0049
20300	1745.0	3.6	-10	6.67	0.0038
20300	1745.0	3.6	0	-5.95	-0.0034
20300	1745.0	3.6	10	4.25	0.0024
20300	1745.0	3.6	20	6.95	0.0040
20300	1745.0	3.6	30	-8.93	-0.0051
20300	1745.0	3.6	40	-4.85	-0.0028
20300	1745.0	3.6	50	-6.27	-0.0036
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20300	1745.0	4.1	-30	8.96	0.0051
20300	1745.0	4.1	-20	-6.42	-0.0037
20300	1745.0	4.1	-10	7.50	0.0043
20300	1745.0	4.1	0	6.55	0.0038
20300	1745.0	4.1	10	-4.36	-0.0025
20300	1745.0	4.1	20	6.95	0.0040
20300	1745.0	4.1	30	-7.00	-0.0040
20300	1745.0	4.1	40	6.25	0.0036
20300	1745.0	4.1	50	-6.49	-0.0037
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20300	1745.0	4.35	-30	-7.82	-0.0045
20300	1745.0	4.35	-20	6.79	0.0039
20300	1745.0	4.35	-10	7.67	0.0044
20300	1745.0	4.35	0	5.51	0.0032
20300	1745.0	4.35	10	-3.68	-0.0021
20300	1745.0	4.35	20	8.57	0.0049
20300	1745.0	4.35	30	8.27	0.0047
20300	1745.0	4.35	40	-5.11	-0.0029
20300	1745.0	4.35	50	4.66	0.0027

APPENDIX 5C – LTE Band 4 RADIATED EMISSIONS TEST DATA

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 5C	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Radiated Power Test Data Results

The following measurements were performed by Rex Zhang.

Date of Test: July 16, 2014

The environmental tests conditions were: Temperature: 25.0 °C

Relative Humidity: 29.5 %

The BlackBerry® smartphone was standalone, USB up with the LCD facing to the RX antenna when the turntable is at 0 degree position.

Measurements were performed with QPSK and 16QAM modulations. The smallest test margins are reported below.

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

LTE band 4, 15MHz BW, RB=1, QPSK modulation

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator)		Limit (dBm)	Diff to Limit (dB)
										(dBm)	(W)		
F0	20000	1715.00	4	Horn	V	-21.14	-21.14	V-V	-11.47	29.13	0.82	30.00	0.87
F0	20000	1715.00	4	Horn	H	-31.55		H-H	-11.08				
F0	20175	1732.50	4	Horn	V	-21.92	-21.92	V-V	-11.87	28.94	0.78	30.00	1.06
F0	20175	1732.50	4	Horn	H	-30.92		H-H	-11.39				
F0	20349	1749.90	4	Horn	V	-21.80	-21.80	V-V	-11.20	29.35	0.86	30.00	0.65
F0	20349	1749.90	4	Horn	H	-31.66		H-H	-10.68				

LTE band 4, 15MHz BW, RB=1, 16-QAM modulation

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency	Band	Type	Pol.	Reading	Max (V,H)	Pol.	Reading	Corrected Reading (relative to Isotropic Radiator)		Limit	Diff to Limit
		(MHz)				(dBuV)	(dBuV)			(dBm)	(W)		
F0	20000	1715.00	4	Horn	V	-22.17	-22.17	V-V	-12.51	28.06	0.64	30.00	1.94
F0	20000	1715.00	4	Horn	H	-32.91		H-H	-12.15				
F0	20175	1732.50	4	Horn	V	-22.94	-22.94	V-V	-12.86	27.93	0.62	30.00	2.07
F0	20175	1732.50	4	Horn	H	-31.84		H-H	-12.40				
F0	20349	1749.90	4	Horn	V	-23.22	-23.22	V-V	-12.66	27.92	0.62	30.00	2.08
F0	20349	1749.90	4	Horn	H	-32.68		H-H	-12.11				

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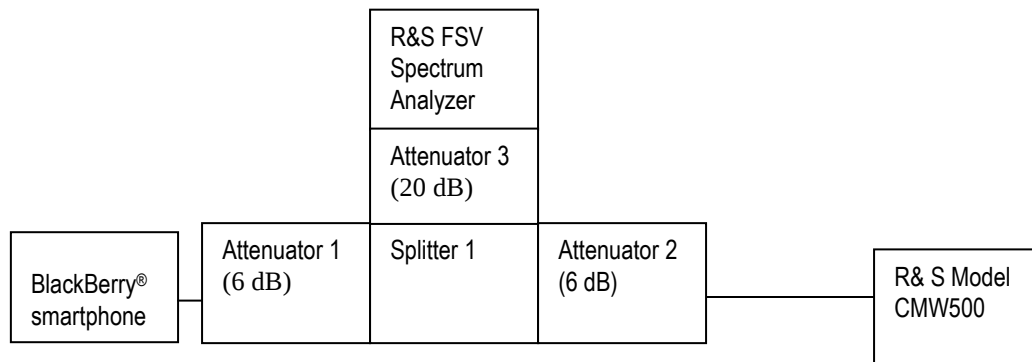
APPENDIX 6A– LTE Band 17 CONDUCTED RF EMISSIONS TEST DATA/PLOTS

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 6A	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

LTE Band 17 Conducted RF Emission Test Data

This appendix contains measurement data pertaining to conducted spurious emissions, 99% power bandwidth and the channel mask.

Test Setup Diagram



A reference offset of 32.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SERIAL NUMBER</u>
Attenuator 1	Mini-Circuits	BW-S6W2+	0647
Attenuator 2	Mini-Circuits	BW-S6W2+	0648
Attenuator 3	Mini-Circuits	BW-S20-2W263+	1234
Splitter 1	Weinschel	1515	MES 92

Date of Test: June 26-27, 2014.

The environmental test conditions were: Temperature: 21.8 – 22.5°C
 Relative Humidity: 19 – 19.2 %

The following measurements were performed by Chuan Tran.

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LTE Band 17 Conducted RF Emission Test Data cont'd

Emission Designator Table

Frequency Range (MHz)	Conducted Output Power (dBm)	Emission Designator	Band	Bandwidth (MHz)	Modulation
706.5-713.5	23.22	4M48G7D	LTE B17	5	QPSK
706.5-713.5	22.47	4M47D7W	LTE B17	5	16QAM
709-711	23.34	8M95G7D	LTE B17	10	QPSK
709-711	22.80	8M93D7W	LTE B17	10	16QAM

The conducted spurious emissions – As per 47 CFR 2.202, CFR 2.1046, CFR 27.53 CFR 27.54, CFR 27.50, RSS-139 were measured from 30 MHz to 20 GHz.

–26 dBc Bandwidth and Occupied Bandwidth (99%)

the modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth for each 5MHz and 10MHz with different number of RBs for LTE band 17. QPSK and 16-QAM modulations were applied to each of the bandwidths. Only the worst case measurements are documented in this report.

A minimum RB condition was also measured (RB = 1).

The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.

The worst case –26dBc bandwidth for LTE band 17 was measured to be 9.359MHz. Results were derived in a 100 kHz resolution bandwidth.

On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

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Test Data for LTE Band 17 selected Frequencies in 10MHz BW (RB = 50)

LTE Band 17 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	QPSK	16-QAM
709.0	9.32	8.955	8.973
710.0	9.359	8.973	8.955
711.0	9.359	8.955	8.955

Peak to Average Ratio (PAR)

For each 5MHz and 10MHz with different number of RBs as per scalable bandwidths for LTE band 17, the peak to average ratio was measured on the low, middle and high channels with QPSK modulation.

On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

The worst case measured was 10.48 dB on in 10MHz bandwidth with 50 RBs.

Measurement Plots for LTE Band 17

See Figures 6-1a to 6-12a for the plots of the conducted spurious emissions.

See Figures 6-19a to 6-24a and 6-37a to 6-39a for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.

See Figures 6-25a to 6-32a for the plots of the Channel mask.

See Figures 6-33a to 6-36a for the plots of the Peak to Average Ratio.

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 6A	
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LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 6-1a: Band 17, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)

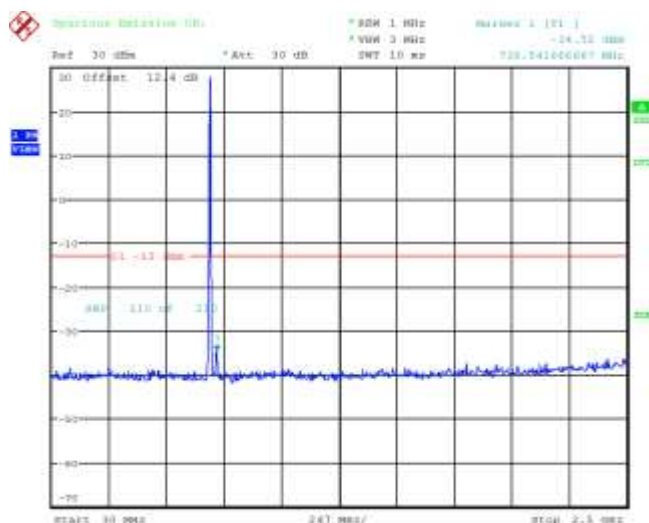


Figure 6-2a: Band 17, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)

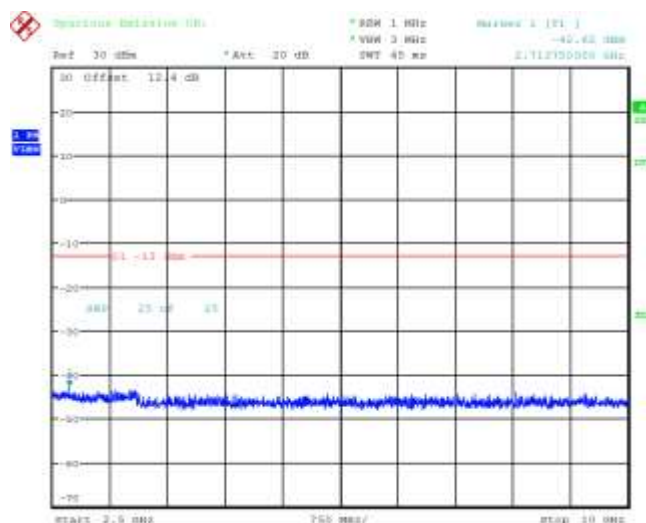


Figure 6-3a: Band 17, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 25)

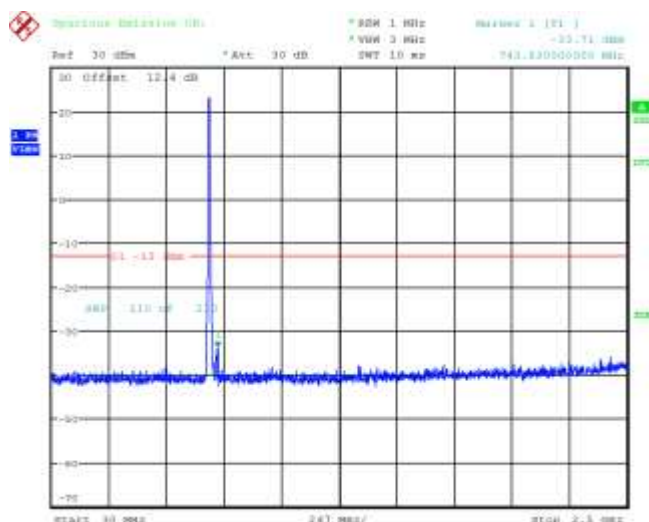
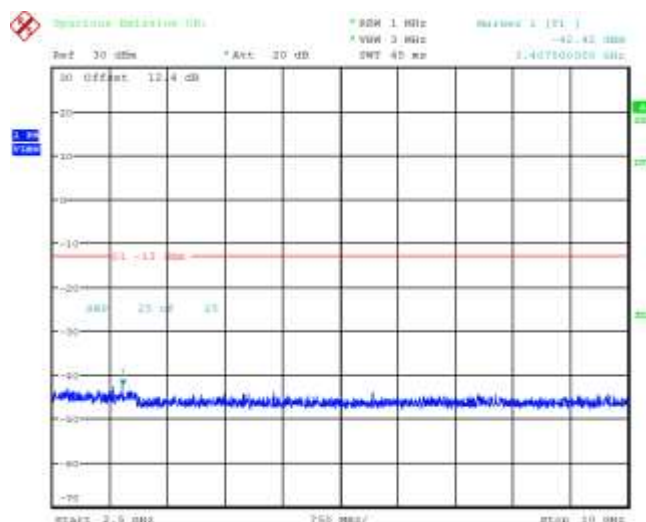


Figure 6-4a: Band 17, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 25)



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LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 6-5a: Band 17, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)

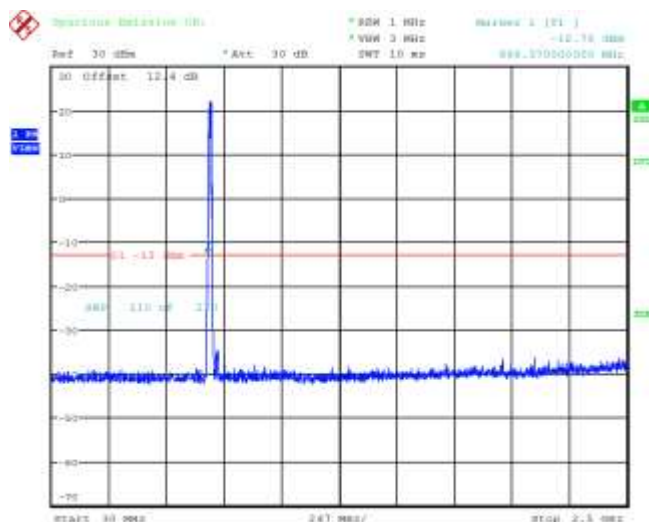


Figure 6-6a: Band 17, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)

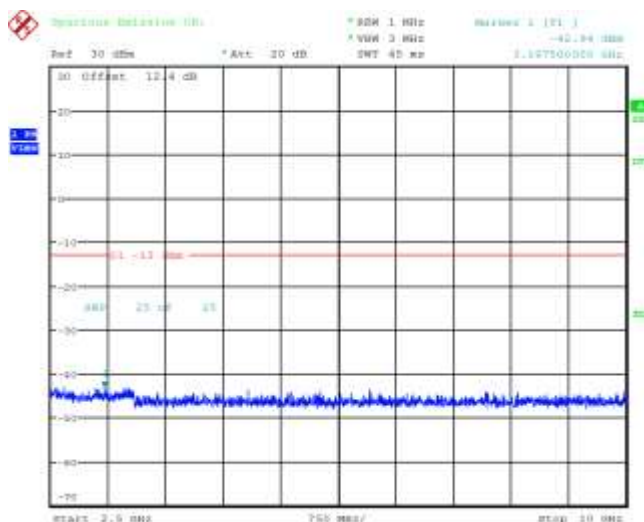


Figure 6-7a: Band 17, Spurious Conducted Emissions, Low channel, 5MHz BW (RB= 1)

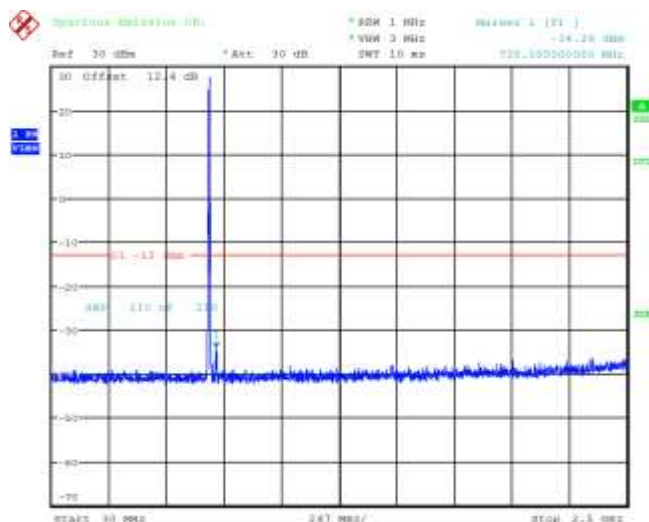
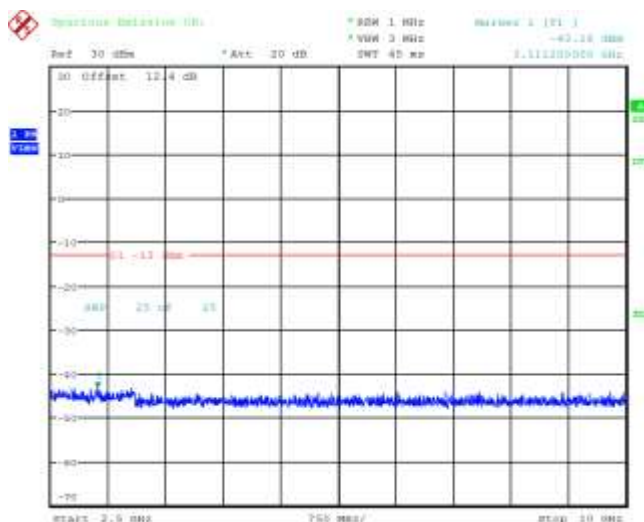


Figure 6-8a: Band 17, Spurious Conducted Emissions, Low channel, 5MHz BW (RB= 1)



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LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 6-9a: Band 17, Spurious Conducted Emissions, Middle Channel, 5MHz BW (RB= 15)

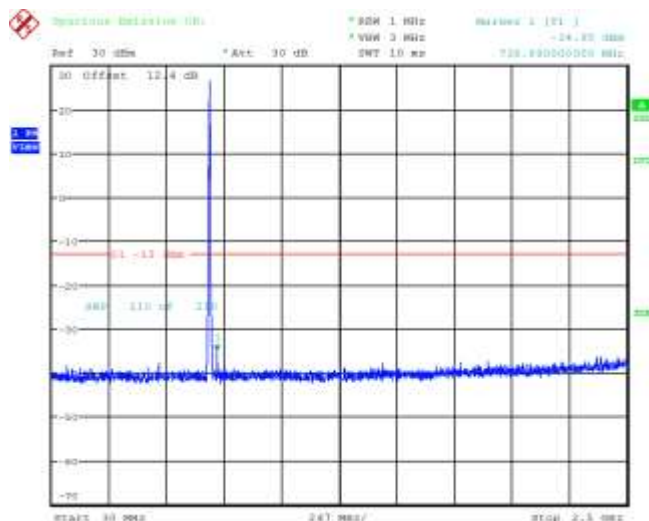


Figure 6-10a: Band 17, Spurious Conducted Emissions, High Channel, 5MHz BW (RB= 15)

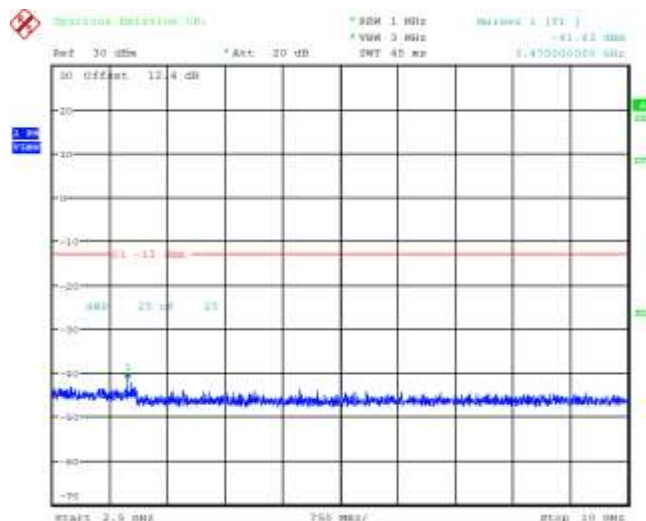


Figure 6-11a: Band 17, Spurious Conducted Emissions, High channel, 5MHz BW (RB= 25)

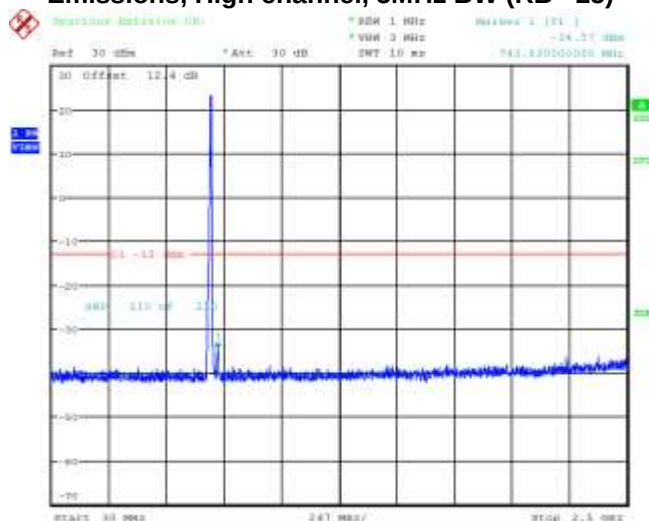
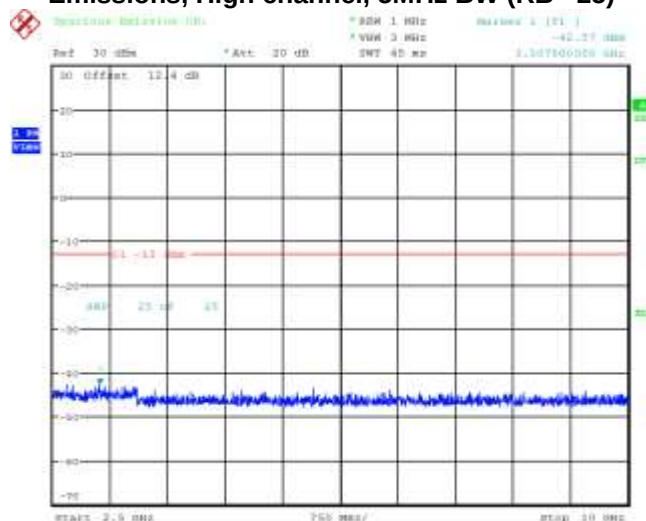


Figure 6-12a: Band 17, Spurious Conducted Emissions, High channel, 5MHz BW (RB= 25)



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LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 6-13a: Occupied Bandwidth, Band 17 Low Channel, 10MHz BW, RB=50

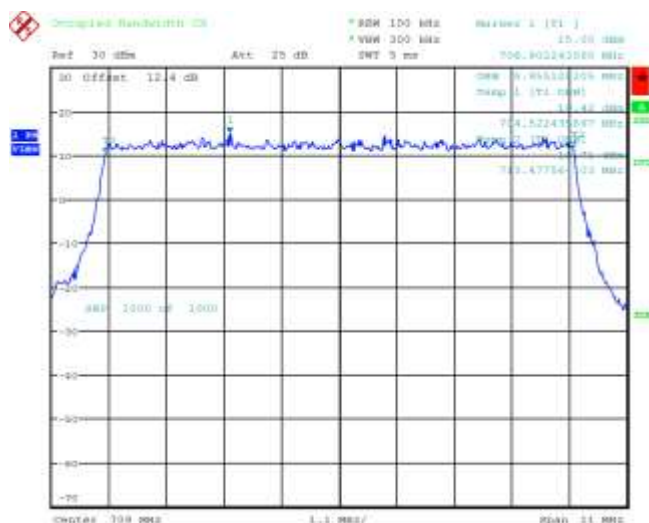


Figure 6-14a: Occupied Bandwidth, Band 17 Middle Channel, 10MHz BW, RB=50

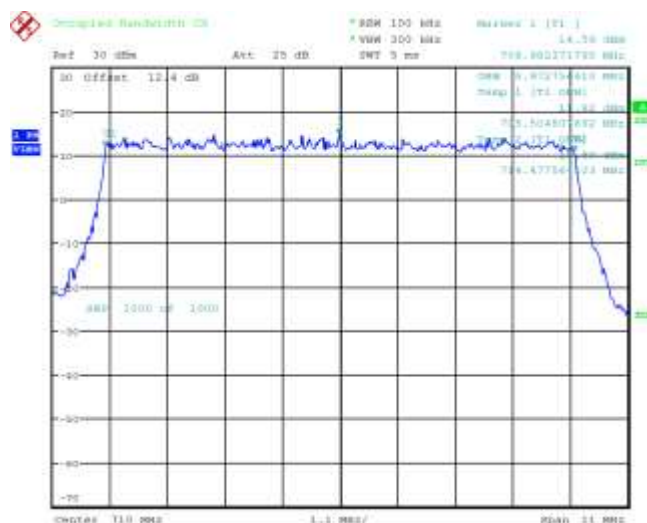
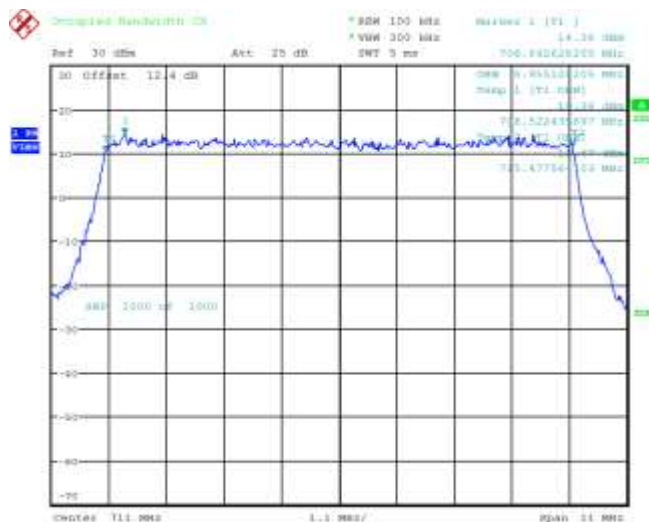


Figure 6-15a: Occupied Bandwidth, Band 17 High Channel, 10MHz BW, RB=50



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LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 6-16a: Occupied Bandwidth, Band 5 Low Channel, 5MHz BW, RB=25

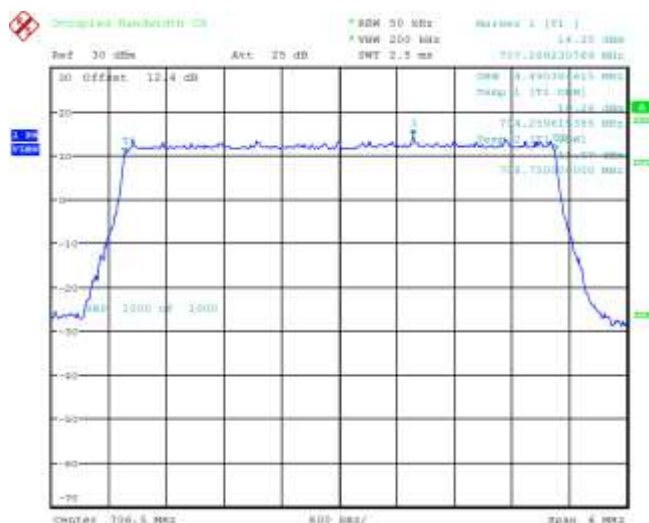


Figure 6-17a: Occupied Bandwidth, Band 5 Middle Channel, 5MHz BW, RB=25



Figure 6-18a: Occupied Bandwidth, Band 5 High Channel, 5MHz BW, RB=25



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LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 6-19a: -26 dBc Bandwidth, Band 17 Low Channel, 10MHz BW, RB=50

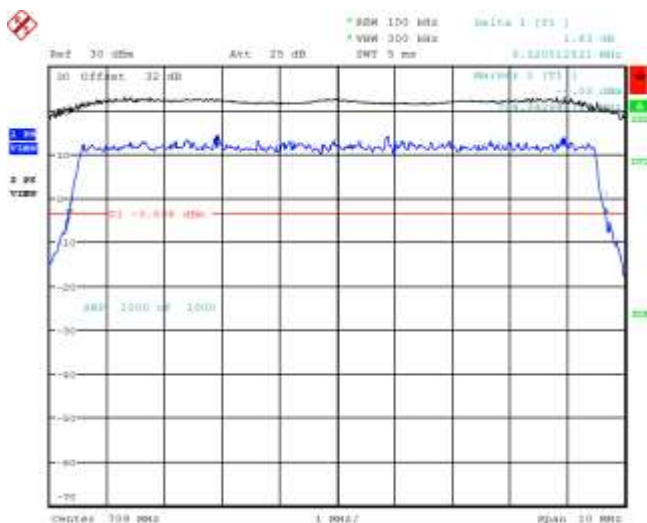


Figure 6-20a: -26 dBc Bandwidth, Band 17 Middle Channel, 10MHz BW, RB=50

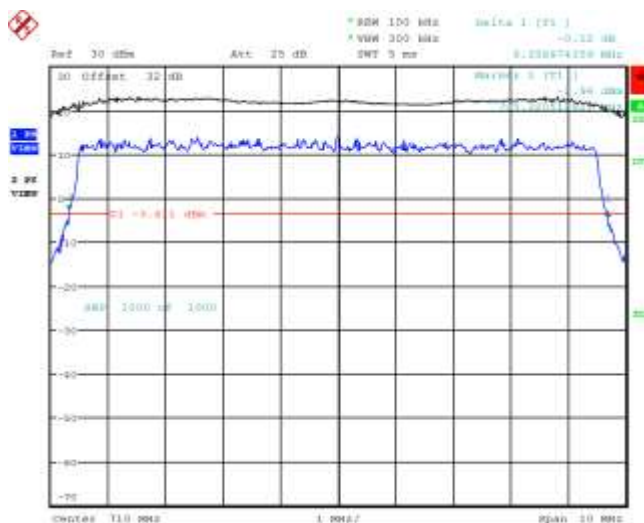


Figure 6-21a: -26 dBc Bandwidth, Band 17 High Channel, 10MHz BW, RB=50

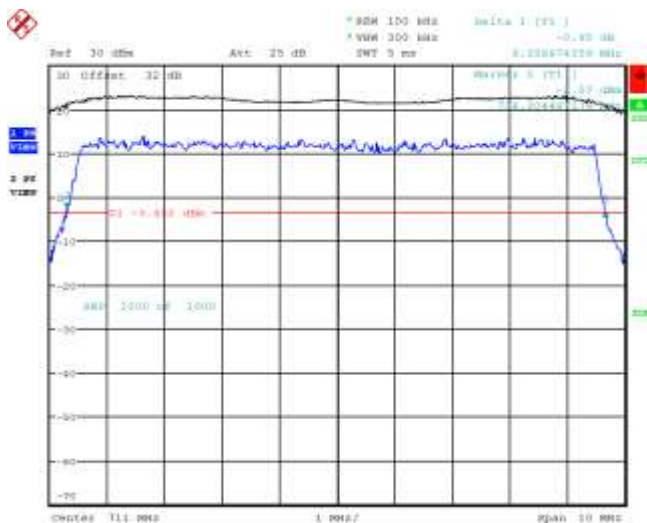
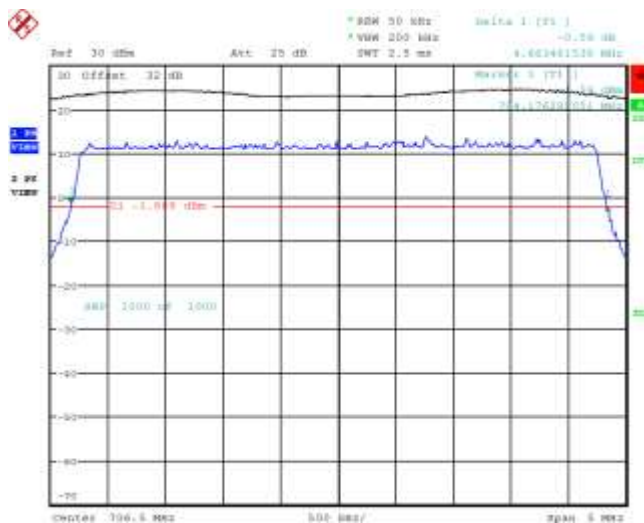


Figure 6-22a: -26 dBc Bandwidth, Band 17 Low Channel, 5MHz BW, RB=25



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LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 6-23a: -26 dBc Bandwidth, Band 17 Middle Channel, 5MHz BW, RB=25

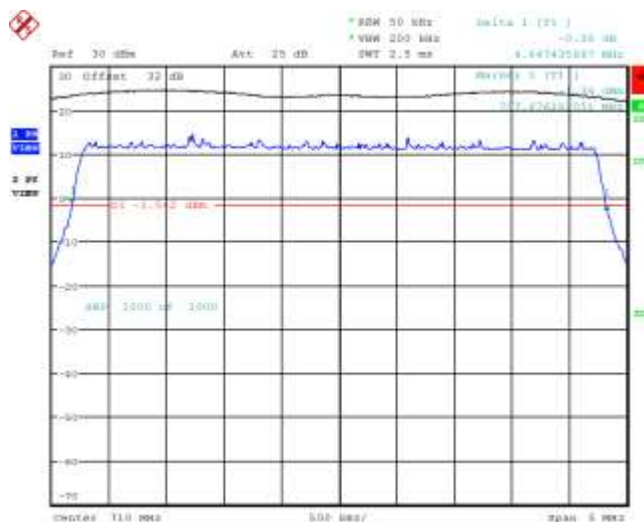


Figure 6-24a: -26 dBc Bandwidth, Band 17 High Channel, 5MHz BW, RB=25

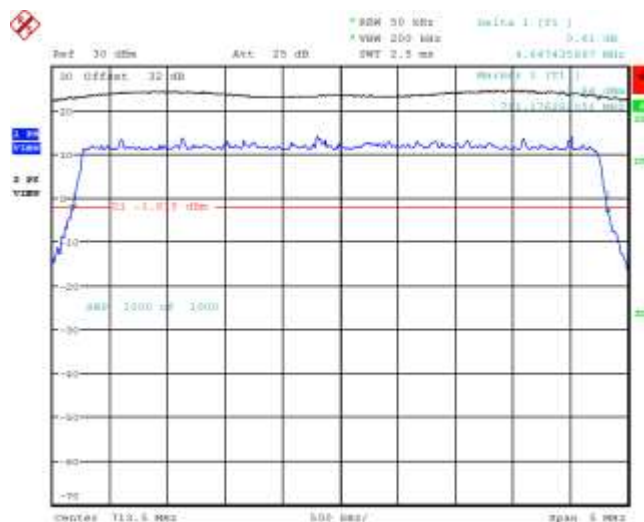


Figure 6-25a: Band 17 Low Channel Mask, 10MHz BW, RB=50

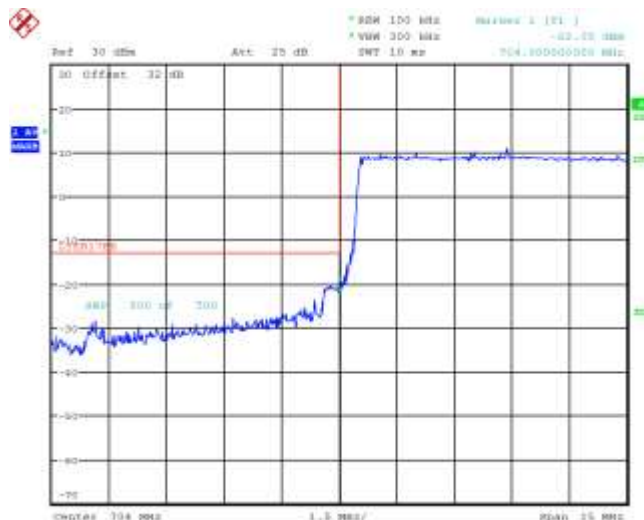
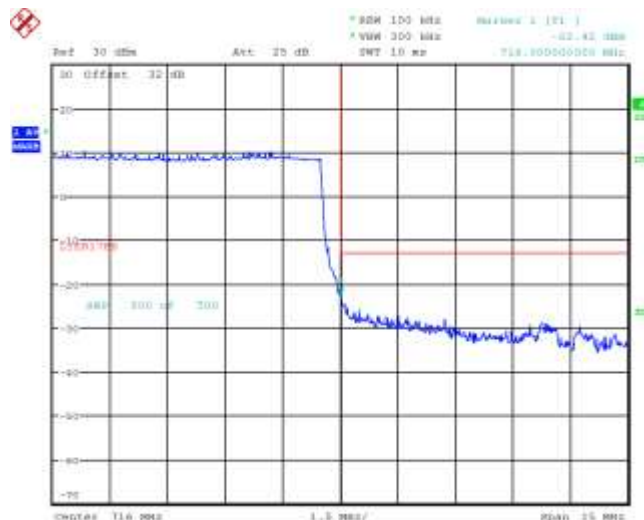


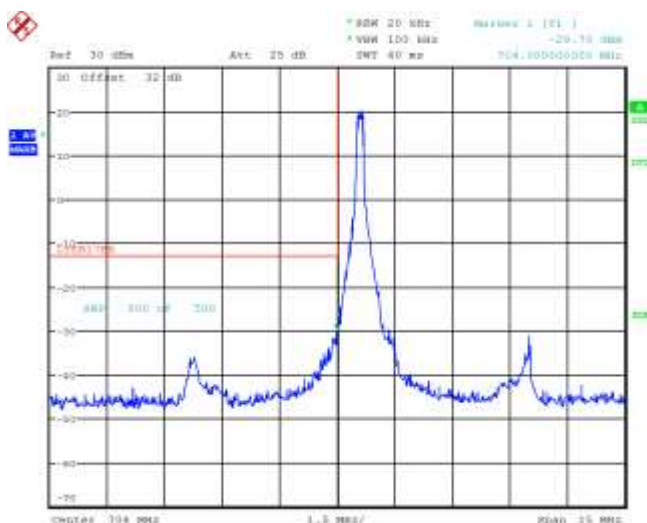
Figure 6-26a: Band 17 High Channel Mask, 10MHz BW, RB=50



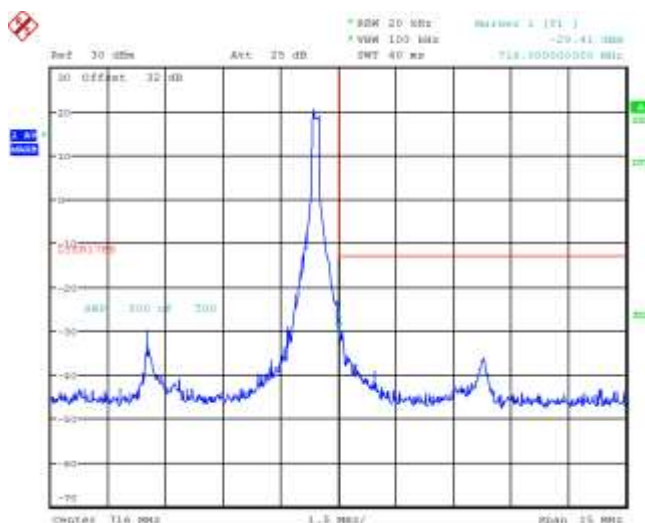
	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 6A	
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LTE Band 17 Conducted RF Emission Test Data cont'd

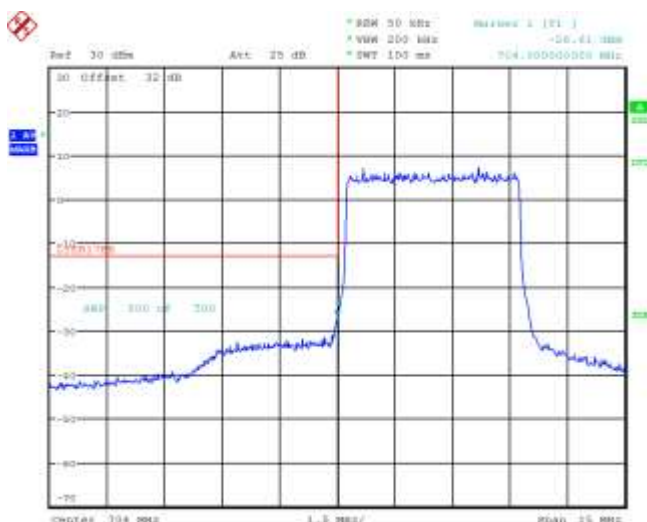
**Figure 6-27a: Band 17 Low Channel Mask, 10MHz
BW, RB=1**



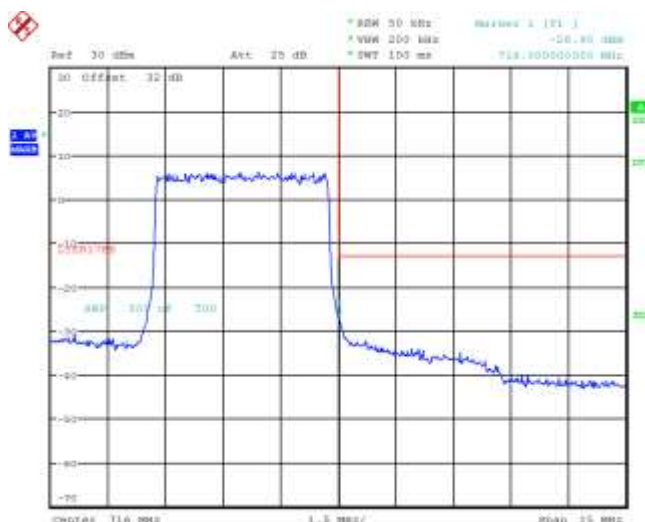
**Figure 6-28a: Band 17 High Channel Mask, 10MHz
BW, RB=1**



**Figure 6-29a: Band 17 Low Channel Mask, 5MHz
BW, RB=25**



**Figure 6-30a: Band 17 High Channel Mask, 5MHz
BW, RB=25**



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LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 6-31a: Band 17 Low Channel Mask, 5MHz BW, RB=1

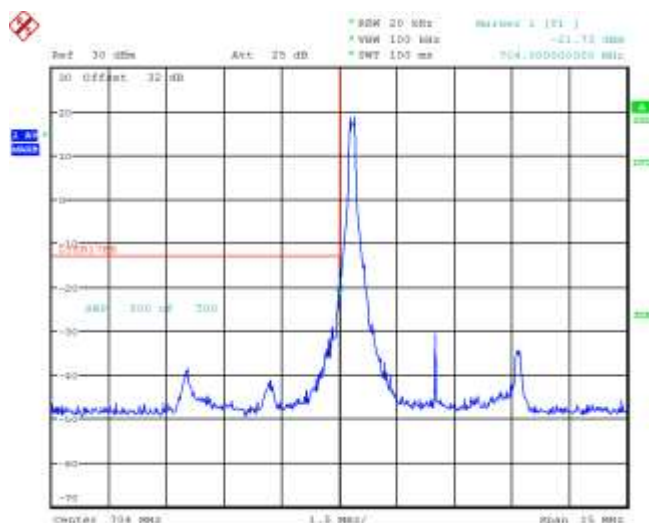


Figure 6-32a: Band 17 High Channel Mask, 5MHz BW, RB=1

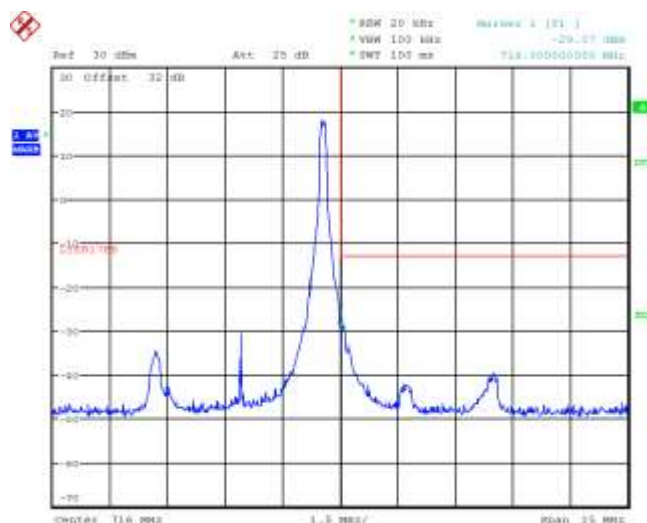


Figure 6-33a: Band 17 Mid Channel PAR, 10MHz BW, RB=25

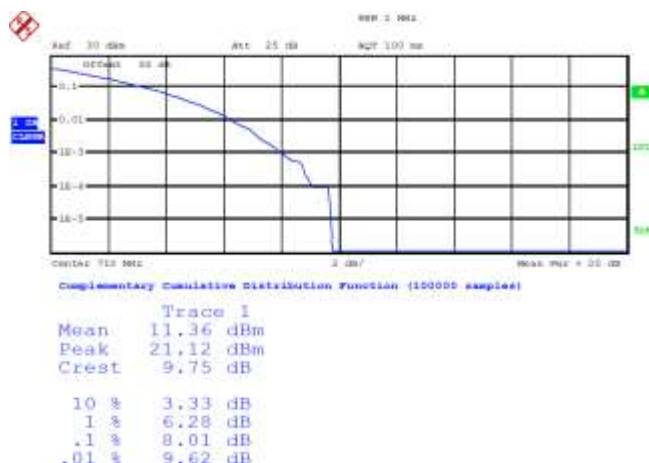
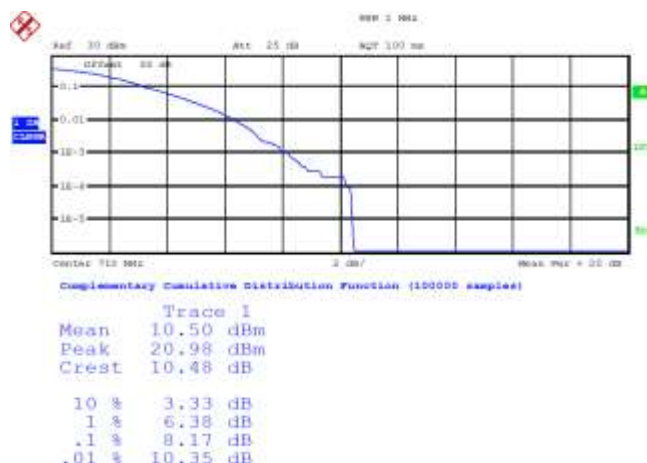


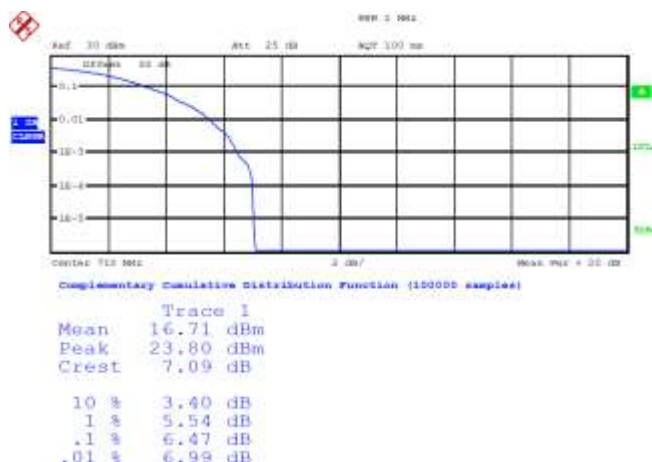
Figure 6-34a: Band 17 Middle Channel PAR, 10MHz BW, RB=50



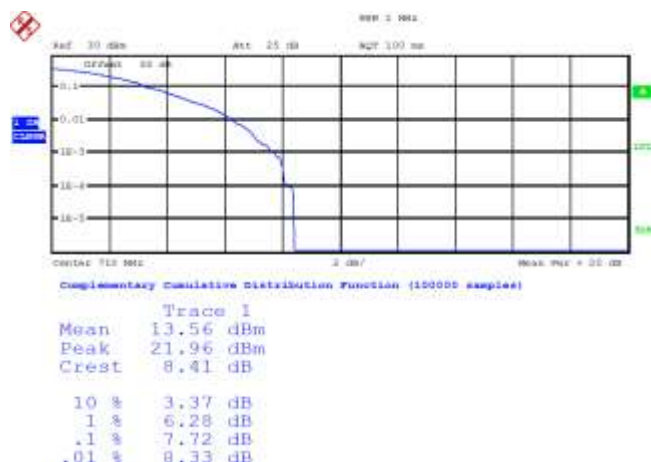
BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 6A	
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LTE Band 17 Conducted RF Emission Test Data cont'd

**Figure 6-35a: Band 17 Mid Channel PAR, 5MHz
BW, RB=15**



**Figure 6-36a: Band 17 Mid Channel PAR, 5MHz
BW, RB=25**



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LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 6-37a: Occupied Bandwidth, Band 17 Low Channel, 20MHz BW (RB= 100) 16-QAM

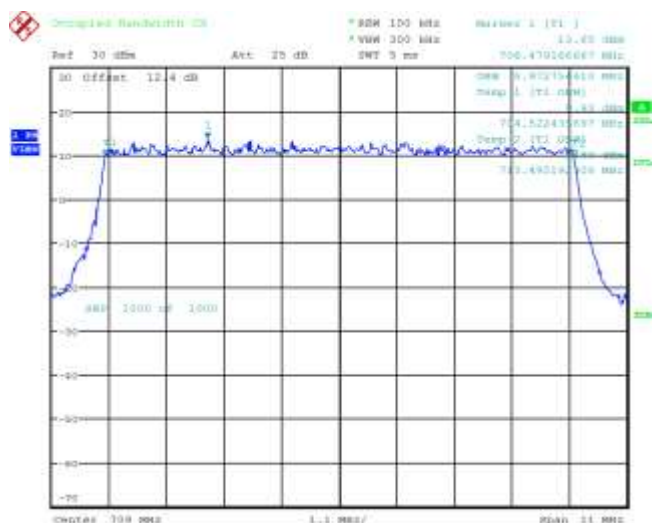


Figure 6-38a: Occupied Bandwidth, Band 17 Mid Channel, 20MHz BW (RB= 100) 16-QAM

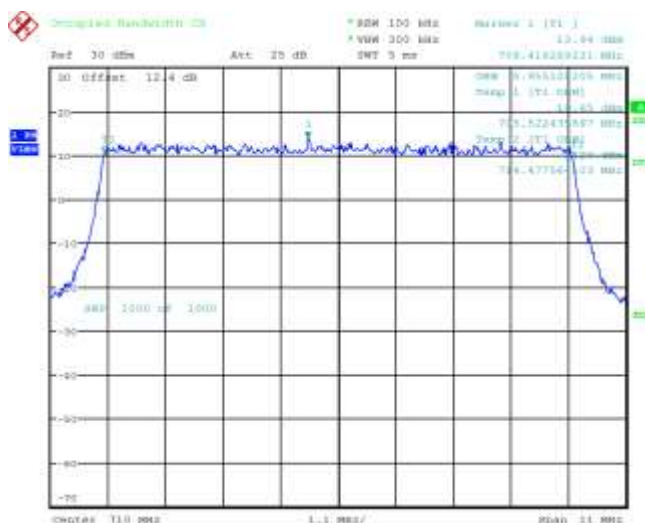
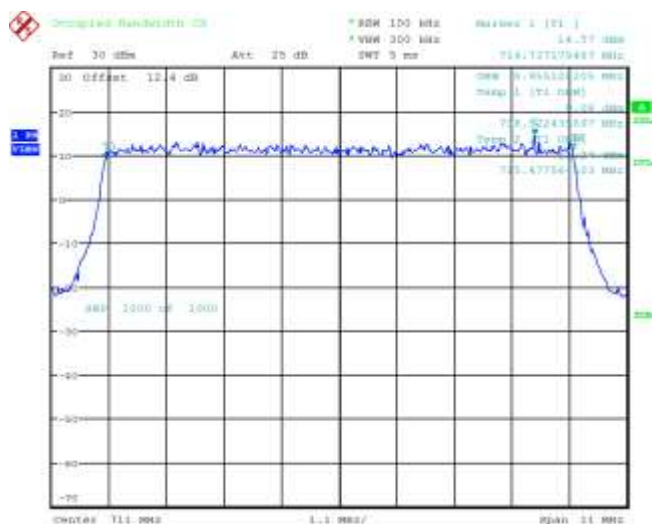


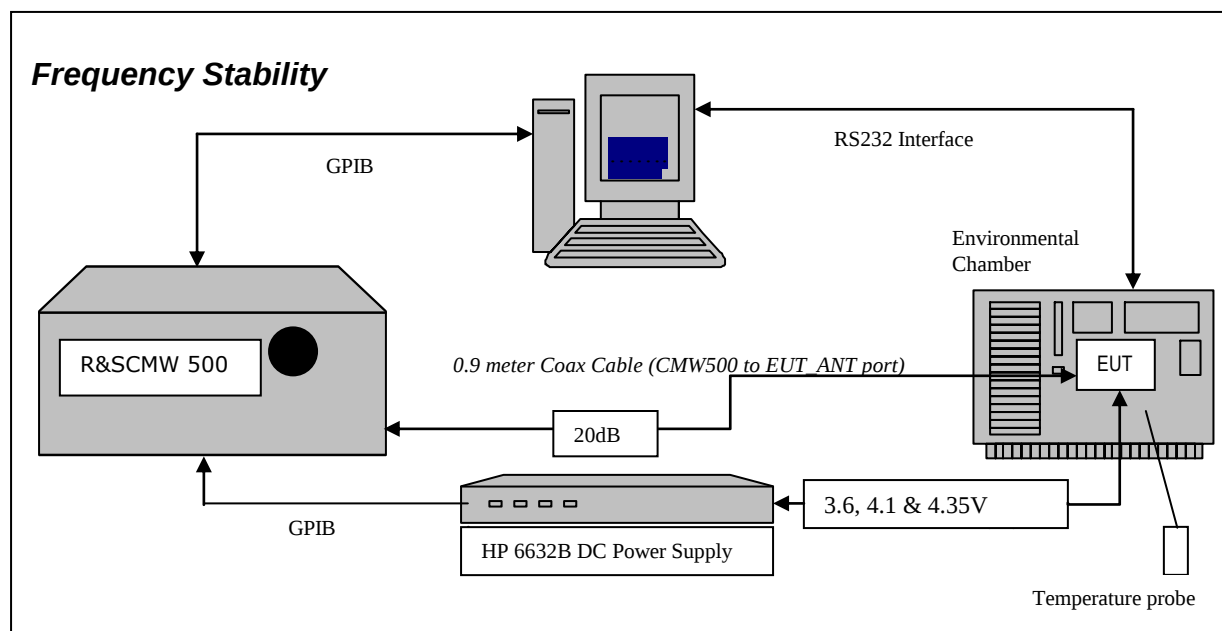
Figure 6-39a: Occupied Bandwidth, Band 17 High Channel, 20MHz BW (RB= 100) 16-QAM



APPENDIX 6B – LTE Band 17 FREQUENCY STABILITY TEST DATA

BlackBerry	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 6B	
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LTE Band 17 Frequency Stability Test Data



The following measurements were performed by Chuan Tran.

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2 Required Measurements

2.1055 Frequency Stability - Procedures

(a,b) Frequency Stability - Temperature Variation

(d) Frequency Stability - Voltage Variation

The EUT meets the requirements as stated in CFR 47 chapter 1, Section 27.54, CFR 47 and RSS-139, 6.3 Frequency Stability.

Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-metre coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMW 500 and the EUT antenna port.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 6B	
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Test Setup:

The EUT was placed in the Temperature chamber and connected to CMW 500 outside as shown in the figure above. Dry air was pumped inside the temperature chamber to maintain a backpressure during the test. The EUT was kept in the off condition at all times except when the following measurements were to be made.

The chamber was switched on and the temperature was set to -30°C. After the chamber stabilized at -30 °C there was a soak period of one hour to alleviate moisture in the chamber, the EUT voltage was enabled. The system software recorded the frequency, power, and associated measurements.

A Computer system controlled the automated software. This application was given the command of activating all machines intrinsic to the temperature and voltage tests controlling the CMW 500 via the GPIB Bus. The Environmental Chamber was instructed through an RS-232 serial line. The EUT dialogue was passed through a serial connection.

The EUT repetitively transmitted 100 bursts for each set of programmed parameters recording temperature, voltage settings, and systematically selected frequencies. The power supply was cycled from minimum voltage 3.6 volts, to 4.1 volts and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 4.1 volts and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 709.0 MHz, 710.0 MHz and 711.0 MHz each was measured under 10 MHz bandwidth with maximum (50) RBs. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million.

After the initial one-hour soak at the beginning of the tests, a period of thirty minutes soak was initialized between each ascending temperature step, before proceeding to the next measurement test cycle.

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Procedure:

The test system software for commencing the Frequency Stability Tests carried through the following cycle.

43. Switch on the HP 6632B power supply; CMW 500 Communications test Set, and Environmental Chamber.
44. Start test program
45. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
46. Set power supply voltage to 3.6 volts.
47. Set up CMW 500 Radio Communication Tester.
48. Command the CMW 500 to switch to the low channel.
49. Enable the voltage to the EUT, and connect a link to the CMW 500 test set.
50. EUT is commanded to Transmit 100 Bursts.
51. Software logs the following data from the CMW 500, power supply and temperature chamber: Traffic Channel Number, Traffic Channel Frequency, Power Level, Chamber Temperature, Supply Voltage, Power and Frequency Error.
52. The CMW 500 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
53. Repeat steps 5 to 10 changing the supply voltage to 4.1 Volts
54. Increase temperature by 10°C and soak for 1/2 hour.
55. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
56. Repeat steps 5 to 10 changing the supply voltage to 4.35 volts

Procedure 5 to 10 was repeated at room temperature (20°C) with the power supply voltage set to 3.6, 4.1 and 4.35 volts

The maximum frequency error in the LTE band 17 measured was **-0.0176PPM**.

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 6B	
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LTE Band 17 results: channels 23780, 23790 and 23800 @ 20°C maximum transmitted power

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23780	709.0	3.6	20	-3.59	-0.0051
23790	710.0	3.6	20	3.85	0.0054
23800	711.0	3.6	20	3.10	0.0044

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23780	709.0	4.1	20	3.89	0.0055
23790	710.0	4.1	20	4.86	0.0068
23800	711.0	4.1	20	2.70	0.0038

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23780	709.0	4.35	20	2.98	0.0042
23790	710.0	4.35	20	3.25	0.0046
23800	711.0	4.35	20	2.65	0.0037

	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 6B	
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LTE band 17 Results: channel 23780 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23780	709.0	3.6	-30	-4.28	-0.0060
23780	709.0	3.6	-20	-3.81	-0.0054
23780	709.0	3.6	-10	-3.75	-0.0053
23780	709.0	3.6	0	-3.19	-0.0045
23780	709.0	3.6	10	-3.29	-0.0046
23780	709.0	3.6	20	-3.59	-0.0051
23780	709.0	3.6	30	-3.68	-0.0052
23780	709.0	3.6	40	-5.29	-0.0075
23780	709.0	3.6	50	-4.68	-0.0066
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23780	709.0	4.1	-30	-4.56	-0.0064
23780	709.0	4.1	-20	-2.96	-0.0042
23780	709.0	4.1	-10	3.46	0.0049
23780	709.0	4.1	0	-4.58	-0.0065
23780	709.0	4.1	10	-4.23	-0.0060
23780	709.0	4.1	20	3.89	0.0055
23780	709.0	4.1	30	-3.69	-0.0052
23780	709.0	4.1	40	-5.59	-0.0079
23780	709.0	4.1	50	-3.79	-0.0053
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23780	709.0	4.35	-30	-5.58	-0.0079
23780	709.0	4.35	-20	-2.85	-0.0040
23780	709.0	4.35	-10	-3.63	-0.0051
23780	709.0	4.35	0	-3.88	-0.0055
23780	709.0	4.35	10	-3.85	-0.0054
23780	709.0	4.35	20	2.98	0.0042
23780	709.0	4.35	30	-3.12	-0.0044
23780	709.0	4.35	40	-5.35	-0.0075
23780	709.0	4.35	50	-4.32	-0.0061

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LTE band 5 Results: channel 23790 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23790	710.0	3.6	-30	5.48	0.0077
23790	710.0	3.6	-20	4.12	0.0058
23790	710.0	3.6	-10	4.95	0.0070
23790	710.0	3.6	0	3.26	0.0046
23790	710.0	3.6	10	3.75	0.0053
23790	710.0	3.6	20	3.85	0.0054
23790	710.0	3.6	30	-5.02	-0.0071
23790	710.0	3.6	40	-6.21	-0.0087
23790	710.0	3.6	50	5.35	0.0075
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23790	710.0	4.1	-30	5.06	0.0071
23790	710.0	4.1	-20	5.15	0.0073
23790	710.0	4.1	-10	6.08	0.0086
23790	710.0	4.1	0	4.86	0.0068
23790	710.0	4.1	10	3.83	0.0054
23790	710.0	4.1	20	4.86	0.0068
23790	710.0	4.1	30	-4.08	-0.0057
23790	710.0	4.1	40	-3.33	-0.0047
23790	710.0	4.1	50	4.22	0.0059
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23790	710.0	4.35	-30	5.87	0.0083
23790	710.0	4.35	-20	6.35	0.0089
23790	710.0	4.35	-10	7.54	0.0106
23790	710.0	4.35	0	2.40	0.0034
23790	710.0	4.35	10	4.26	0.0060
23790	710.0	4.35	20	3.25	0.0046
23790	710.0	4.35	30	-5.26	-0.0074
23790	710.0	4.35	40	-5.08	-0.0072
23790	710.0	4.35	50	2.43	0.0034

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LTE band 17 Results: channel 23800 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23800	711.0	3.6	-30	3.39	0.0048
23800	711.0	3.6	-20	3.52	0.0050
23800	711.0	3.6	-10	6.52	0.0092
23800	711.0	3.6	0	4.28	0.0060
23800	711.0	3.6	10	4.05	0.0057
23800	711.0	3.6	20	3.10	0.0044
23800	711.0	3.6	30	-2.78	-0.0039
23800	711.0	3.6	40	-4.69	-0.0066
23800	711.0	3.6	50	-7.23	-0.0102
23800	711.0	3.6	60	3.39	0.0048
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23800	711.0	4.1	-30	-3.16	-0.0044
23800	711.0	4.1	-20	4.51	0.0063
23800	711.0	4.1	-10	3.63	0.0051
23800	711.0	4.1	0	-2.96	-0.0042
23800	711.0	4.1	10	4.05	0.0057
23800	711.0	4.1	20	2.70	0.0038
23800	711.0	4.1	30	-4.49	-0.0063
23800	711.0	4.1	40	-3.78	-0.0053
23800	711.0	4.1	50	-4.29	-0.0060
23800	711.0	4.1	60	-3.16	-0.0044
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
23800	711.0	4.35	-30	-2.82	-0.0040
23800	711.0	4.35	-20	-3.55	-0.0050
23800	711.0	4.35	-10	2.59	0.0036
23800	711.0	4.35	0	-3.23	-0.0045
23800	711.0	4.35	10	3.73	0.0052
23800	711.0	4.35	20	2.65	0.0037
23800	711.0	4.35	30	-4.01	-0.0056
23800	711.0	4.35	40	-4.08	-0.0057
23800	711.0	4.35	50	-2.68	-0.0038
23800	711.0	4.35	60	-2.82	-0.0040

APPENDIX 6C – LTE Band 17 RADIATED EMISSIONS TEST DATA

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Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW	

Radiated Power Test Data Results

Date of Test: July 17, 2014

The following measurements were performed by Rex Zhang.

The environmental tests conditions were: Temperature: 25.0 °C
Relative Humidity: 29.5 %

The BlackBerry® smartphone was standalone, vertically with LCD facing the RX antenna when the turntable is at 0 degree position.

Measurements were performed with QPSK and 16QAM modulations. The smallest test margins are reported below.

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

LTE band 17, 5MHz BW, RB=1, QPSK modulation

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method					
								Tracking Generator					
Type	Ch	Frequency	Band	Type	Pol.	Reading	Max	Pol.	Reading	Corrected Reading		Limit	Diff. To
		(MHz)				(dBm)	(V,H)			(dBm)	Tx-Rx		
F0	23755	706.50	17	Dipole	V	-42.97	-31.26	V-V	4.31	22.72	0.19	35.00	12.28
F0	23755	706.50	17	Dipole	H	-31.26		H-H	0.20				
F0	23790	710.00	17	Dipole	V	-43.45	-31.04	V-V	4.02	22.47	0.18	35.00	12.53
F0	23790	710.00	17	Dipole	H	-31.04		H-H	0.24				
F0	23824	713.40	17	Dipole	V	-43.07	-31.28	V-V	3.30	21.73	0.15	35.00	13.27
F0	23824	713.40	17	Dipole	H	-31.28		H-H	-0.33				

LTE band 17, 5MHz BW, RB=1, 16-QAM modulation

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method					
								Tracking Generator					
Type	Ch	Frequency	Band	Type	Pol.	Reading	Max	Pol.	Reading	Corrected Reading (relative to Dipole)		Limit	Diff. To Limit (dB)
		(MHz)				(dBm)	(V,H)			(dBm)	Tx-Rx		
F0	23755	706.50	17	Dipole	V	-43.74	-32.34	V-V	3.28	21.69	0.15	35.0	13.31
F0	23755	706.50	17	Dipole	H	-32.34		H-H	-0.90				
F0	23790	710.00	17	Dipole	V	-44.34	-32.38	V-V	2.67	21.12	0.13	35.0	13.88
F0	23790	710.00	17	Dipole	H	-32.38		H-H	-1.18				
F0	23824	713.40	17	Dipole	V	-44.20	-31.98	V-V	2.62	21.05	0.13	35.0	13.95
F0	23824	713.40	17	Dipole	H	-31.98		H-H	-1.02				

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	EMC Test Report for the BlackBerry® smartphone Model RHA111LW APPENDIX 6C	
Test Report No.: RTS-6058-1408-12_Rev1	Dates of Test: June 24 to August 5, 2014	FCC ID: L6ARHA110LW IC: 2503A-RHA110LW

Radiated Emissions Test Data Results cont'd

The following measurements were performed by Rex Zhang.

Date of Test: June 30, 2014

The environmental test conditions were: Temperature: 25.7 °C
 Relative Humidity: 17.9 %

The BlackBerry® smartphone was standalone, vertically with LCD facing the RX antenna when the turntable is at 0 degree position.

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height, and the frequency range scanned was 30MHz – 1GHz.

Measurements were performed in LTE band 17 with QPSK and 16-QAM modulations for 10MHz BW (channel 23780, 23790, 23800 with RB = 1).

All emissions were at least 25.0 dB below the limit.

The following measurements were performed by Kevin Guo

Date of Test: July 8-11, 2014

The environmental test conditions were: Temperature: 23.6 – 25.7 °C
 Relative Humidity: 17.2 – 19.8 %

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height, and a frequency range of 1 GHz to 10 GHz.

The BlackBerry® smartphone was standalone, horizontally with LCD facing up and the top pointing to the RX antenna when the turntable is at 0 degree position

Measurements were performed in LTE band 17 with QPSK and 16-QAM modulations for 10MHz BW (channel 23780, 23790, 23800 with RB = 1).

All emissions were at least 25.0 dB below the limit.