EMI Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Parts 2, 22, 24, 27
&
Industry Canada (IC), RSS-gen, 132, 133 and 139

A division of Research In Motion Limited

REPORT NO.: RTS-6012-1208-37

PRODUCT MODEL NO.:	RFF91LW
TYPE NAME:	BlackBerry® smartphone
FCC ID:	L6ARFF90LW
IC:	2503A-RFF90LW
EMISSION DESIGNATOR (GSM):	245KGXW
EMISSION DESIGNATOR (EDGE):	245KG7W
EMISSION DESIGNATOR (WCDMA):	4M19F9W
EMISSION DESIGNATOR (LTE QPSK):	18M0G7D
EMISSION DESIGNATOR (LTE 16QAM):	18M0D7W

DATE: October 29, 2012

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

592

Statement of Performance:

The BlackBerry® smartphone, model RFF91LW, part number CER-48927-001 Rev 2 and accessories when configured and operated per RIM's operation instructions, and 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.

Documented by:

Berkin Can
Regulatory Compliance Associate
Date: November 09, 2012

Reviewed by:

Heng. Lin
Regulatory Compliance Specialist
Date: November 09, 2012

Reviewed and Approved by:

Masud S. Attayi, P.Eng.
Manager, Regulatory Compliance
Date: November 13, 2012

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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, Oct, 2011.
- FCC CFR 47 Part 22, Subpart H, Cellular Radiotelephone Services, Oct., 2011.
- FCC CFR 47 Part 24 Subpart E, Broadband PCS, Oct., 2011.
- FCC CFR 47 Part 27, Subpart C, Technical Standards, Oct, 2011.
- 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.

B. Associated Documents

1. RFF91LW_HW_Declaration_CER-48927-001_Rev2
2. MultiSourceDeclaration_RFF91LW_b1354
3. MultiSourceDeclaration_RFF91LW_b1845
4. MultiSourceDeclaration_RFF91LW_10.0.9.299
5. MultiSourceDeclaration_RFF91LW_10.0.9.728

C. Product Identification

Manufactured by Research In Motion Limited whose headquarters is located at:
295 Phillip Street
Waterloo, Ontario
Canada, N2L 3W8
Phone: 519 888 7465
Fax: 519 888 6906

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

RIM Testing Services EMI 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 06 - July 25, and September 20 – October 11, 2012.

BlackBerry® smartphone Samples Tested

Sample	Model	CER NUMBER	PIN	Software Information
1	RFF91LW	CER-48927-001 Rev1	2A211C3C	OS: 127.0.1.1201
2A	RFF91LW	CER-48927-001 Rev1	2A202C27	OS: 127.0.1.871
2B	RFF91LW	CER-48927-001 Rev1	2A202C27	OS: 127.0.1.1192
3	RFF91LW	CER-48927-001 Rev1	2A211CB7	OS: 127.0.1.1354
4	RFF91LW	CER-48927-001 Rev1	2A202A6D	OS: 127.0.1.1354
5A	RFF91LW	CER-48927-001 Rev2	2A8C7031	OS:10.0.9.299
5B	RFF91LW	CER-48927-001 Rev2	2A8C7031	OS:10.0.9.728
6	RFF91LW	CER-48927-001 Rev2	2A8C6FE2	OS: 127.0.1.1845
7	RFF91LW	CER-48927-001 Rev2	2A8C6FD6	OS:10.0.9.299

RF Conducted Emissions testing was performed on samples 1, 2A, 2B, 5A and 5B.
RF Radiated Emissions testing was performed on samples 3, 4, 6 and 7.

Only the characteristics that may have been affected by the changes from RFF91LW Rev1 to RFF91LW Rev2 were re-tested.

For more details, refer to RFF91LW_HW_Declaration_CER-48927-001_Rev2.

To view the differences between OS: 127.0.1.871 and OS: 10.0.9.728 see document MultiSourceDeclaration_RFF91LW_b1354, MultiSourceDeclaration_RFF91LW_b1845, MultiSourceDeclaration_RFF91LW_10.0.9.299 and MultiSourceDeclaration_RFF91LW_10.0.9.728

BlackBerry® smartphone Accessories Tested

1) Bat. LS1, part number BAT-47277-001.

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.

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 2.1046(a)	RSS-132, 4.4 RSS-133, 6.4	GSM850 / PCS1900 Conducted RF Output Power	Pass	1B
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	1C
Part 22.913(a)(2) Part 24.232(b)(c)	RSS-132, 4.4 RSS-133, 6.4	GSM850 ERP PCS1900 EIRP	Pass	1D
Part 2.1053 Part 22.917 Part 24.238	RSS-132, 4.5 RSS-133, 6.5	GSM850 / PCS1900 Radiated Spurious/Harmonic Emissions	Pass	1D

Part 2.1051 Part 22.917 Part 24.238	RSS-132, 4.5 RSS-133, 6.5	WCDMA Band 2/5 Conducted Spurious Emissions	Pass	2A
Part 2.1049 Part 22.917 Part 24.238	RSS-GEN, 4.6	WCDMA Band 2/5 Occupied Bandwidth and Channel Mask	Pass	2A
Part 2.1046(a)	RSS-132, 4.4 RSS-133, 6.4	WCDMA Band 2/5 Conducted RF Output Power	Pass	2B
Part 2.1055(a)(d) Part 22.917 Part 24.235	RSS-132, 4.3 RSS-133, 6.3	WCDMA Band 2/5 Frequency Stability vs. Temperature and Voltage	Pass	2C
Part 22.913(a)(2) Part 24.232(c)	RSS-132, 4.4 RSS-133, 6.4	WCDMA Band 5 ERP WCDMA Band 2 EIRP	Pass	2D
Part 22.917 Part 24.238	RSS-132, 4.5 RSS-133, 6.5	WCDMA Band 2/5 Radiated Spurious/Harmonic Emissions	Pass	2D
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 2.1046(a)	RSS-133, 6.4	LTE Band 2 Conducted RF Output Power	Pass	3B
Part 2.1055(a)(d) Part 24.235	RSS-133, 6.3	LTE Band 2 Frequency Stability vs. Temperature and Voltage	Pass	3C
Part 24.232(b)(c)	RSS-133, 6.4	LTE Band 2 EIRP	Pass	3D
Part 24.238	RSS-133, 6.5	LTE Band 2 Radiated Spurious/Harmonic Emissions	Pass	3D
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 2.1046(a)	RSS-132, 4.4	LTE Band 5 Conducted RF Output Power	Pass	4B
Part 2.1055(a)(d) Part 22.917	RSS-132, 4.3	LTE Band 5 Frequency Stability vs. Temperature and Voltage	Pass	4C

Part 22.913(a)(2)	RSS-132, 4.4	LTE Band 5 ERP	Pass	4D
Part 22.917	RSS-132, 4.5	LTE Band 5 Radiated Spurious/Harmonic Emissions	Pass	4D
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 2.1046(a)	RSS-139, 6.4	LTE Band 4 Conducted RF Output Power	Pass	5B
Part 2.1055 Part 27.54	RSS-139, 6.3	LTE Band 4 Frequency Stability vs. Temperature and Voltage	Pass	5C
Part 2.1053 Part 27.50(d)(4)	RSS-139, 6.4	LTE Band 4 EIRP	Pass	5D
Part 2.1053 Part 27.53(h)	RSS-139, 6.5	LTE Band 4 Radiated Spurious/Harmonic Emissions	Pass	5D
Part 2.1051 Part 27.53(g)	-	LTE Band 17 Conducted Spurious Emissions	Pass	6A
Part 2.1049 Part 27.53(g)	-	LTE Band 17 Occupied Bandwidth and Channel Mask	Pass	6A
Part 27.50 (d)(5)	-	LTE Band 17 Peak to Average Ratio measurements	Pass	6A
Part 2.1046(a)	-	LTE Band 17 Conducted RF Output Power	Pass	6B
Part 2.1055 Part 27.54	-	LTE Band 17 Frequency Stability vs. Temperature and Voltage	Pass	6C
Part 2.1053 Part 27.50(c)(9)	-	LTE Band 17 ERP	Pass	6D
Part 2.1053 Part 27.53(g)	-	LTE Band 17 Radiated Spurious/Harmonic Emissions	Pass	6D

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 10 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 10 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 243.0 kHz on the low and high channels in CALL mode, and 245.0 kHz on low and high channels 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 245.0 kHz on the high channel in CALL mode, and 243.0 kHz on the low in EDGE mode.
See APPENDIX 1A for test data.

- The BlackBerry® smartphone met the requirements of the Tx Conducted RF output Power in the GSM850 as per 47 CFR 2.1046, and RSS-GEN, 4.4. The EUT was measured on the low, middle and high channels.
See APPENDIX1B for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted RF output Power in the PCS1900 as per 47 CFR 2.1046, and RSS-GEN, 6.4. The EUT was measured 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 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 1C 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 APPENDIX1C for test data.

- The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the WCDMA band 5 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 10 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 2 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 10 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 5 as per 47 CFR 2.202, CFR 22.917 and RSS-GEN, 4.6. The EUT was measured in Loopback and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.142 MHz on the low and high channels in Loopback mode, and 4.183 MHz on the low channel 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 2 as per 47 CFR 2.202, CFR 24.238 and RSS-GEN, 4.6. The EUT was measured in Loopback and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.058 MHz on the low channel in Loopback mode, and 4.050 MHz on all three channels in HSUPA mode.
See APPENDIX 2A for test data.

- The BlackBerry® smartphone met the requirements of the Tx Conducted RF output Power in the WCDMA band 5 as per 47 CFR 2.1046, and RSS-GEN, 4.4. The EUT was measured on the low, middle and high channels.
See APPENDIX 2B for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted RF output Power in the WCDMA band 2 as per 47 CFR 2.1046, and RSS-GEN, 6.4. The EUT was measured 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 5 as per 47 CFR 2.1055, CFR 22.917 and RSS-GEN, 4.3. The EUT was measured in WCDMA band 5 mode on the low, middle and high channels.
See APPENDIX 2C for test data.

The BlackBerry® smartphone met the requirements of the Frequency Stability in the WCDMA band 2 as per 47 CFR 2.1055, CFR 24.235 and RSS-GEN, 4.7. The EUT was measured in WCDMA band 2 mode on the low, middle and high channels.
See APPENDIX 2C 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(a) and RSS-GEN, 4.9. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 2 with QPSK and 16-QAM modulations. Different resource block allocations were investigated, a minimum one resource block case was also tested. The frequency range investigated was from 10 MHz to 20 GHz.

- 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. The worst case occupied bandwidth was 17.95 MHz on the middle channel in 20MHz BW, 100 resource blocks and QPSK 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 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 2 with QPSK and 16-QAM modulations. Different resource block allocations were also investigated, a minimum one resource block case was also tested. The worst case Peak to Average Ratio was 9.65 dB on middle channel in 20MHz bandwidth with 50 resource blocks.
See APPENDIX 3A for test data

- The BlackBerry® smartphone met the requirements of the Tx Conducted RF output Power in the LTE band 2 as per 47 CFR 2.1046, and RSS-GEN, 6.4. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 2 with QPSK and 16-QAM modulations. Different resource block allocations were also investigated, a minimum one resource block case was also tested.
See APPENDIX 3B 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-GEN, 4.7. The EUT was measured in LTE Band 2 mode on the low, middle and high channels in 20MHz BW with 100 resource blocks and QPSK modulation.
See APPENDIX 3C 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) and RSS-GEN, 4.9. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz and 10MHz as per scalable bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Different resource block allocations were investigated, a minimum one resource block case was also tested. The frequency range investigated was from 10 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 resource block allocations were investigated, a minimum one resource block case was also tested. The worst case occupied bandwidth was 8.929 MHz on the low and middle channels in 10MHz BW, 50 resource blocks and QPSK modulation.
See APPENDIX 4A for test data.

- The BlackBerry® smartphone met the requirements of the Tx Conducted RF Output Power in the LTE Band 5 as per 47 CFR 2.1046, and RSS-GEN, 4.4. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz and 10MHz as per scalable bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Different resource block allocations were investigated, a minimum one resource block case was also tested.
See APPENDIX 4B for test data.

- 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-GEN, 4.3. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz and 10MHz as per scalable bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Different resource block allocations were investigated, a minimum one resource block case was also tested.
See APPENDIX 4C 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 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 4 with QPSK and 16-QAM modulations. Different resource block allocations were investigated, a minimum one resource block 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. The worst case occupied bandwidth was 17.92 MHz on the high channel in 20MHz BW, 100 resource blocks and QPSK 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 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 4 with QPSK and 16-QAM modulations. Different resource block allocations were also investigated, a minimum one resource block case was also tested. The worst case Peak to Average Ratio was 9.78 dB on middle channel in 20MHz bandwidth with 50 resource blocks.
See APPENDIX 5A for test data

- The BlackBerry® smartphone met the requirements of the Tx Conducted RF Output Power in the LTE Band 4 as per 47 CFR 2.1046, and RSS-139, 6.4. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 4 with QPSK and 16-QAM modulations. Different resource block allocations were also investigated, a minimum one resource block case was also tested.
See APPENDIX 5B 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 resource blocks and QPSK modulation.
See APPENDIX 5C 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 resource block allocations were investigated, a minimum one resource block case was also tested. The frequency range investigated was from 30 MHz to 20 GHz.
See Appendix 6A for test data

- 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 17.95 MHz on the middle channel in 20MHz BW, 100 resource blocks and QPSK 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 resource block allocations were also investigated, a minimum one resource block case was also tested. The worst case Peak to Average Ratio was 9.65 dB on middle channel in 20MHz bandwidth with 50 resource blocks.
See APPENDIX 6A for test data

- The BlackBerry® smartphone met the requirements of the Tx Conducted RF output Power in the LTE Band 17 as per 47 CFR 2.1046. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 17 with QPSK and 16-QAM modulations. Different resource block allocations were also investigated, a minimum one resource block case was also tested.
See APPENDIX 6B 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 resource blocks and QPSK modulation.
See APPENDIX 6C for test data.

2) Radiated Emission Measurements

a) 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 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 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.

- The highest ERP in the 850 band Call mode measured was 33.41 dBm (2.19 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 824.20 MHz (channel 251).

- The highest EIRP in the PCS band Call mode measured was 32.17 dBm (1.65 W) at 1909.80 MHz (channel 810).

- The highest EIRP in the PCS band EDGE mode measured was 30.34 dBm (1.08 W) at 1909.80 MHz (channel 810).

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 19.5dB below the limit at 2509.5MHz in the GSM850 band in CALL mode.

- The worst margin was 5.9dB below the limit at 5640.3MHz in the PCS1900 band in call mode.

See Appendix 1D for test data.

b) The radiated spurious emissions/harmonics and ERP/EIRP were measured for WCDMA Band 2 and Band 5. 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 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 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.

The highest ERP in the WCDMA band 5, Call Service mode was 19.70 dBm (0.09 W) at 836.40 MHz (channel 4182).

The highest ERP in the WCDMA band 5, HSUPA mode was 18.52 dBm (0.07 W) at 836.40 MHz (channel 4182).

The highest EIRP in the WCDMA band 2, Call Service mode measured was 27.76 dBm (0.60 W) at 1880 MHz (channel 9400).

The highest EIRP in the WCDMA band 2, HSUPA mode measured was 26.09 dBm (0.41 W) at 1880 MHz (channel 9400).

The radiated carrier harmonics were measured up to the 10th harmonic for low, middle and high channels in the WCDMA band 5 and WCDMA Band 2. Each band was measured in Call, and HSUPA modes. Both the horizontal and vertical polarizations were measured.

- All margins in the WCDMA band 5 for harmonic emissions were greater than 25 dB below the accepted limits for all test frequencies.

- The worst test margin was 14.2dB at 5639.7MHz in the WCDMA Band 2 in call service mode.

See Appendix 2D for test data.

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

The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 2 with QPSK and 16-QAM modulations. Different resource block allocations were investigated, a minimum one resource block case was also tested. Both the horizontal and vertical polarizations were measured.

The highest EIRP in the LTE Band 2 measured was 28.55 dBm (0.72 W) at 1899.90 MHz (channel 19099) in 20MHz BW, 1 resource block and QPSK modulation.

The radiated carrier harmonics were measured up to the 10th harmonic. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 2 with QPSK modulations. Different resource block allocations were investigated, a minimum one resource block case was also tested. Both the horizontal and vertical polarizations were measured.

- All margins in the LTE Band 2 for harmonic emissions were greater than 25 dB below the accepted limits for all test frequencies.

See Appendix 3D for test data.

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

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 resource block allocations were investigated, a minimum one resource block case was also tested. Both the horizontal and vertical polarizations were measured.

The highest EIRP in the LTE Band 5 measured was 25.02 dBm (0.32 W) at 838.90 MHz (channel 20549) in 10MHz BW, 1 resource block and QPSK modulation.

The radiated carrier harmonics were measured up to the 10th harmonic. 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 modulations. Different resource block allocations were investigated, a minimum one resource block case was also tested. Both the horizontal and vertical polarizations were measured.

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

See Appendix 4D for test data.

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

The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 4 with QPSK and 16-QAM modulations. Different resource block allocations were investigated, a minimum one resource block case was also tested. Both the horizontal and vertical polarizations were measured.

The highest EIRP in the LTE Band 4 measured was 27.12 dBm (0.52 W) at 1744.90 MHz (channel 20299) in 20MHz BW, 1 resource block and QPSK modulation.

The radiated carrier harmonics were measured up to the 10th harmonic. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz bandwidths for LTE Band 4 with QPSK modulations. Different resource block allocations were investigated, a minimum one resource block case was also tested. Both the horizontal and vertical polarizations were measured.

- All margins in the LTE Band 4 for harmonic emissions were greater than 25 dB below the accepted limits for all test frequencies.

See Appendix 5D for test data.

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

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 resource block allocations were investigated, a minimum one resource block case was also tested. Both the horizontal and vertical polarizations were measured.

The highest EIRP in the LTE band 17 measured was 25.68 dBm (0.37 W) at 709.0 MHz (channel 23780) in 10MHz BW, 1 resource block and QPSK modulation.

The radiated carrier harmonics were measured up to the 10^{th} harmonic. The EUT was measured on the low, middle and high channels in 5MHz and 10MHz bandwidths for LTE Band 17 with QPSK modulations. Different resource block allocations were investigated, a minimum one resource block case was also tested. Both the horizontal and vertical polarizations were measured.

- All margins in the LTE Band 17 for harmonic emissions were greater than 25 dB below the accepted limits for all test frequencies.

See Appendix 6D for test data.

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 B2 + Bluetooth(3DH5)+ 802.11n(2.4GHz).
- WCDMA B5 + Bluetooth(DH5) + 802.11a
- LTE B2 + Bluetooth(2DH5) + 802.11b
- LTE B4 + Bluetooth(3DH5) + 802.11g
- LTE B5 + Bluetooth(DH5) + 802.11n
- LTE B17 + Bluetooth(2DH5) + 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 ±4.5 dB

G. Compliance Test Equipment Used

UNIT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL DUE DATE (YY MM DD)	USE
Preamplifier	Sonoma	310N/11909A	185831	13-10-17	Radiated Emissions
Preamplifier system	TDK RF Solutions	PA-02	080010	13-10-17	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA4-SP	001	13-09-01	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	13-09-01	Radiated Emissions
Hybrid Log Antenna	EMC Automation	HLP-3003C	017301	13-08-23	Radiated Emissions
Horn Antenna	EMC Automation	HRN-0118	030101	13-03-15	Radiated Emissions
Horn Antenna	EMC Automation	HRN-0118	030201	14-09-22	Radiated Emissions
Horn Antenna	Emco	3117	47563	14-08-04	Radiated Emissions
Horn Antenna	ETS	3116	2538	14-09-24	Radiated Emissions
Dipole Antenna	Schwarzbeck	UHAP	974	12-11-08	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	837493/073	12-11-30	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	112394	12-11-21	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	109747	12-11-20	RF Conducted Emissions
EMI Receiver	Rohde & Schwarz	ESIB-40	100255	12-12-08	Radiated Emissions
EMI Receiver	Rohde & Schwarz	ESU-40	100162	12-12-07	Radiated Emissions
Spectrum Analyzer	HP	8563E	3745A08112	13-10-05	RF Conducted Emissions
DC Power Supply	HP	6632B	US37472178	13-09-27	RF Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0380561	13-10-20	Radiated Emissions

Compliance Test Equipment Used cont'd

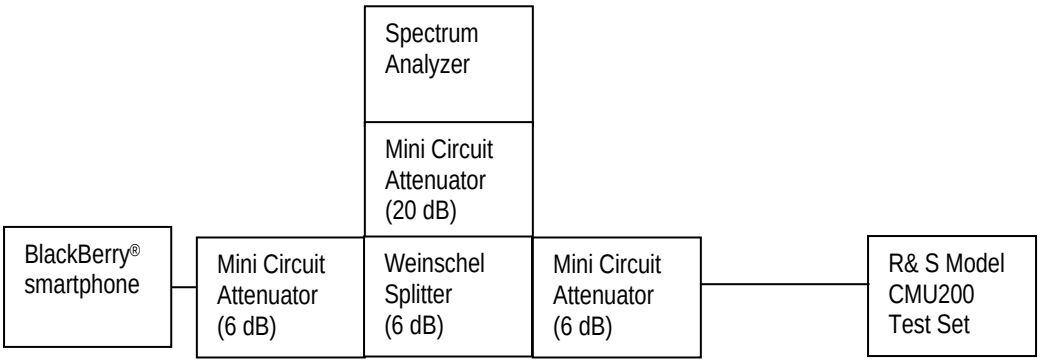
UNIT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL DUE DATE (YY MM DD)	USE
Environment Monitor	Omega	iTHX-SD	0340060	13-10-20	RF Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0380567	13-10-20	Radiated Emissions
Signal Generator	Agilent	E8257D	MY45140527	12-11-18	Radiated Emissions
Signal Generator	Agilent	83630B	3844A00927	12-10-28	Radiated Emissions
Spectrum Analyzer	Rohde & Schwarz	FSV	101820	12-12-06	RF Conducted Emissions
Spectrum Analyzer	Rohde & Schwarz	FSP	100884	12-12-03	RF Conducted Emissions

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

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



Date of Test: June 06, 2012

The environmental test conditions were:

Temperature: 23.8 ºC
Relative Humidity: 35.5 %

The following measurements were performed by Kevin Guo.

GSM Conducted RF Emission Test Data cont'd

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 24.238(a), RSS-GEN, 4.9, CFR 22 Subpart H and RSS-132 were measured from 10 MHz to 20 GHz. The EUT emissions were in the noise floor.
See figures 1-1a to 1-12a for the plots of the conducted spurious emissions.

–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 277 kHz, and for the PCS1900 band was measured to be 273 kHz 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	277	243
837.6	277	242
848.8	270	243

PCS1900 band Frequency (MHz)	-26dBc Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
1850.2	270	242
1880.0	273	242
1909.8	272	245

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.

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	242
848.8	245

PCS1900 band Frequency (MHz)	99% Occupied Bandwidth (kHz)
1850.2	243
1880.0	242
1909.8	242

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

GSM Conducted RF Emission Test Data cont'd

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

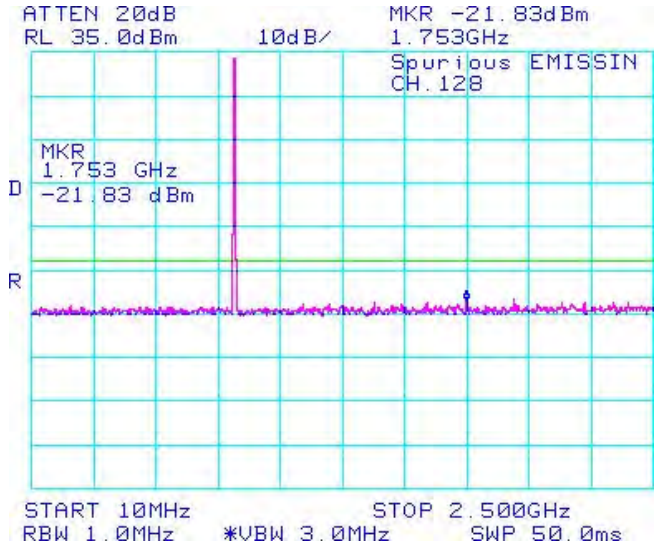


Figure 1-2a: GSM850 band, Spurious Conducted Emissions, Low channel

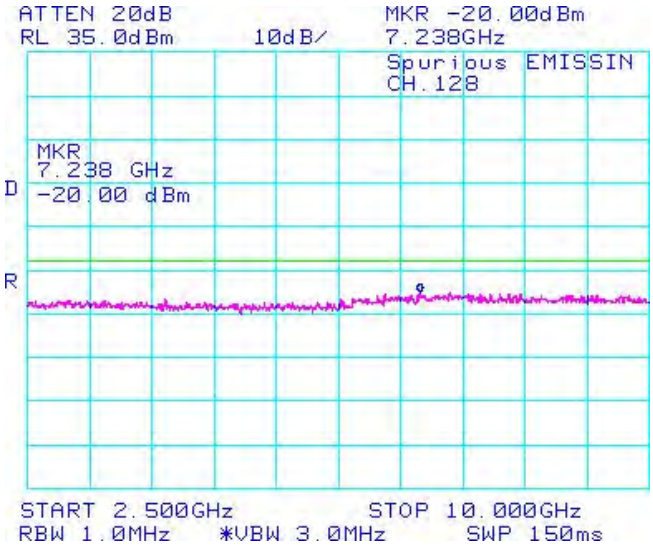


Figure 1-3a: GSM850 band, Spurious Conducted Emissions, Middle Channel

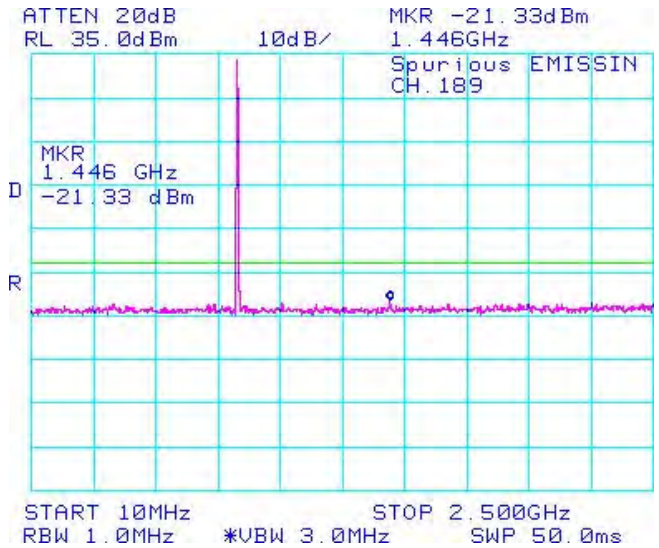
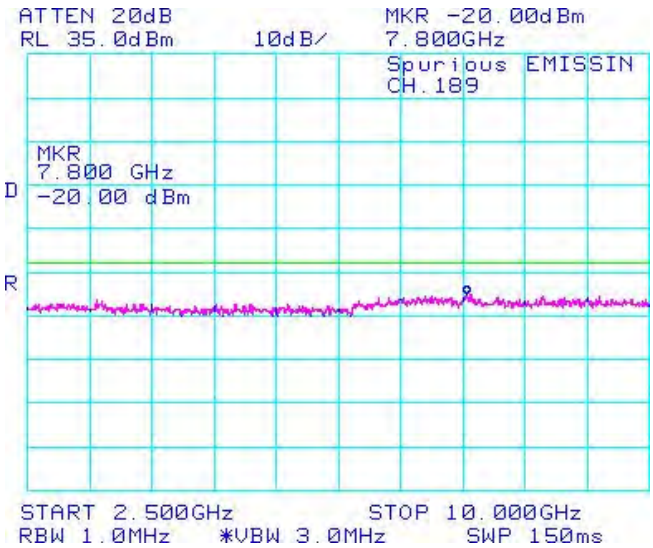


Figure 1-4a: GSM850 band, Spurious Conducted Emissions, Middle Channel



GSM Conducted RF Emission Test Data cont'd

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

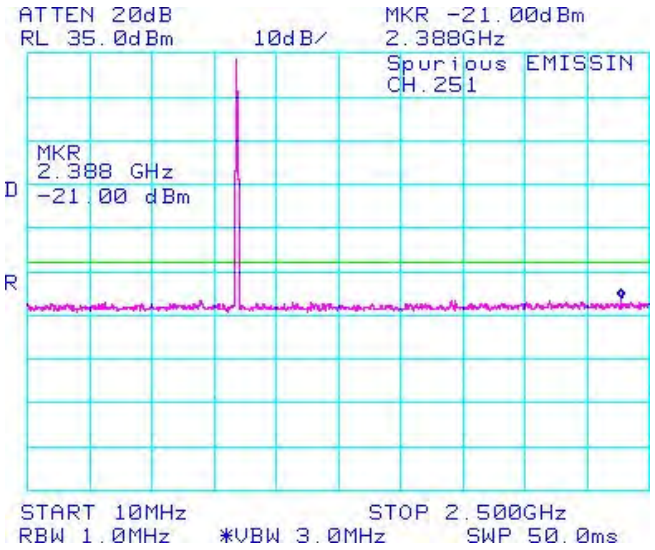


Figure 1-6a: GSM850 band, Spurious Conducted Emissions, High Channel

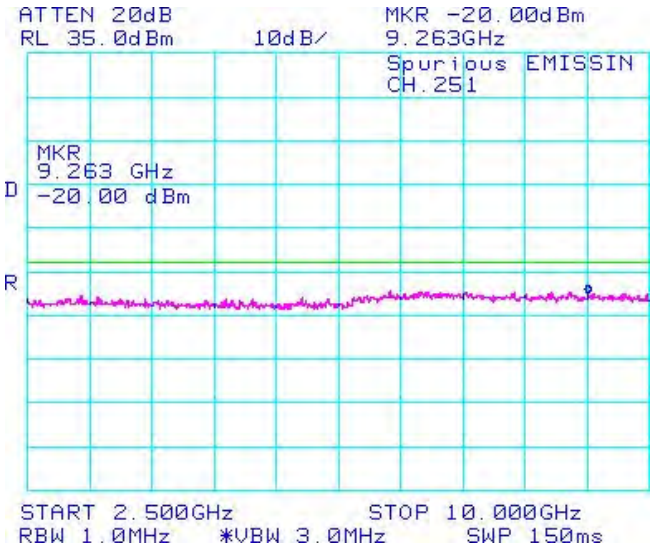


Figure 1-7a: PCS1900 band, Spurious Conducted Emissions, Low Channel

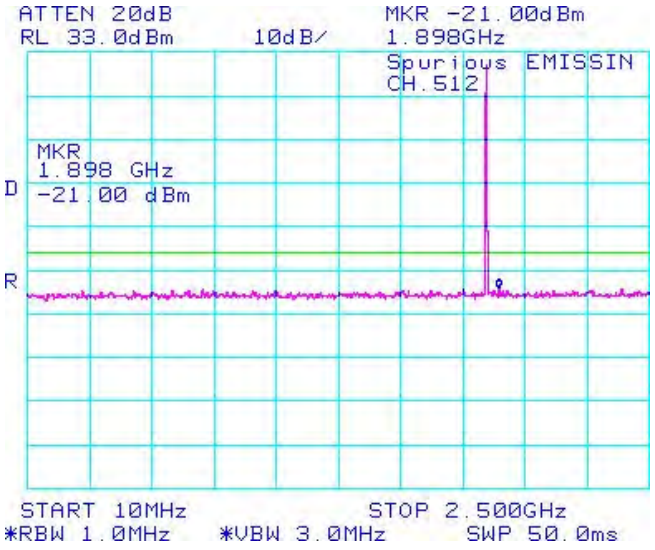
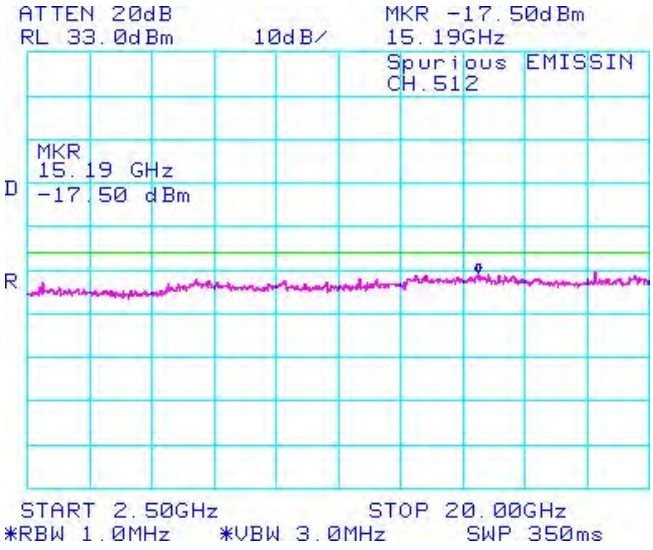


Figure 1-8a: PCS1900 band, Spurious Conducted Emissions, Low Channel



GSM Conducted RF Emission Test Data cont'd

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

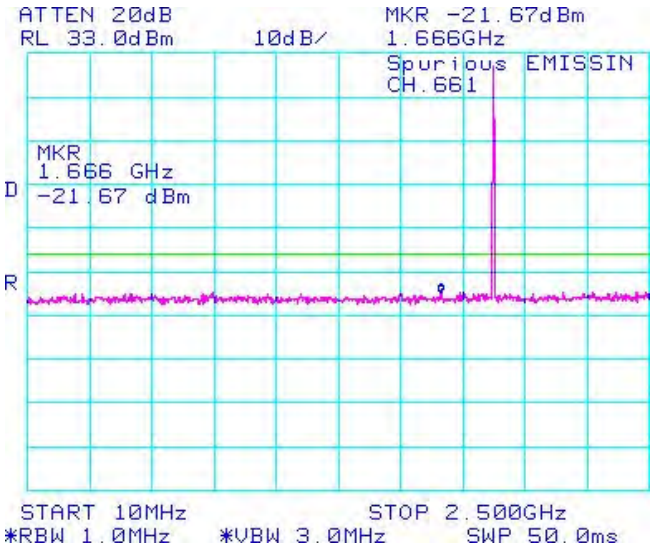


Figure 1-10a: PCS1900 band, Spurious Conducted Emissions, Middle Channel

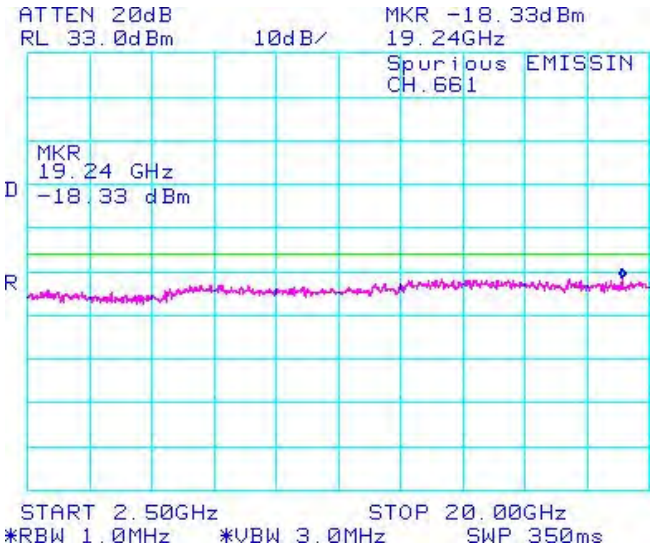


Figure 1-11a: PCS1900 band, Spurious Conducted Emissions, High Channel

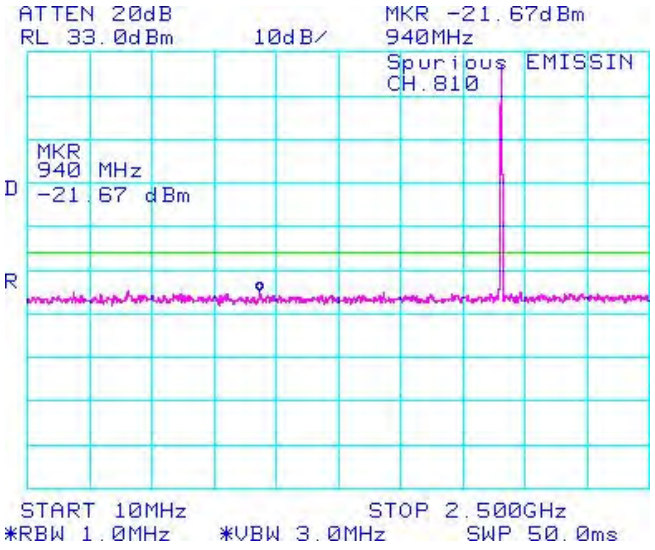
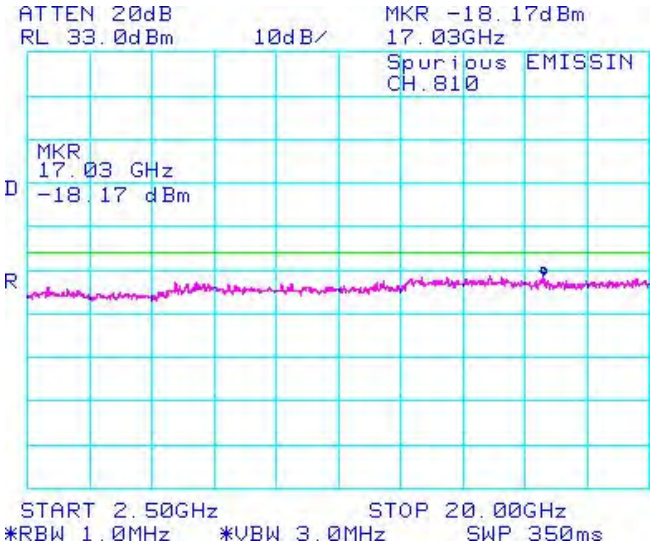


Figure 1-12a: PCS1900 band, Spurious Conducted Emissions, High Channel



GSM Conducted RF Emission Test Data cont'd

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

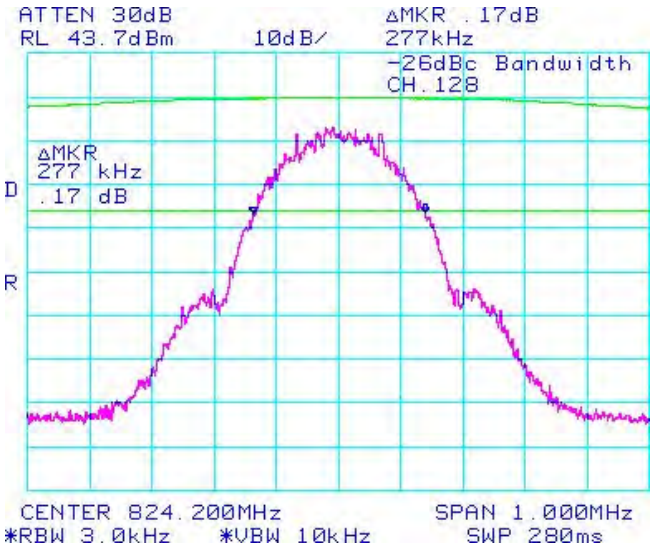


Figure 1-14a: Occupied Bandwidth, GSM850 band Low Channel in GSM mode

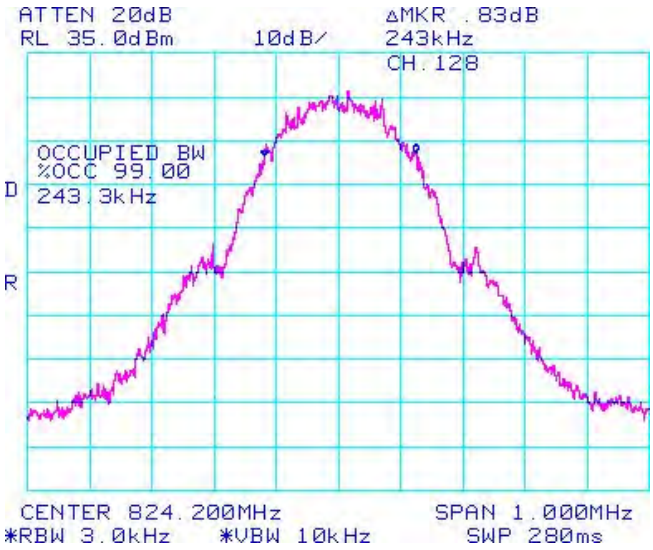


Figure 1-15a: -26dBc bandwidth, GSM850 band Middle Channel in GSM mode

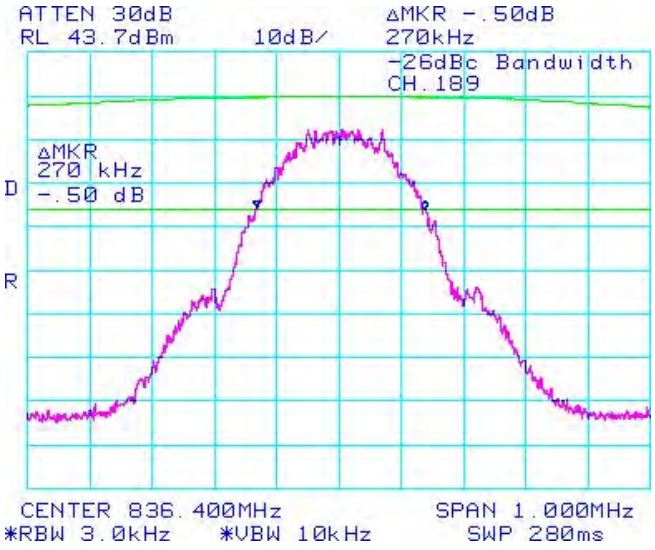
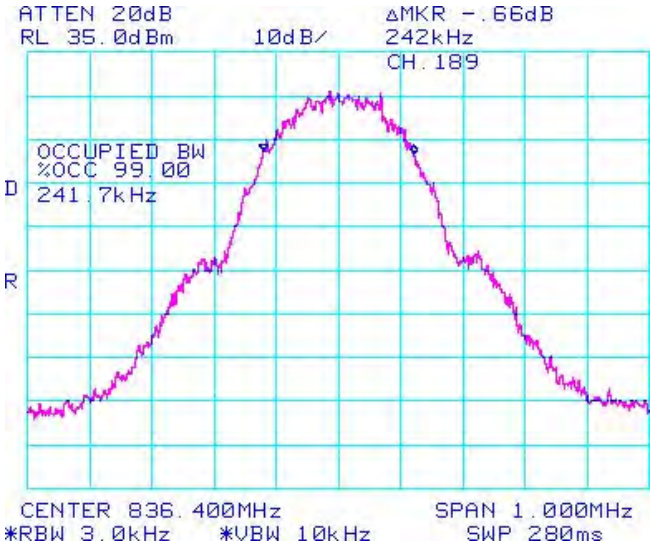


Figure 1-16a: Occupied Bandwidth, GSM850 band Middle Channel in GSM mode



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

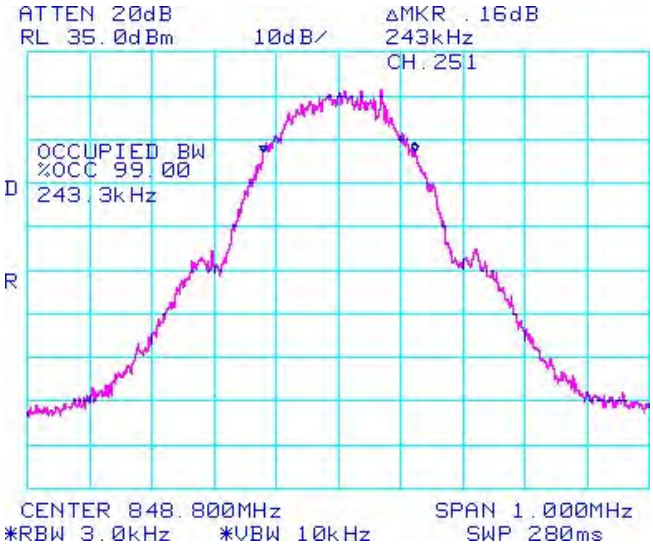


Figure 1-19a: -26dBc bandwidth, PCS1900 Low Channel in GSM mode

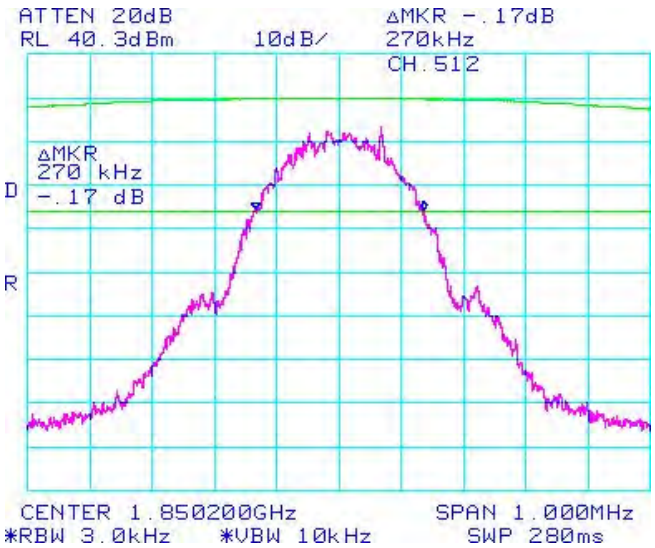
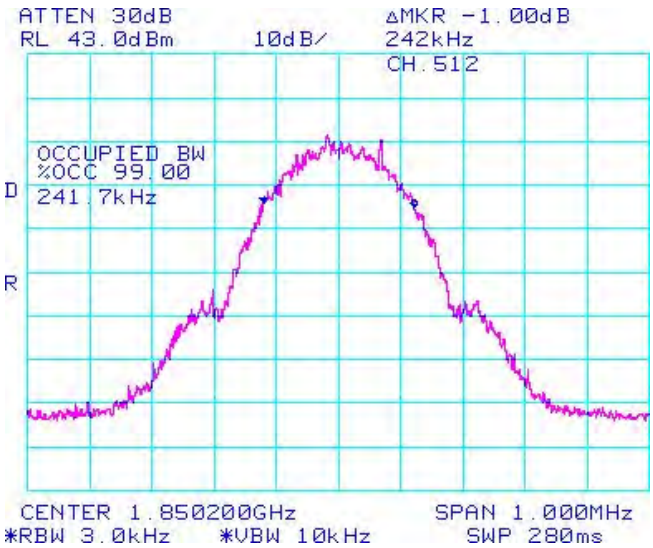


Figure 1-20a: Occupied Bandwidth, PCS1900 Low Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

Figure 1-21a: -26dBc bandwidth, PCS1900 Middle Channel in GSM mode

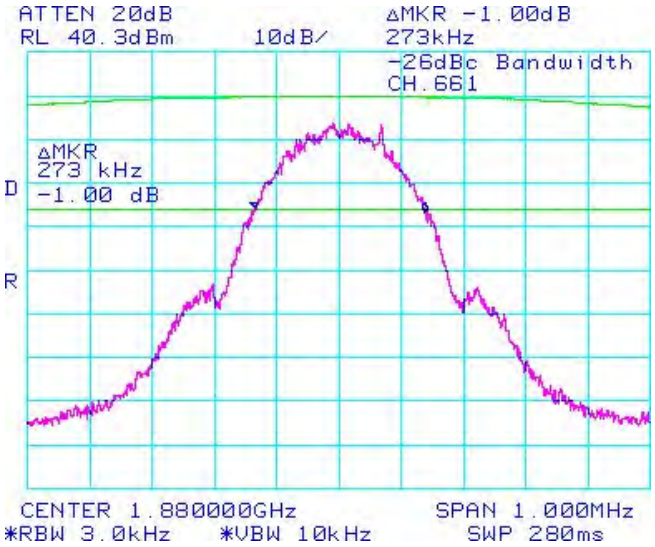


Figure 1-22a: Occupied Bandwidth, PCS1900 Middle Channel in GSM mode

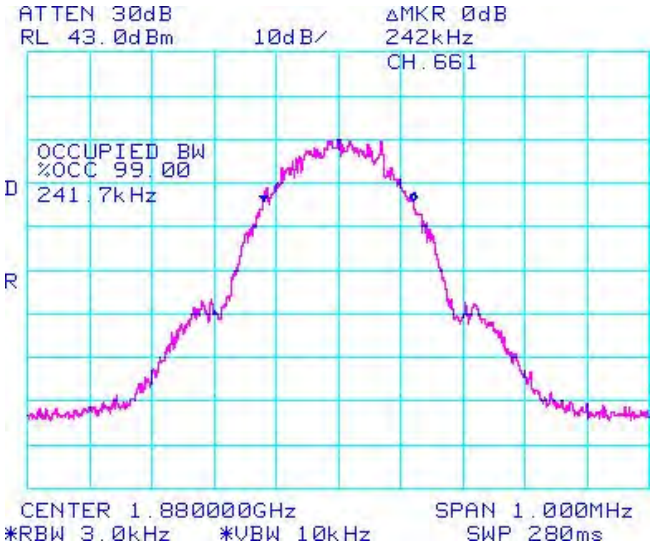


Figure 1-23a: -26dBc bandwidth, PCS1900 High Channel in GSM mode

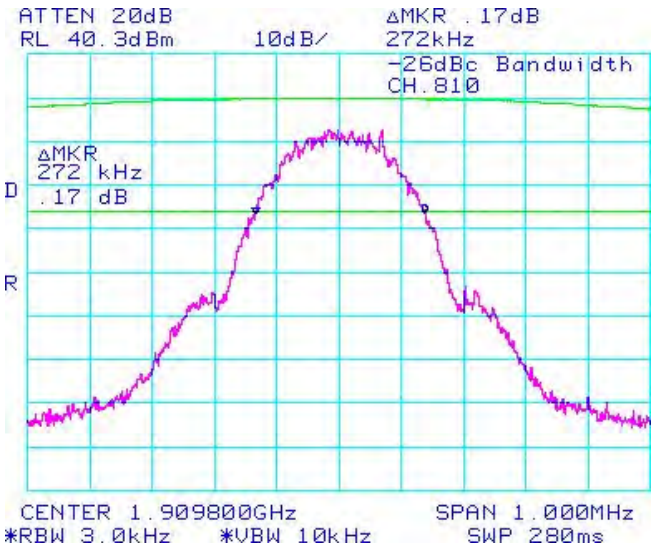
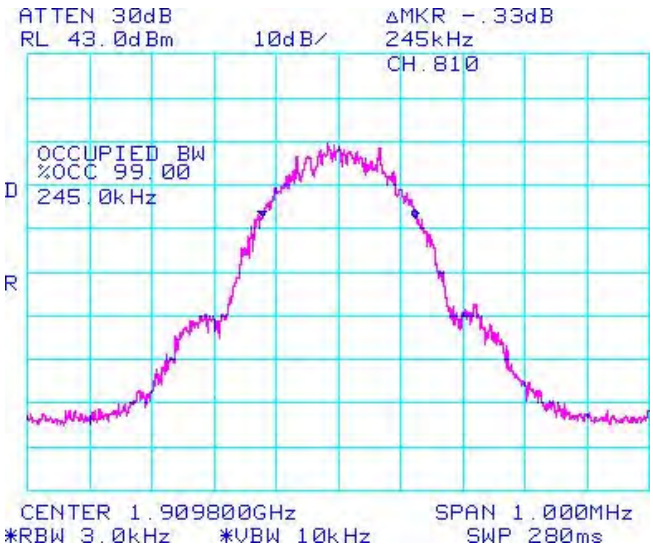


Figure 1-24a: Occupied Bandwidth, PCS1900 High Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

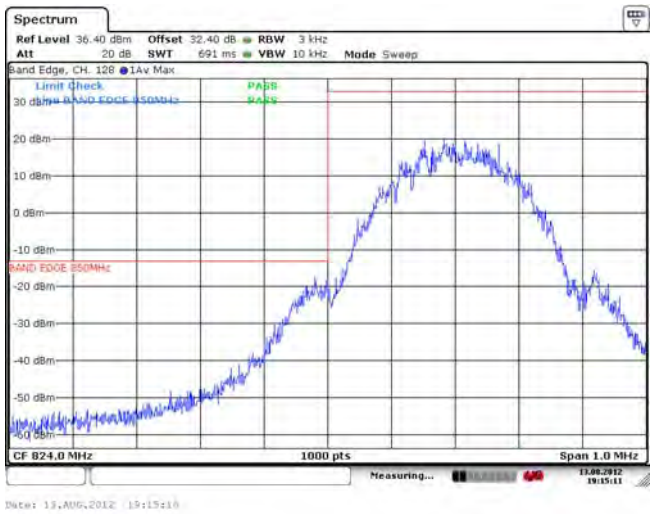


Figure 1-26a: GSM850 band High Channel Mask in GSM mode

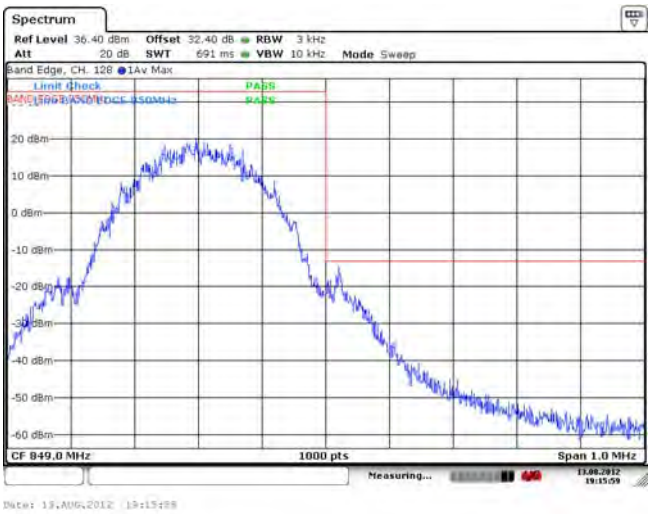


Figure 1-27a: PCS1900, Low Channel Mask in GSM mode

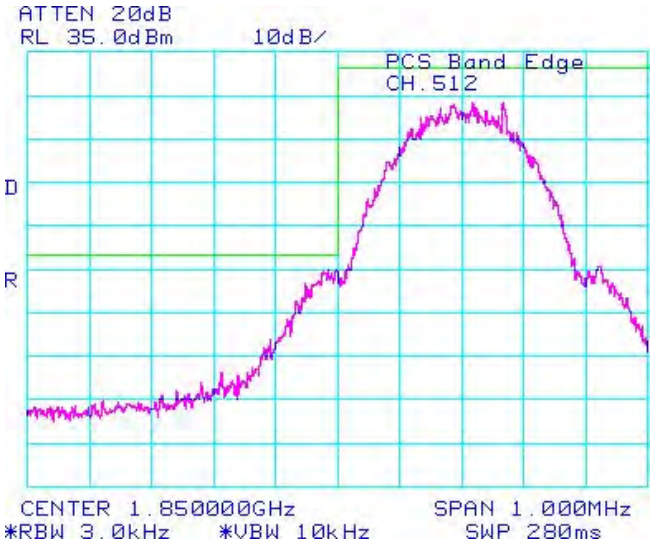
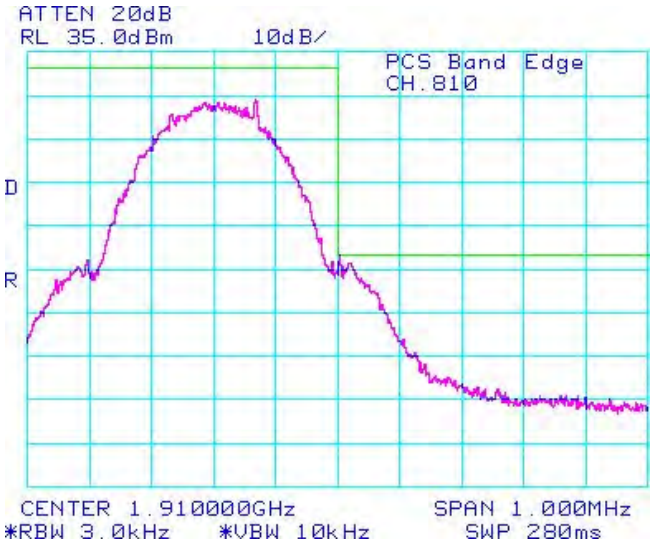


Figure 1-28a: PCS1900, High Channel Mask in GSM mode



GSM Conducted RF Emission Test Data cont'd

Figure 1-29a: Occupied Bandwidth, GSM850 Band, Low Channel in EDGE mode

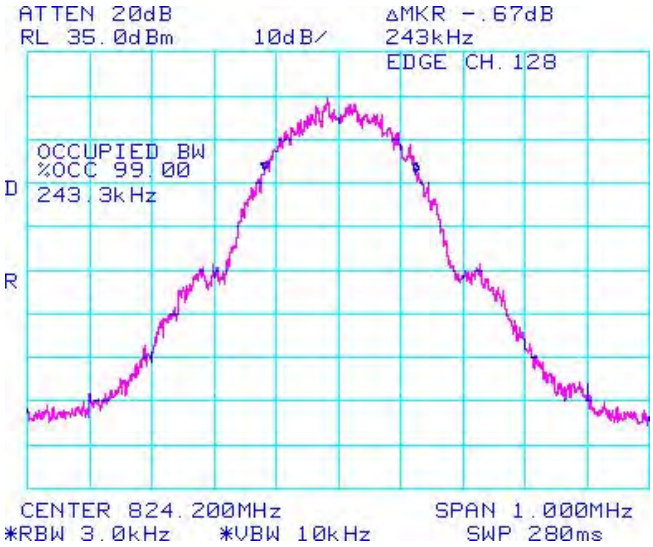


Figure 1-30a: Occupied Bandwidth, GSM850 Band, Middle Channel in EDGE mode

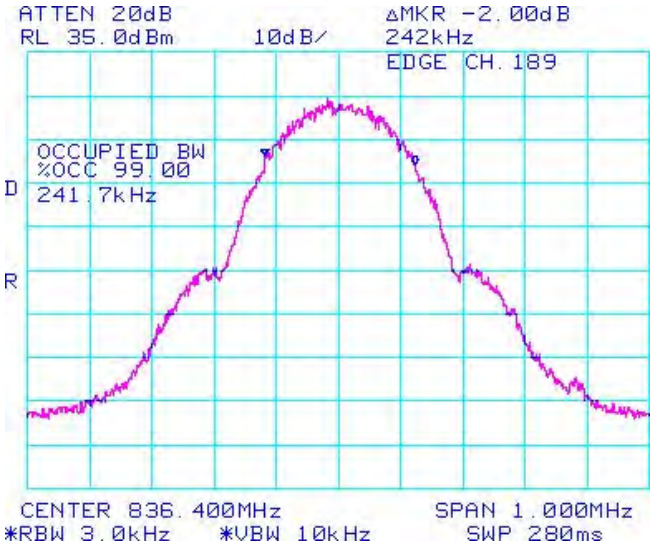


Figure 1-31a: Occupied Bandwidth, GSM850 band, High Channel in EDGE mode

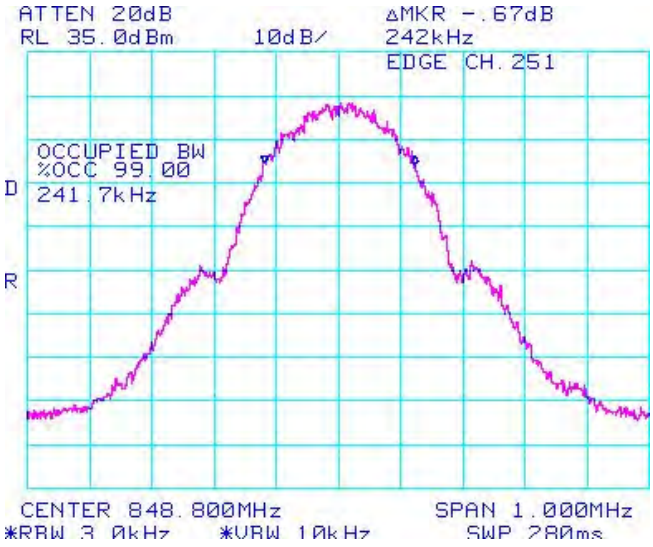
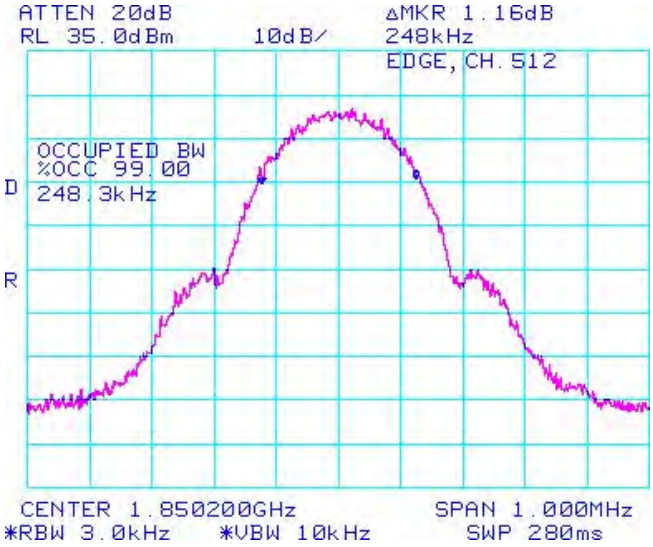


Figure 1-32a: Occupied Bandwidth, PCS1900 Band, Low Channel in EDGE mode



GSM Conducted RF Emission Test Data cont'd

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

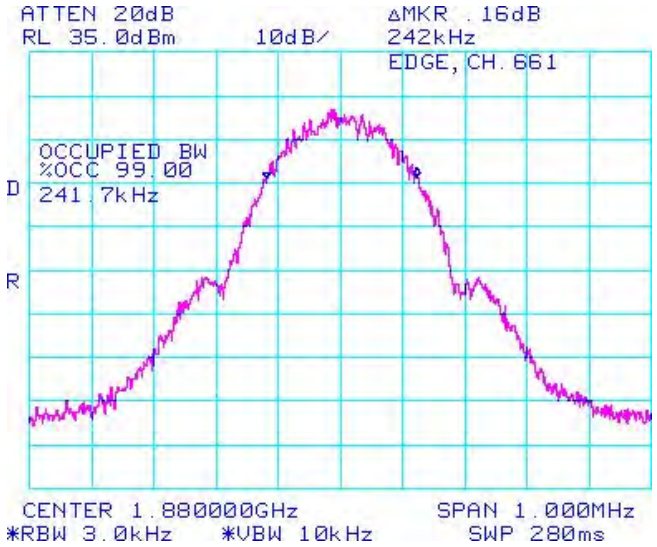


Figure 1-34a: Occupied Bandwidth, PCS1900 Band, High Channel in EDGE mode

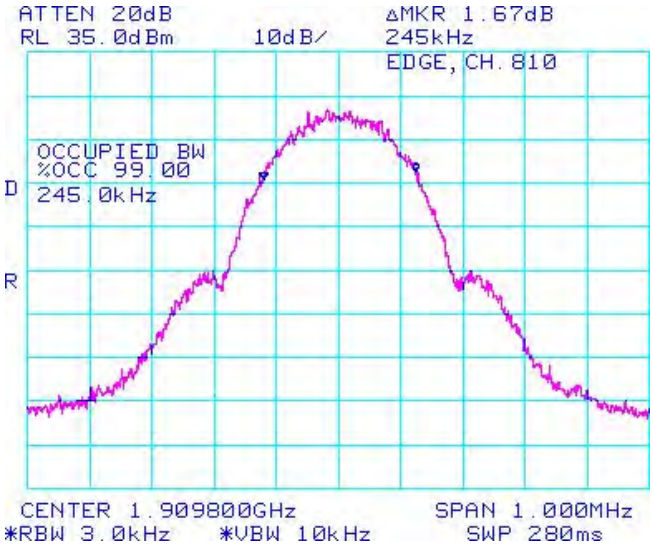


Figure 1-35a: GSM850 Band, Low Channel Mask in EDGE mode

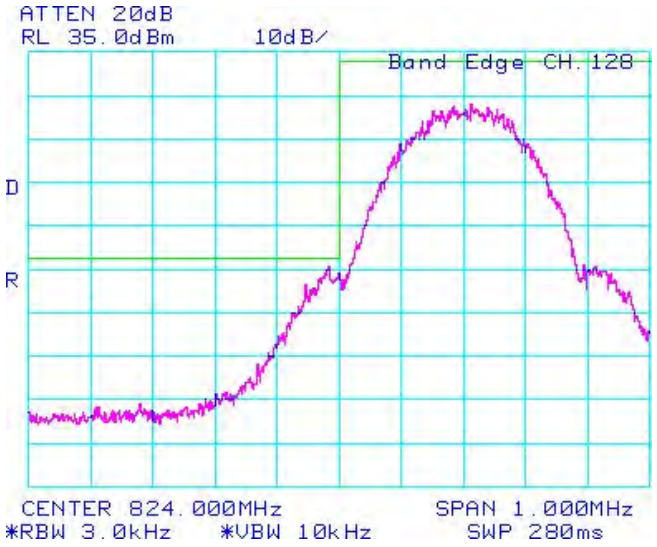
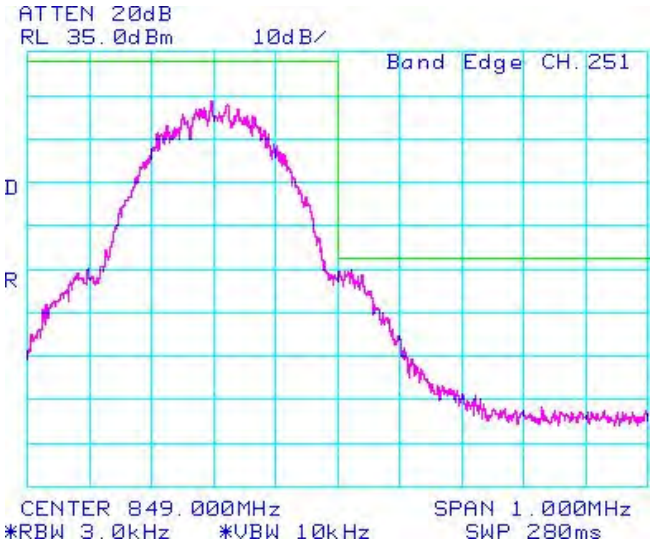


Figure 1-36a: GSM850 Band, High Channel Mask in EDGE mode



GSM Conducted RF Emission Test Data cont'd

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

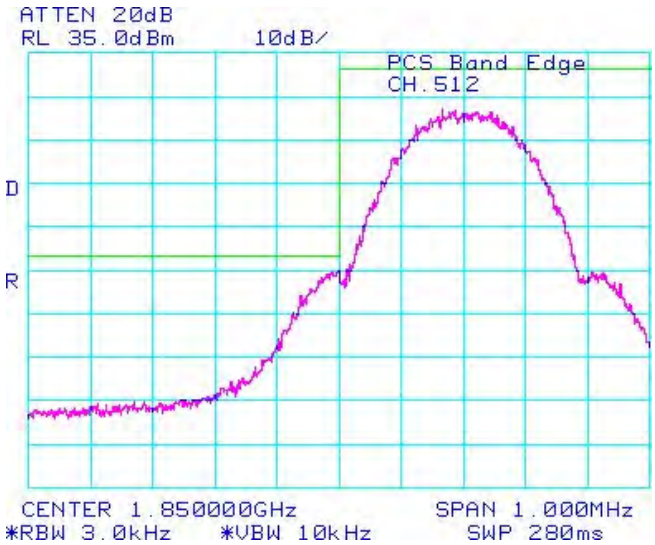
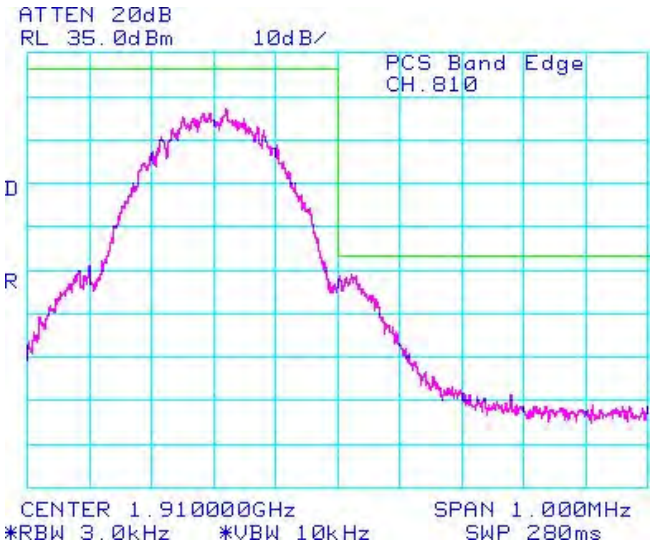


Figure 1-38a: PCS1900 Band, High Channel Mask in EDGE mode



GSM Conducted RF Emission Test Data cont'd

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

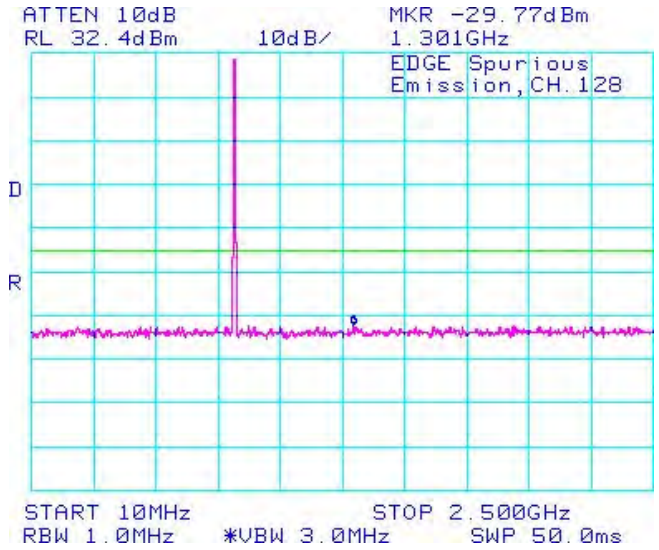


Figure 1-40a: GSM850 band, Spurious Conducted Emissions, Low channel in Edge Mode

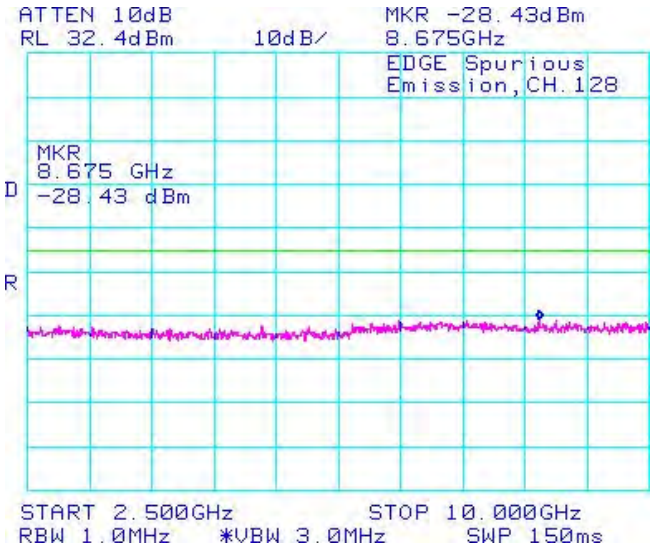


Figure 1-41a: GSM850 band, Spurious Conducted Emissions, Middle channel in Edge Mode

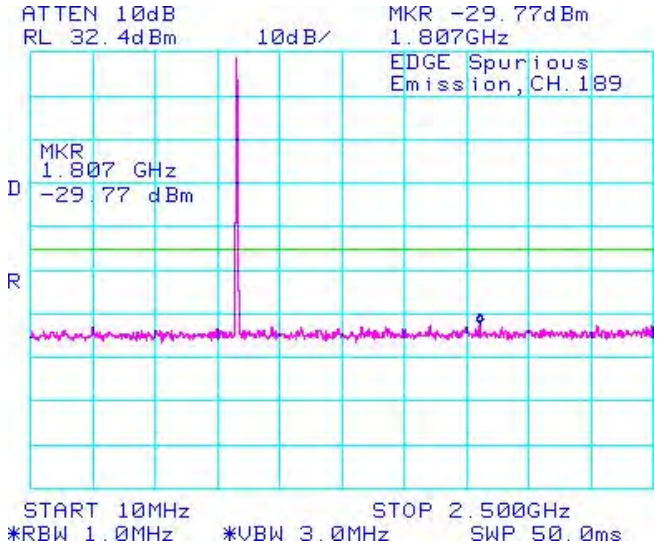
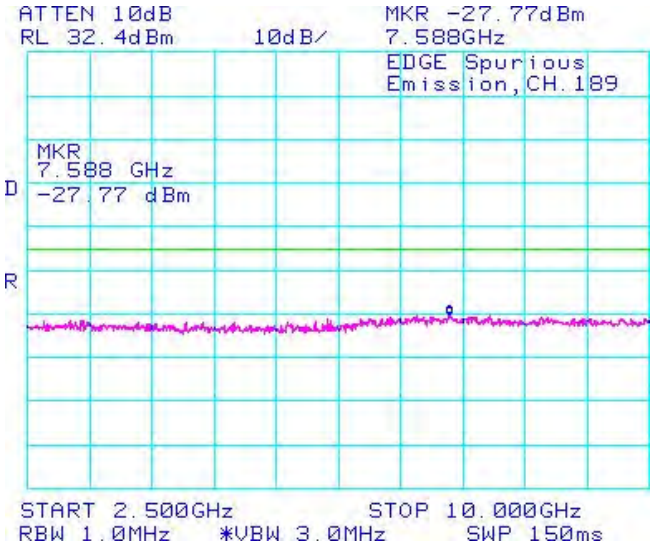


Figure 1-42a: GSM850 band, Spurious Conducted Emissions, Middle channel in Edge Mode



GSM Conducted RF Emission Test Data cont'd

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

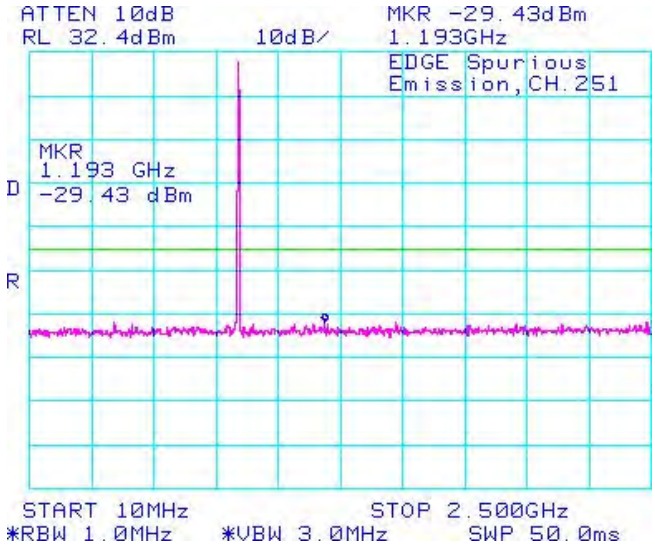


Figure 1-44a: GSM850 band, Spurious Conducted Emissions, High channel in Edge Mode

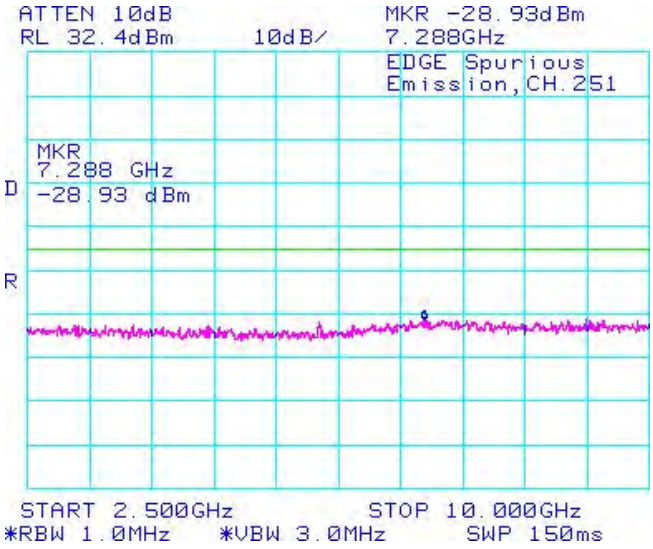


Figure 1-45a: PCS1900 band, Spurious Conducted Emissions, Low channel in Edge Mode

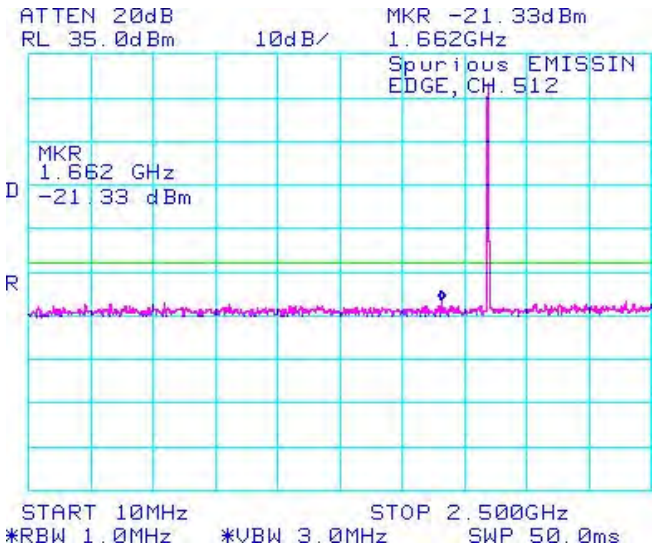
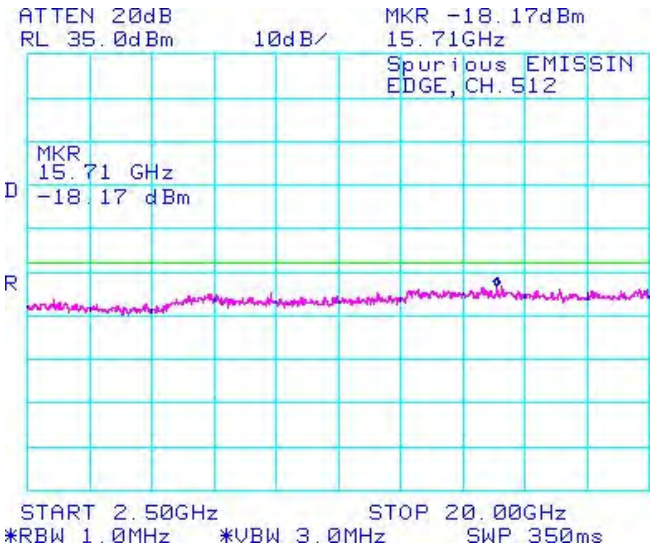


Figure 1-46a: PCS1900 band, Spurious Conducted Emissions, Low channel in Edge Mode



GSM Conducted RF Emission Test Data cont'd

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

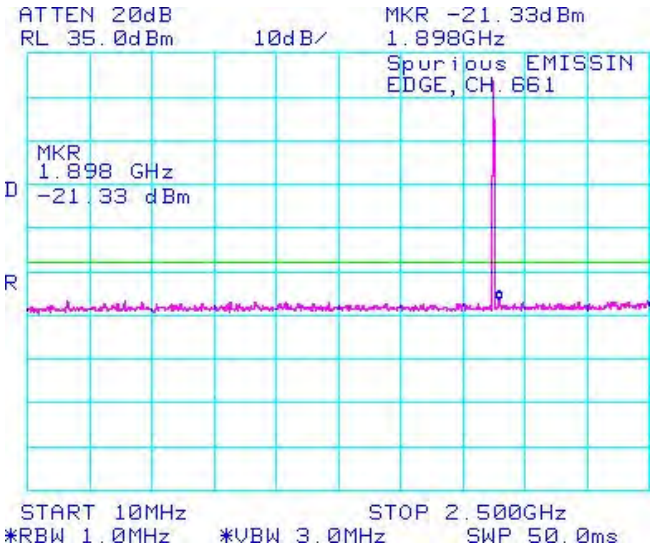


Figure 1-48a: PCS1900 band, Spurious Conducted Emissions, middle channel in Edge Mode

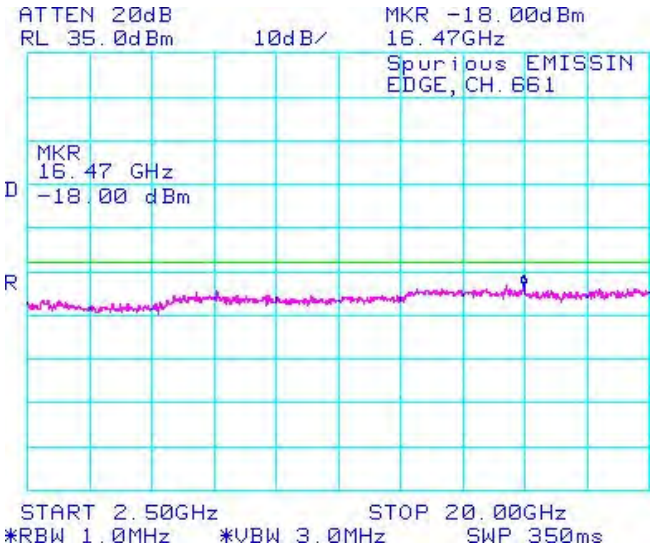


Figure 1-49a: PCS1900 band, Spurious Conducted Emissions, High channel in Edge Mode

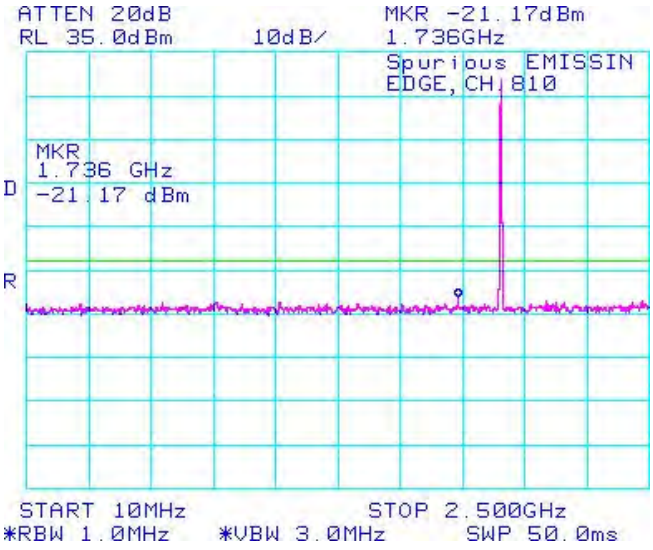
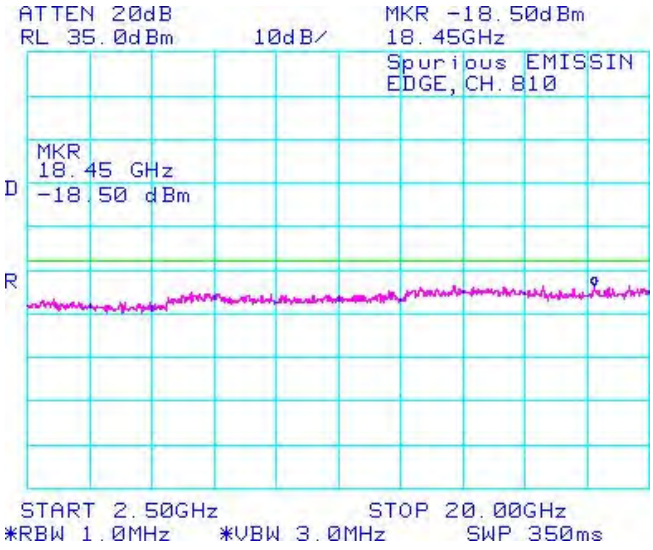


Figure 1-50a: PCS1900 band, Spurious Conducted Emissions, High channel in Edge Mode



APPENDIX 1B – GSM CONDUCTED RF OUTPUT POWER TEST DATA

GSM Conducted RF Output Power Test Data

The conducted RF output power was measured on the BlackBerry® smartphone using the Communication Tester, Rohde & Schwarz, model CMU 200. The low, middle and high channels were measured at maximum output power. The insertion loss of the coaxial cable from the CMU 200 to the BlackBerry® smartphone was compensated for in the measurements.

Date of Test: June 20, 2012

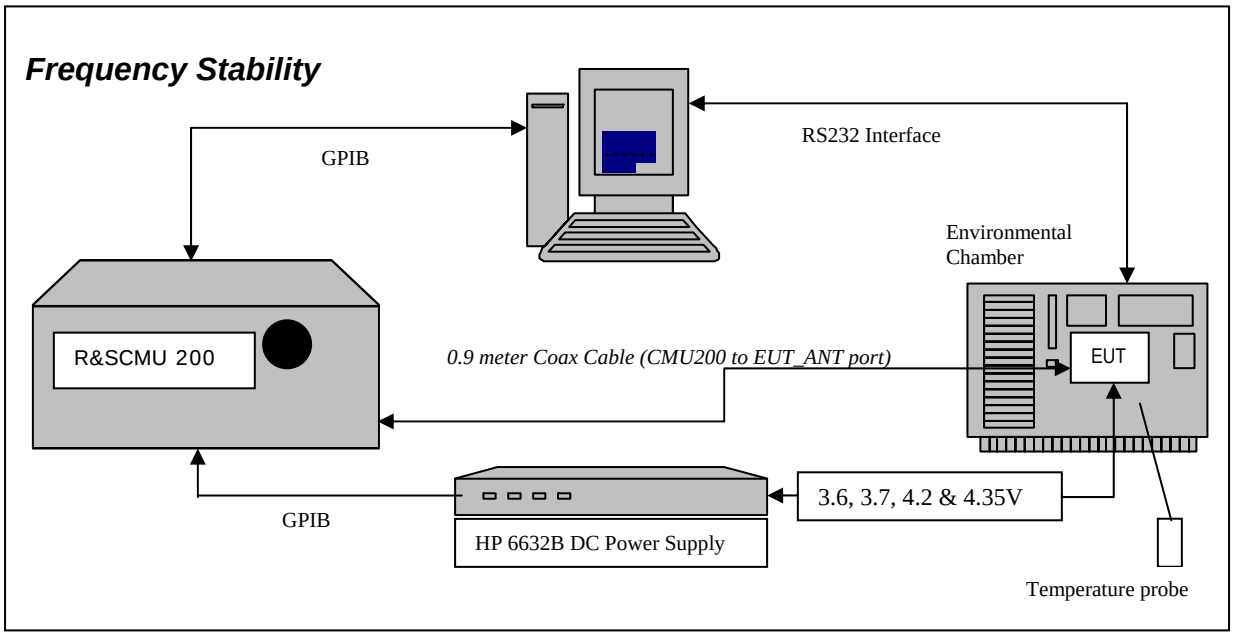
The environmental conditions were: Temperature: 23.0 °C
Humidity: 37.4 %

The measurements were performed by Daoud Attayi

Channel	Frequency (MHz)	Maximum Output Power (dBm)	Maximum Output Power (Watts)	Channel	Frequency (MHz)	Maximum Output Power (dBm)	Maximum Output Power (Watts)
GSM850				GSM850 EDGE			
128	824.20	33.5	2.24	128	824.20	30.3	1.07
189	837.60	33.5	2.24	189	837.60	30.3	1.07
251	848.80	33.1	2.04	251	848.80	29.8	0.95
PCS				PCS EDGE			
512	1850.2	29.8	0.95	512	1850.2	28.4	0.69
661	1880.0	29.8	0.95	661	1880.0	28.3	0.68
810	1909.8	29.8	0.95	810	1909.8	28.1	0.65

APPENDIX 1C – GSM FREQUENCY STABILITY TEST DATA

GSM Frequency Stability Test Data



The measurements were performed by Kevin Guo.

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

24.235/22.917 *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.
Calibration for the Cable Loss was performed in the RF Laboratory using the Agilent power meter and Agilent Signal Generator.

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 3.7 volts, to 4.2 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, 3.7 volts, 4.2 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.

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 3.7 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 4.2 volts
15. 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, 3.7, 4.2 and 4.35 volts.

The maximum frequency error in the GSM850 band measured was -**0.0582 PPM**.
The maximum frequency error in the PCS1900 band measured was **-0.0382PPM**.

Date of Test: July 05, 2012

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	-21	-0.0255
189	836.40	3.6	20	-23	-0.0275
251	848.60	3.6	20	-26	-0.0306

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	3.7	20	-20	-0.0243
189	836.40	3.7	20	25	0.0299
251	848.60	3.7	20	-18	-0.0212

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.2	20	27	0.0328
189	836.40	4.2	20	21	0.0251
251	848.60	4.2	20	24	0.0283

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.35	20	15	0.0182
189	836.40	4.35	20	15	0.0179
251	848.60	4.35	20	-18	-0.0212

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	-36	-0.0437
128	824.20	3.6	-20	-20	-0.0243
128	824.20	3.6	-10	-25	-0.0303
128	824.20	3.6	0	20	0.0243
128	824.20	3.6	10	29	0.0352
128	824.20	3.6	20	-21	-0.0255
128	824.20	3.6	30	31	0.0376
128	824.20	3.6	40	-20	-0.0243
128	824.20	3.6	50	-24	-0.0291
128	824.20	3.6	60	24	0.0291
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
128	824.20	3.7	-30	-17	-0.0206
128	824.20	3.7	-20	-26	-0.0315
128	824.20	3.7	-10	20	0.0243
128	824.20	3.7	0	21	0.0255
128	824.20	3.7	10	22	0.0267
128	824.20	3.7	20	-20	-0.0243
128	824.20	3.7	30	26	0.0315
128	824.20	3.7	40	-18	-0.0218
128	824.20	3.7	50	27	0.0328
128	824.20	3.7	60	25	0.0303
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
128	824.20	4.2	-30	-48	**-0.0582**
128	824.20	4.2	-20	-27	-0.0328
128	824.20	4.2	-10	30	0.0364
128	824.20	4.2	0	25	0.0303
128	824.20	4.2	10	21	0.0255
128	824.20	4.2	20	27	0.0328
128	824.20	4.2	30	-17	-0.0206
128	824.20	4.2	40	18	0.0218
128	824.20	4.2	50	29	0.0352
128	824.20	4.2	60	26	0.0315

GSM850 Results: channel 128 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.35	-30	-16	-0.0194
128	824.20	4.35	-20	17	0.0206
128	824.20	4.35	-10	23	0.0279
128	824.20	4.35	0	26	0.0315
128	824.20	4.35	10	19	0.0231
128	824.20	4.35	20	15	0.0182
128	824.20	4.35	30	-28	-0.0340
128	824.20	4.35	40	16	0.0194
128	824.20	4.35	50	-13	-0.0158
128	824.20	4.35	60	-18	-0.0218

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	27	0.0323
189	836.40	3.6	-20	-29	-0.0347
189	836.40	3.6	-10	27	0.0323
189	836.40	3.6	0	27	0.0323
189	836.40	3.6	10	19	0.0227
189	836.40	3.6	20	-23	-0.0275
189	836.40	3.6	30	-21	-0.0251
189	836.40	3.6	40	21	0.0251
189	836.40	3.6	50	24	0.0287
189	836.40	3.6	60	24	0.0287
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
189	836.40	3.7	-30	33	0.0395
189	836.40	3.7	-20	31	0.0371
189	836.40	3.7	-10	28	0.0335
189	836.40	3.7	0	23	0.0275
189	836.40	3.7	10	21	0.0251
189	836.40	3.7	20	25	0.0299
189	836.40	3.7	30	-24	-0.0287
189	836.40	3.7	40	29	0.0347
189	836.40	3.7	50	-27	-0.0323
189	836.40	3.7	60	27	0.0323

GSM850 Results: channel 189 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
189	836.40	4.2	-30	-35	-0.0418
189	836.40	4.2	-20	26	0.0311
189	836.40	4.2	-10	22	0.0263
189	836.40	4.2	0	25	0.0299
189	836.40	4.2	10	22	0.0263
189	836.40	4.2	20	21	0.0251
189	836.40	4.2	30	-28	-0.0335
189	836.40	4.2	40	28	0.0335
189	836.40	4.2	50	18	0.0215
189	836.40	4.2	60	-19	-0.0227
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
189	836.40	4.35	-30	18	0.0215
189	836.40	4.35	-20	21	0.0251
189	836.40	4.35	-10	18	0.0215
189	836.40	4.35	0	25	0.0299
189	836.40	4.35	10	18	0.0215
189	836.40	4.35	20	15	0.0179
189	836.40	4.35	30	-22	-0.0263
189	836.40	4.35	40	-12	-0.0143
189	836.40	4.35	50	15	0.0179
189	836.40	4.35	60	-19	-0.0227

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	21	0.0247
251	848.8	3.6	-20	22	0.0259
251	848.8	3.6	-10	25	0.0295
251	848.8	3.6	0	20	0.0236
251	848.8	3.6	10	27	0.0318
251	848.8	3.6	20	-26	-0.0306
251	848.8	3.6	30	-27	-0.0318
251	848.8	3.6	40	22	0.0259
251	848.8	3.6	50	19	0.0224
251	848.8	3.6	60	25	0.0295
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
251	848.8	3.7	-30	31	0.0365
251	848.8	3.7	-20	31	0.0365
251	848.8	3.7	-10	24	0.0283
251	848.8	3.7	0	22	0.0259
251	848.8	3.7	10	28	0.0330
251	848.8	3.7	20	-18	-0.0212
251	848.8	3.7	30	-27	-0.0318
251	848.8	3.7	40	20	0.0236
251	848.8	3.7	50	24	0.0283
251	848.8	3.7	60	24	0.0283
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
251	848.8	4.2	-30	-22	-0.0259
251	848.8	4.2	-20	28	0.0330
251	848.8	4.2	-10	21	0.0247
251	848.8	4.2	0	20	0.0236
251	848.8	4.2	10	-20	-0.0236
251	848.8	4.2	20	24	0.0283
251	848.8	4.2	30	-20	-0.0236
251	848.8	4.2	40	-21	-0.0247
251	848.8	4.2	50	25	0.0295
251	848.8	4.2	60	23	0.0271

GSM850 Results: channel 251 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
251	848.8	4.35	-30	-15	-0.0177
251	848.8	4.35	-20	-12	-0.0141
251	848.8	4.35	-10	17	0.0200
251	848.8	4.35	0	23	0.0271
251	848.8	4.35	10	19	0.0224
251	848.8	4.35	20	-18	-0.0212
251	848.8	4.35	30	-13	-0.0153
251	848.8	4.35	40	-13	-0.0153
251	848.8	4.35	50	-11	-0.0130
251	848.8	4.35	60	-20	-0.0236

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	24.00	0.0130
661	1880.00	3.6	20	24.00	0.0128
810	1909.80	3.6	20	29.00	0.0152

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	3.7	20	36.00	0.0195
661	1880.00	3.7	20	32.00	0.0170
810	1909.80	3.7	20	28.00	0.0147

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.2	20	19.00	0.0103
661	1880.00	4.2	20	30.00	0.0160
810	1909.80	4.2	20	26.00	0.0136

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.35	20	47.00	0.0254
661	1880.00	4.35	20	50.00	0.0226
810	1909.80	4.35	20	57.00	0.0298

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	29.00	0.0157
512	1850.20	3.6	-20	36.00	0.0195
512	1850.20	3.6	-10	41.00	0.0222
512	1850.20	3.6	0	67.00	0.0362
512	1850.20	3.6	10	50.00	0.0270
512	1850.20	3.6	20	24.00	0.0130
512	1850.20	3.6	30	50.00	0.0270
512	1850.20	3.6	40	-34.00	-0.0184
512	1850.20	3.6	50	16.00	0.0086
512	1850.20	3.6	60	32.00	0.0173
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
512	1850.20	3.7	-30	34.00	0.0184
512	1850.20	3.7	-20	33.00	0.0178
512	1850.20	3.7	-10	34.00	0.0184
512	1850.20	3.7	0	55.00	0.0297
512	1850.20	3.7	10	51.00	0.0276
512	1850.20	3.7	20	36.00	0.0195
512	1850.20	3.7	30	70.00	0.0378
512	1850.20	3.7	40	31.00	0.0168
512	1850.20	3.7	50	37.00	0.0200
512	1850.20	3.7	60	28.00	0.0151
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
512	1850.20	4.2	-30	44.00	0.0238
512	1850.20	4.2	-20	38.00	0.0205
512	1850.20	4.2	-10	33.00	0.0178
512	1850.20	4.2	0	55.00	0.0297
512	1850.20	4.2	10	44.00	0.0238
512	1850.20	4.2	20	19.00	0.0103
512	1850.20	4.2	30	18.00	0.0097
512	1850.20	4.2	40	61.00	0.0330
512	1850.20	4.2	50	-30.00	-0.0162
512	1850.20	4.2	60	-34.00	-0.0184

PCS1900 Results: channel 512 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.35	-30	33	0.0178
512	1850.20	4.35	-20	27	0.0146
512	1850.20	4.35	-10	35	0.0189
512	1850.20	4.35	0	68	0.0368
512	1850.20	4.35	10	61	0.0330
512	1850.20	4.35	20	47	0.0254
512	1850.20	4.35	30	34	0.0184
512	1850.20	4.35	40	20	0.0108
512	1850.20	4.35	50	17	0.0092
512	1850.20	4.35	60	33	0.0178

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	32.00	0.0170
661	1880.00	3.6	-20	33.00	0.0176
661	1880.00	3.6	-10	36.00	0.0191
661	1880.00	3.6	0	55.00	0.0293
661	1880.00	3.6	10	40.00	0.0213
661	1880.00	3.6	20	24.00	0.0128
661	1880.00	3.6	30	-34.00	-0.0181
661	1880.00	3.6	40	-28.00	-0.0149
661	1880.00	3.6	50	-24.00	-0.0128
661	1880.00	3.6	60	16.00	0.0085
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
661	1880.00	3.7	-30	38.00	0.0202
661	1880.00	3.7	-20	33.00	0.0176
661	1880.00	3.7	-10	32.00	0.0170
661	1880.00	3.7	0	62.00	0.0330
661	1880.00	3.7	10	47.00	0.0250
661	1880.00	3.7	20	32.00	0.0170
661	1880.00	3.7	30	-30.00	-0.0160
661	1880.00	3.7	40	48.00	0.0255
661	1880.00	3.7	50	17.00	0.0090
661	1880.00	3.7	60	38.00	0.0202

PCS1900 Results: channel 661 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
661	1880.00	4.2	-30	41.00	0.0218
661	1880.00	4.2	-20	37.00	0.0197
661	1880.00	4.2	-10	31.00	0.0165
661	1880.00	4.2	0	52.00	0.0277
661	1880.00	4.2	10	51.00	0.0271
661	1880.00	4.2	20	30.00	0.0160
661	1880.00	4.2	30	-11.00	-0.0059
661	1880.00	4.2	40	-18.00	-0.0096
661	1880.00	4.2	50	18.00	0.0096
661	1880.00	4.2	60	-17.00	-0.0090
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
661	1880.00	4.35	-30	36	0.0191
661	1880.00	4.35	-20	21	0.0112
661	1880.00	4.35	-10	31	0.0165
661	1880.00	4.35	0	66	0.0351
661	1880.00	4.35	10	62	0.0330
661	1880.00	4.35	20	50	0.0266
661	1880.00	4.35	30	32	0.0170
661	1880.00	4.35	40	25	0.0133
661	1880.00	4.35	50	21	0.0112
661	1880.00	4.35	60	32	0.0170

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	28.00	0.0147
810	1909.80	3.6	-20	31.00	0.0162
810	1909.80	3.6	-10	30.00	0.0157
810	1909.80	3.6	0	58.00	0.0304
810	1909.80	3.6	10	46.00	0.0241
810	1909.80	3.6	20	29.00	0.0152
810	1909.80	3.6	30	-48.00	-0.0251
810	1909.80	3.6	40	-70.00	-0.0367
810	1909.80	3.6	50	-37.00	-0.0194
810	1909.80	3.6	60	-34.00	-0.0178

PCS1900 Results: channel 810 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
810	1909.80	3.7	-30	40.00	0.0209
810	1909.80	3.7	-20	32.00	0.0168
810	1909.80	3.7	-10	33.00	0.0173
810	1909.80	3.7	0	52.00	0.0272
810	1909.80	3.7	10	54.00	0.0283
810	1909.80	3.7	20	28.00	0.0147
810	1909.80	3.7	30	-73.00	**-0.0382**
810	1909.80	3.7	40	25.00	0.0131
810	1909.80	3.7	50	-21.00	-0.0110
810	1909.80	3.7	60	-19.00	-0.0099
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
810	1909.80	4.2	-30	28.00	0.0147
810	1909.80	4.2	-20	30.00	0.0157
810	1909.80	4.2	-10	34.00	0.0178
810	1909.80	4.2	0	54.00	0.0283
810	1909.80	4.2	10	44.00	0.0230
810	1909.80	4.2	20	26.00	0.0136
810	1909.80	4.2	30	-27.00	-0.0141
810	1909.80	4.2	40	10.00	0.0052
810	1909.80	4.2	50	6.00	0.0031
810	1909.80	4.2	60	-10.00	-0.0052
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
810	1909.80	4.35	-30	41	0.0215
810	1909.80	4.35	-20	28	0.0147
810	1909.80	4.35	-10	36	0.0189
810	1909.80	4.35	0	64	0.0335
810	1909.80	4.35	10	53	0.0278
810	1909.80	4.35	20	57	0.0298
810	1909.80	4.35	30	36	0.0189
810	1909.80	4.35	40	28	0.0147
810	1909.80	4.35	50	20	0.0105
810	1909.80	4.35	60	40	0.0209

APPENDIX 1D – GSM RADIATED EMISSIONS TEST DATA

Radiated Power Test Data Results

Date of test: June 14, 2012

The following measurements were performed by Savtej Sandhu.
The environmental tests conditions were: Temperature: 25.2 °C
Relative Humidity: 28.8 %

The BlackBerry® smartphone was standalone, horizontal with LCD facing 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.

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) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole) (dBm)	(W)	Limit (dBm)	Diff. To Limit (dB)
F0	128	824.20	850	Dipole	V	79.00	88.41	V-V	15.30	33.06	2.02	38.50	-5.44
F0	128	824.20	850	Dipole	H	88.41		H-H	13.91				
F0	190	836.60	850	Dipole	V	77.99	87.92	V-V	15.05	32.49	1.77	38.50	-6.01
F0	190	836.60	850	Dipole	H	87.92		H-H	14.04				
F0	251	848.80	850	Dipole	V	78.76	87.77	V-V	15.89	**33.41**	**2.19**	38.50	-5.09
F0	251	848.80	850	Dipole	H	87.77		H-H	14.60				

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) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole) (dBm)	(W)	Limit (dBm)	Diff. To Limit (dB)
F0	128	824.20	850	Dipole	V	74.95	84.53	V-V	11.40	29.16	0.82	38.50	-9.34
F0	128	824.20	850	Dipole	H	84.53		H-H	11.17				
F0	190	836.60	850	Dipole	V	74.47	84.57	V-V	11.68	29.12	0.82	38.50	-9.38
F0	190	836.60	850	Dipole	H	84.57		H-H	10.70				
F0	251	848.80	850	Dipole	V	74.92	84.10	V-V	12.22	**29.74**	**0.94**	38.50	-8.76
F0	251	848.80	850	Dipole	H	84.10		H-H	10.91				

Radiated Power Test Data Results cont'd

Date of test: June 06, 2012
The following measurements were performed by Shuo Wang.
The environmental tests conditions were: Temperature: 25.2 °C
Relative Humidity: 34.4 %
The BlackBerry® smartphone was standalone, horizontal with LCD down and head 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 (dBuV)	Max (V,H) dBuV	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	512	1850.20	1900	Horn	V	89.92	89.92	V-V	-3.82	31.06	1.28	33.00	-1.94
F0	512	1850.20	1900	Horn	H	85.8		H-H	-3.75				
F0	661	1880.00	1900	Horn	V	90.06	90.06	V-V	-3.53	31.29	1.35	33.00	-1.71
F0	661	1880.00	1900	Horn	H	85.87		H-H	-3.52				
F0	810	1909.80	1900	Horn	V	89.74	89.74	V-V	-2.64	**32.17**	**1.65**	33.00	-0.83
F0	810	1909.80	1900	Horn	H	85.33		H-H	-2.75				

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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	512	1850.20	1900	Horn	V	87.69	87.69	V-V	-6.05	28.83	0.76	33.00	-4.17
F0	512	1850.20	1900	Horn	H	82.97		H-H	-5.98				
F0	661	1880.00	1900	Horn	V	88.14	88.14	V-V	-5.45	29.37	0.86	33.00	-3.63
F0	661	1880.00	1900	Horn	H	83.55		H-H	-5.44				
F0	810	1909.80	1900	Horn	V	88.06	88.06	V-V	-4.47	**30.34**	**1.08**	33.00	-2.66
F0	810	1909.80	1900	Horn	H	83.73		H-H	-4.65				

Radiated Emissions Test Data Results cont'd

GSM850 Call Mode

Date of Test: June 08 – June 14 and September 20, 2012

The following measurements were performed by Savtej Sandhu.
The environmental test conditions were: Temperature: 25.9 ºC
Relative Humidity: 29.1 %

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height, and a frequency range of 30 MHz to 1000 MHz.

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 GSM850 Call Tx mode, channels 128, 190, 251.
All emissions had test margins greater than 25.0 dB.

Date of Test: June 08 – September 20, 2012

The following measurements were performed by Shuo Wang
The environmental test conditions were: Temperature: 25.4 ºC
Relative Humidity: 41.7 %

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.

The measurements were performed in GSM850 Call Tx mode, channels 128, 190, 251.

BlackBerry® smartphone PIN 2A8C6FD6										
Frequency (MHz)	Channel Of Occurrence	Antenna Pol. (V/H)	Antenna Height (meters)	Test Angle (Deg.)	Detector (PK or QP)	Measured Level (dBµV)	Correction Factor for preamp/antenna/ cables/ filter (dB)	Field Strength Level (reading+corr) (dBm)	Limit @ 3.0 m (dBm)	Test Margin (dB)
2509.504	190	H	1.0	315	PK	54.18	-86.71	-32.53	-13.00	**-19.5**

All other emissions had test margins greater than 25.0 dB

Radiated Emissions Test Data Results cont'd

GSM850 EDGE Mode

Date of Test: June 08 – June 14 and September 20, 2012

The environmental test conditions were: Temperature: 23.9 - 25.9 ºC
Relative Humidity: 29.1 - 31.8 %

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height, and a frequency range of 30 MHz to 1000 MHz.

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 GSM850 EDGE Tx mode, channels 128, 190, 251.
All emissions had test margins greater than 25.0 dB.

Date of Test: June 08 – June 14 and September 20, 2012

The environmental test conditions were: Temperature: 25.4 ºC
Relative Humidity: 41.7 %

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.

The measurements were performed in GSM850 EDGE Tx mode, channels 128, 190, 251.

All emissions had test margins greater than 25.0 dB

Radiated Emissions Test Data Results cont'd

PCS1900 CALL Mode

Date of Test: June 08 – June 14 and September 20, 2012

The environmental test conditions were: Temperature: 23.9 - 25.9 ºC
Relative Humidity: 29.1 - 31.8 %

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height, and a frequency range of 30 MHz to 1000 MHz.

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

Measurements were performed in PCS1900 Call Tx mode, channels 512, 661, 810.
All emissions had test margins greater than 25.0 dB.

Date of Test: June 08 – June 14 and September 20-27, 2012

The environmental test conditions were: Temperature: 25.4 ºC
Relative Humidity: 41.7 %

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 20 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 PCS1900 Call Tx mode, channels 512, 661, 810.

BlackBerry® smartphone PIN 2A8C6FD6										
Frequency (MHz)	Channel Of Occurrence	Antenna		Test Angle (Deg.)	Detector (PK or QP)	Measured Level (dBµV)	Correction Factor for preamp/antenna/ cables/ filter (dB)	Field Strength Level (reading+corr) (dBm)	Limit @ 3.0 m (dBm)	Test Margin (dB)
		Pol. (V/H)	Height (meters)							
5640.264	661	V	2.77	166	PK	53.53	-72.46	-18.93	-13.00	-5.9

All other emissions had test margins greater than 25.0 dB.

Radiated Emissions Test Data Results cont'd

PCS1900 EDGE Mode

Date of Test: June 08 – June 14, 2012

The following measurements were performed by Savtej Sandhu.
The environmental test conditions were: Temperature: 25.9 ºC
Relative Humidity: 29.1 %

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height, and a frequency range of 30 MHz to 1000 MHz.

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

Measurements were performed in PCS1900 EDGE Tx mode, channels 512, 661, 810.
All emissions had test margins greater than 25.0 dB.

Date of Test: June 08 – June 14, 2012

The following measurements were performed by Shuo Wang
The environmental test conditions were: Temperature: 25.4 ºC
Relative Humidity: 41.7 %

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 20 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.

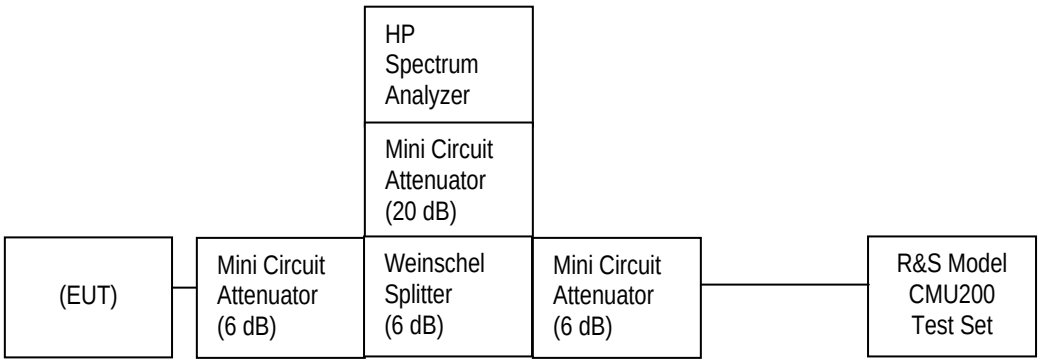
Measurements were performed in PCS1900 EDGE Tx mode, channels 512, 661, 810.
All emissions had test margins greater than 25.0 dB.

APPENDIX 2A– WCDMA Band 2/5 CONDUCTED RF EMISSIONS TEST DATA/PLOTS

WCDMA BAND 2/5 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



Date of Test: July 10, 2012

The environmental test conditions were: Temperature: 25.0ºC
Relative Humidity: 37.0 %

The following measurements were performed by Kevin Guo.

WCDMA Conducted RF Emission Test Data cont'd

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 24.238(a), CFR 2.202, CFR 22 Subpart H, CFR 27.53, RSS-132, RSS - 133 and RSS – 139 were measured from 10 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 5 was measured to be 4.583 MHz, and for the WCDMA band 2 was measured to be 4.592 MHz 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 WCDMA Band 5/2 selected Frequencies in Loopback mode

WCDMA Band 5 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
826.400	4.583	4.142
836.400	4.575	4.133
846.600	4.542	4.142

WCDMA Band 2 Frequency (MHz)	26dBc Occupied Bandwidth (MHz	99% Occupied Bandwidth (MHz)
1852.400	4.592	4.183
1880.000	4.592	4.167
1907.600	4.575	4.167

Measurement Plots for WCDMA Band 5 and WCDMA BAND 2 in Loopback mode

See Figures 1-1b to 1-12b for the plots of the conducted spurious emissions.
See Figures 1-13b to 1-24b for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.
See Figures 1-25b to 1-28b for the plots of the Channel mask.

WCDMA Conducted RF Emission Test Data cont'd

Figure 1-1b: Band 5, Spurious Conducted Emissions, Low channel

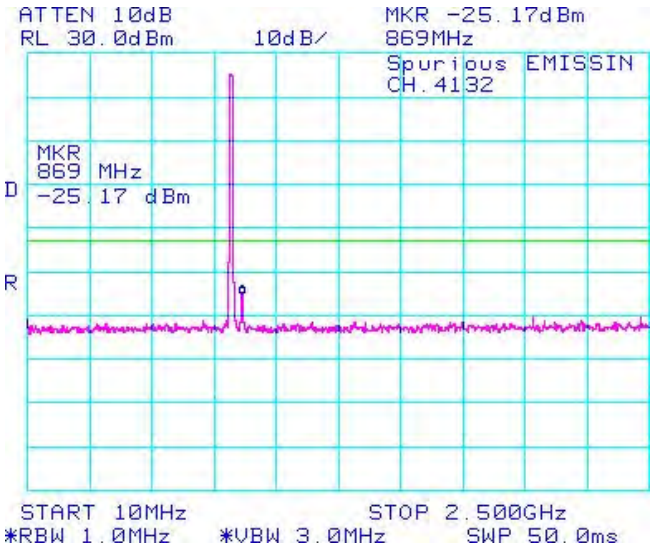


Figure 1-2b: Band 5, Spurious Conducted Emissions, Low channel

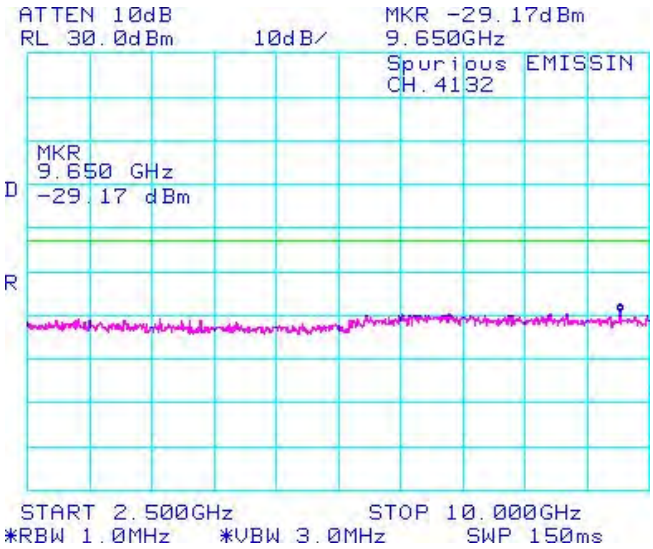


Figure 1-3b: Band 5, Spurious Conducted Emissions, Middle channel

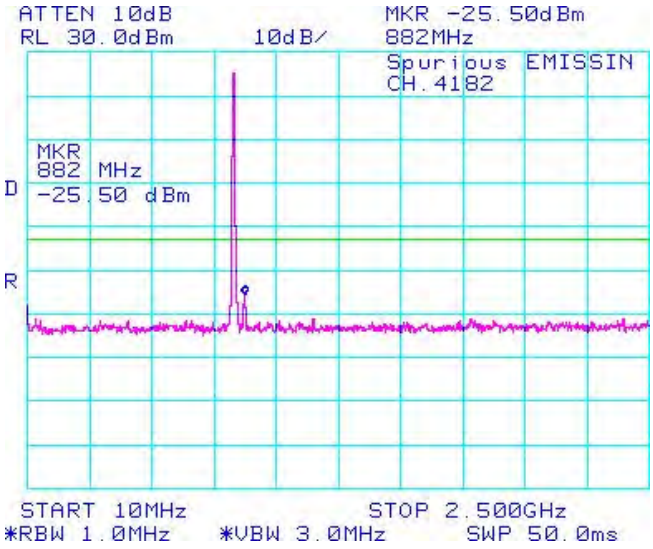
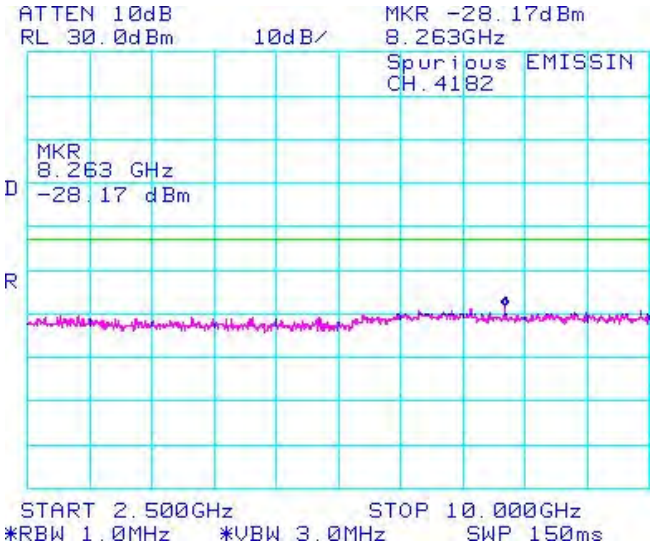


Figure 1-4b: Band 5, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-5b: Band 5, Spurious Conducted Emissions, High Channel

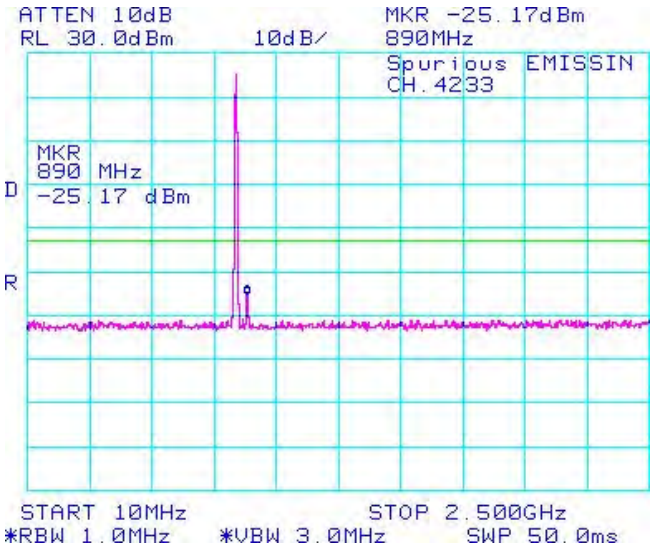


Figure 1-6b: Band 5, Spurious Conducted Emissions, High Channel

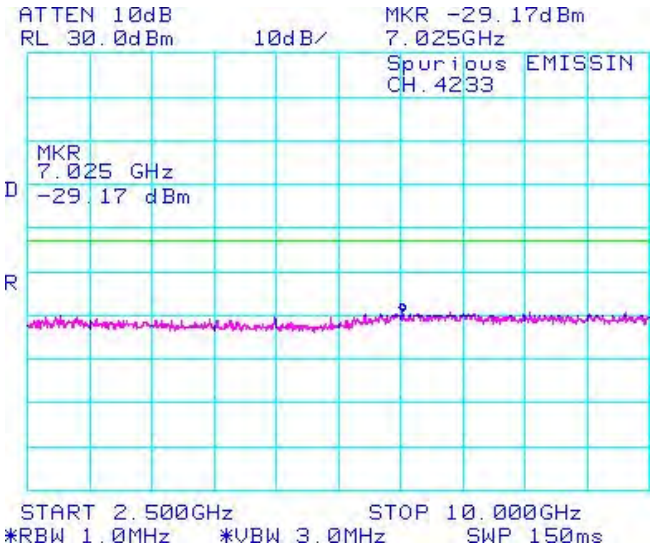


Figure 1-7b:, BAND 2 Spurious Conducted Emissions, Low Channel

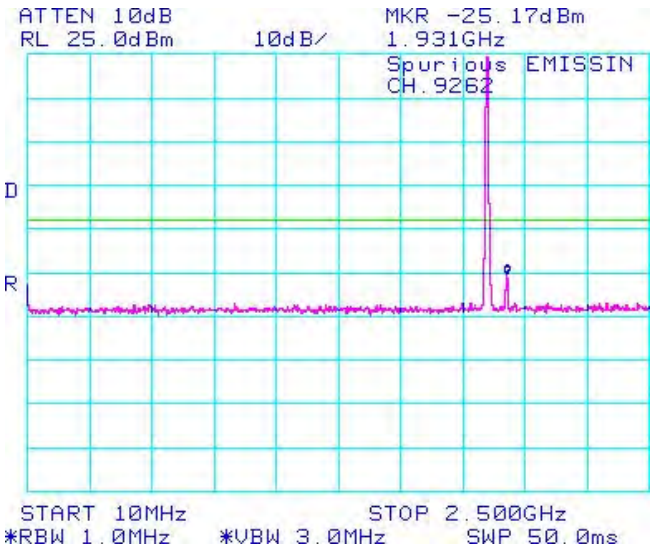
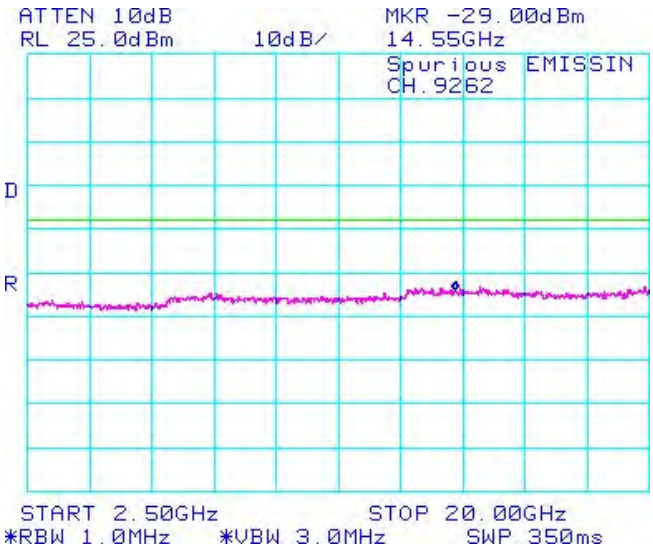


Figure 1-8b: BAND 2, Spurious Conducted Emissions, Low Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-9b: BAND 2, Spurious Conducted Emissions, Middle Channel

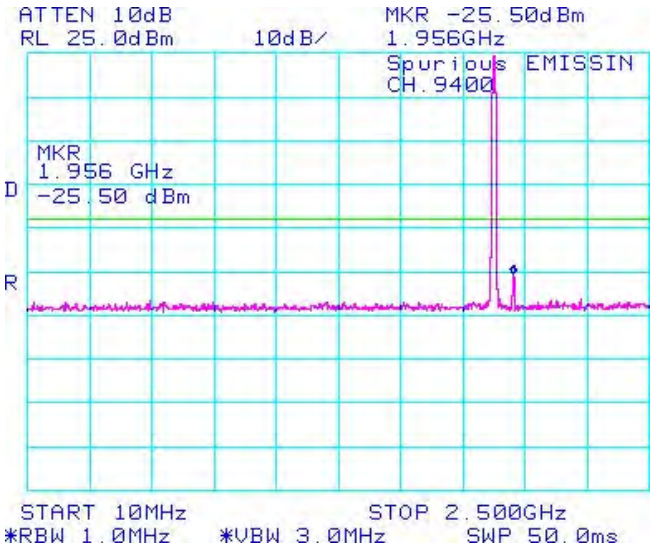


Figure 1-10b: BAND 2, Spurious Conducted Emissions, Middle Channel

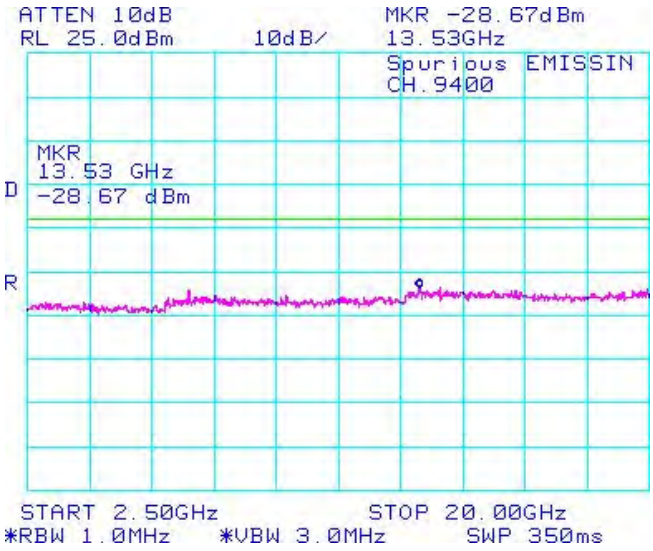


Figure 1-11b: BAND 2, Spurious Conducted Emissions, High Channel

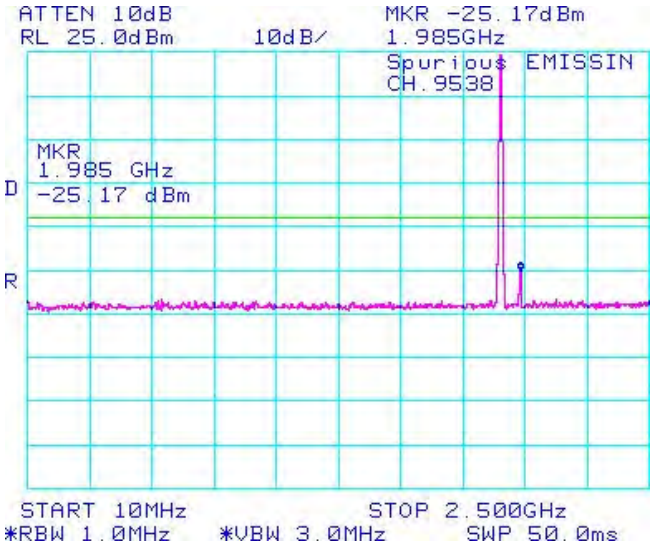
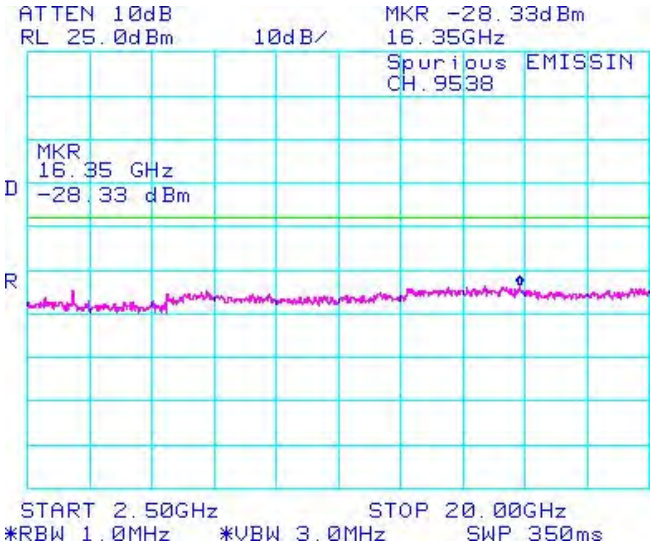


Figure 1-12b: BAND 2, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-13b: Occupied Bandwidth, Band 5 Low Channel

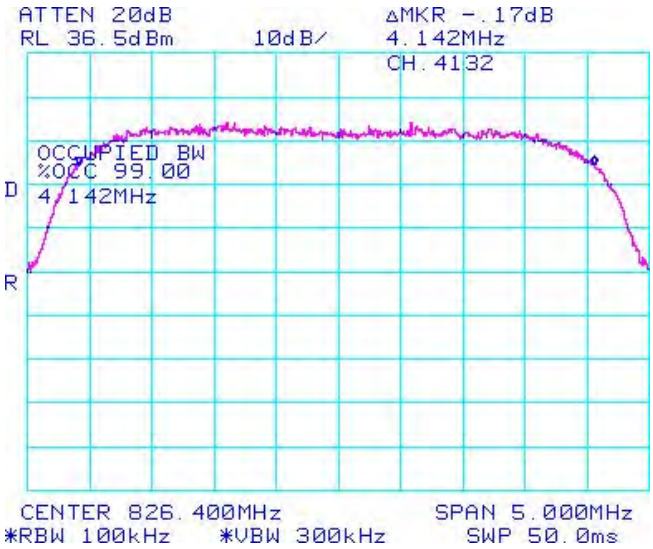


Figure 1-14b: Occupied Bandwidth, Band 5 Middle Channel

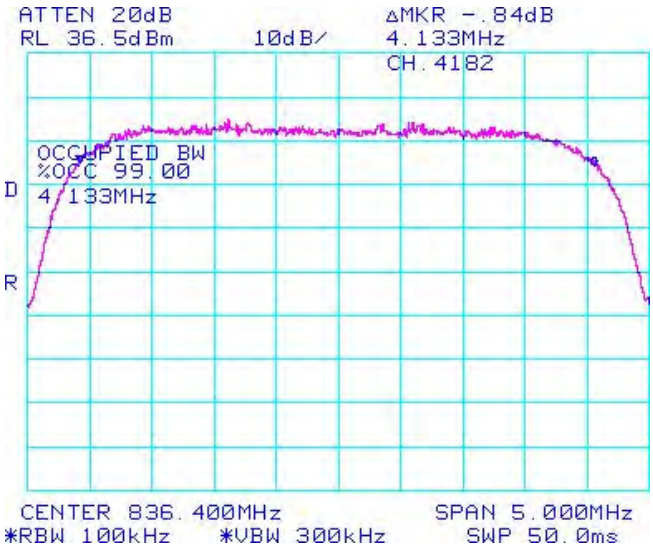


Figure 1-15b: Occupied Bandwidth, Band 5 High Channel

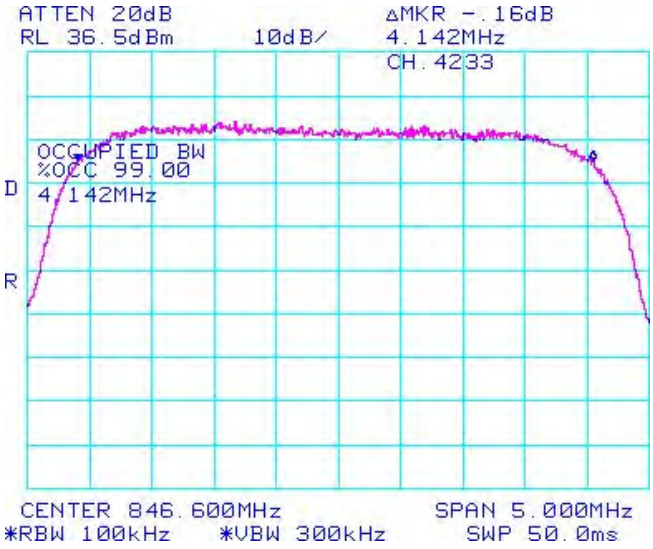
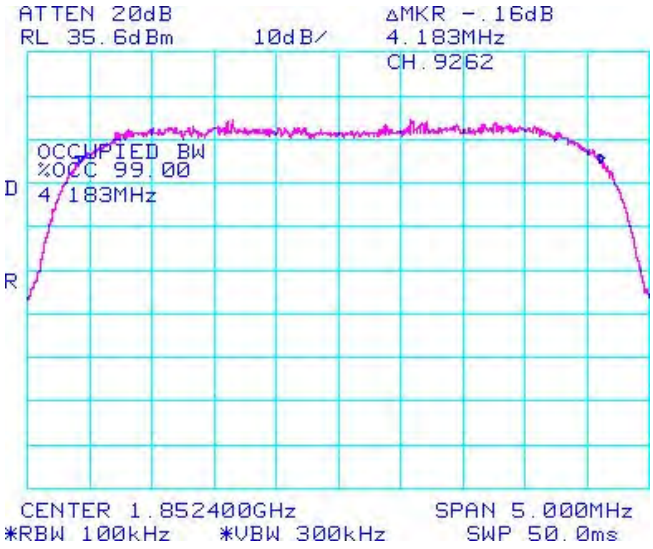


Figure 1-16b: Occupied Bandwidth, Band 2 Low Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-17b: Occupied Bandwidth, Band 2 Middle Channel

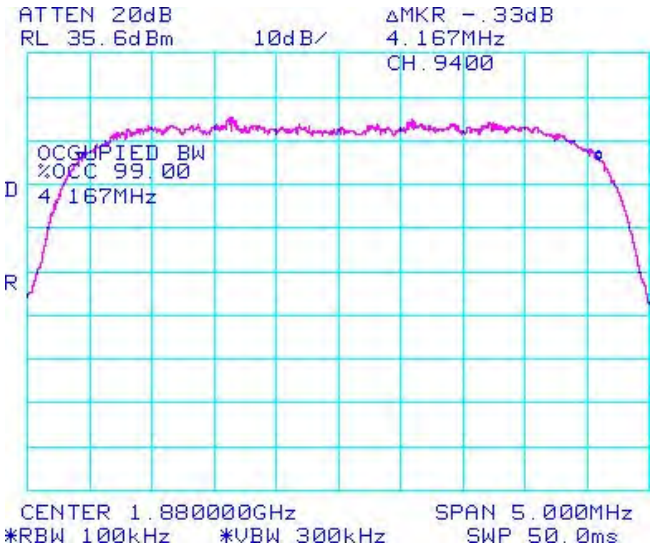


Figure 1-18b: Occupied Bandwidth, Band 2 High Channel

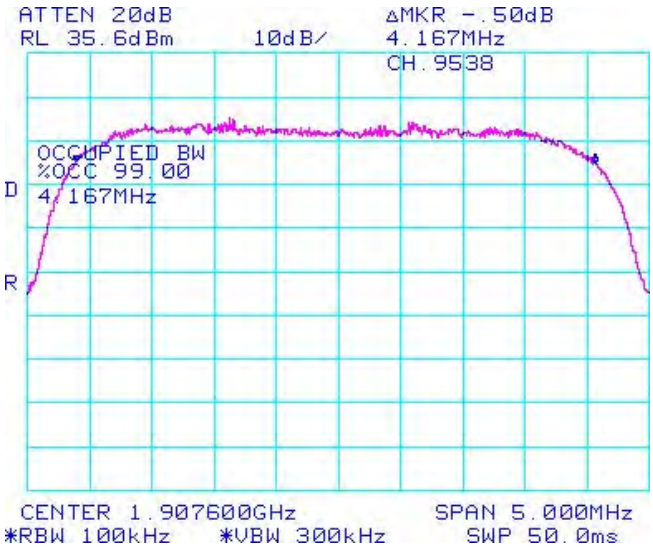


Figure 1-19b: -26 dBc Bandwidth, Band 5 Low Channel

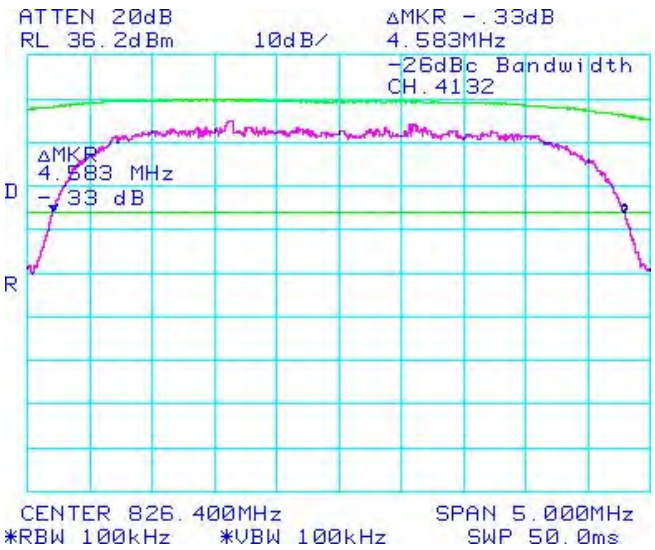
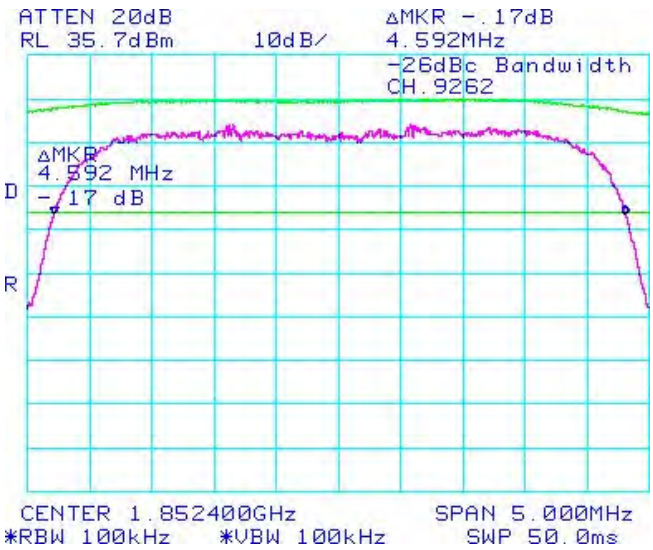


Figure 1-20b: -26 dBc Bandwidth, Band 2 Low Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-21b: -26 dBc Bandwidth, Band 5 Middle Channel

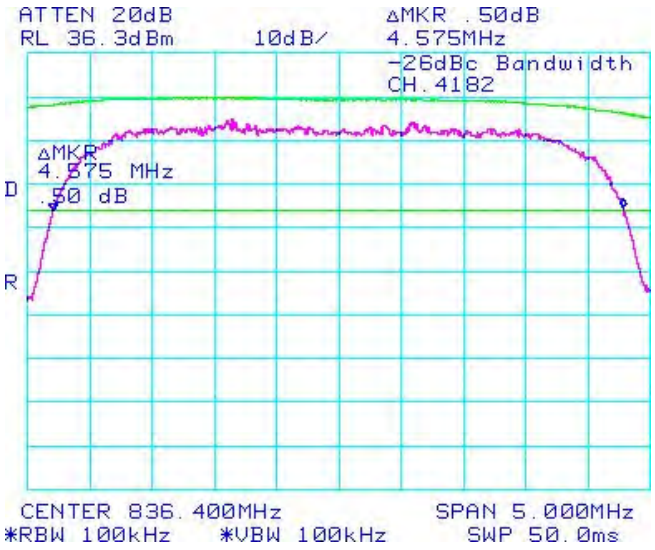


Figure 1-22b: -26 dBc Bandwidth, Band 2 Middle Channel

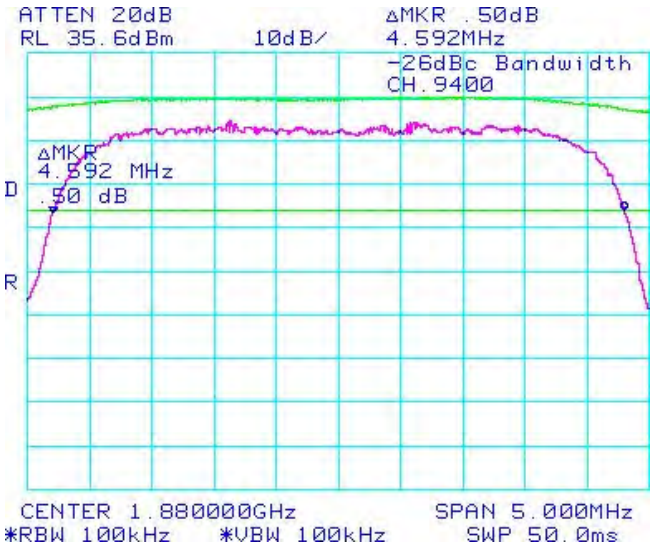


Figure 1-23b: -26 dBc Bandwidth, Band 5 High Channel

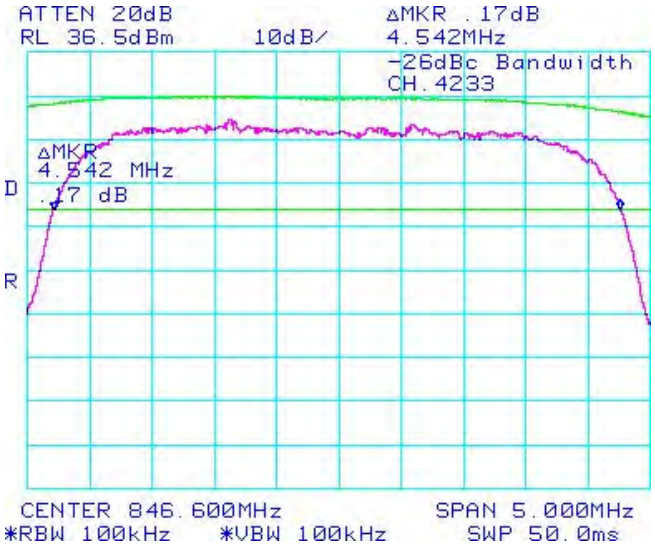
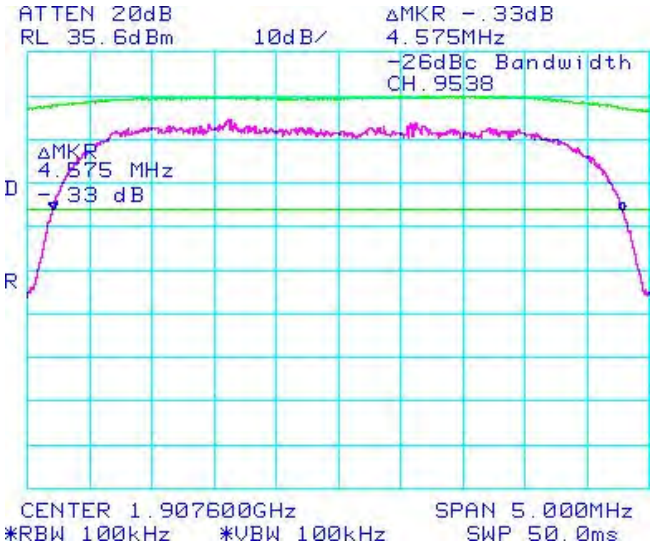


Figure 1-24b: -26 dBc Bandwidth, Band 2 High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-25b: Band 2 Low Channel Mask

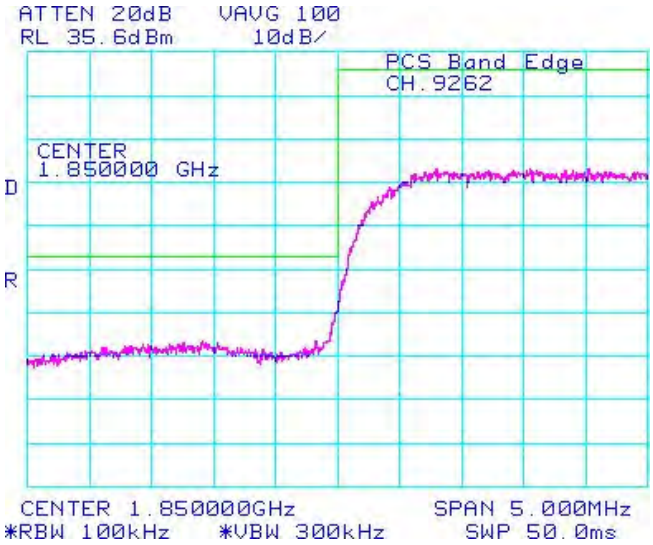


Figure 1-26b: Band 2 High Channel Mask

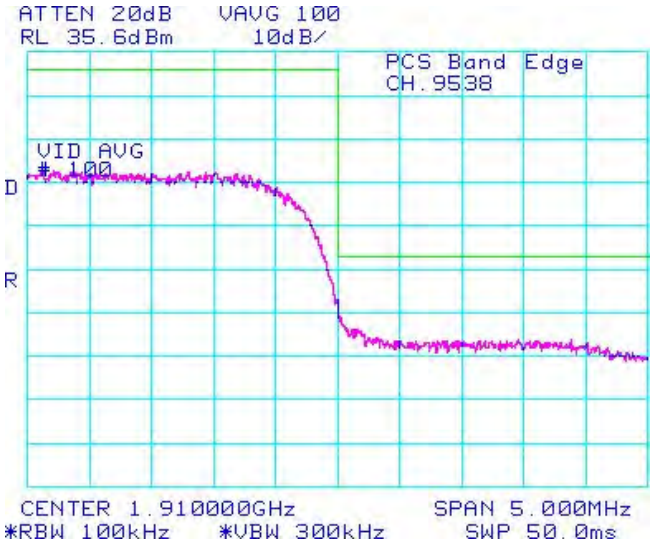


Figure 1-27b: Band 5 Low Channel Mask

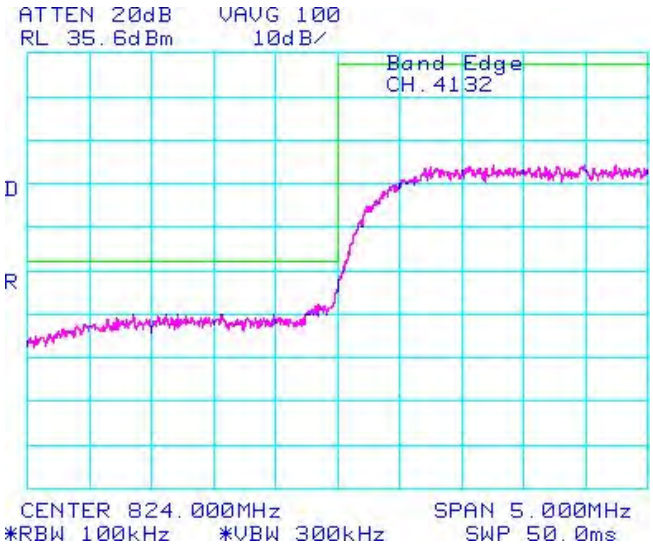
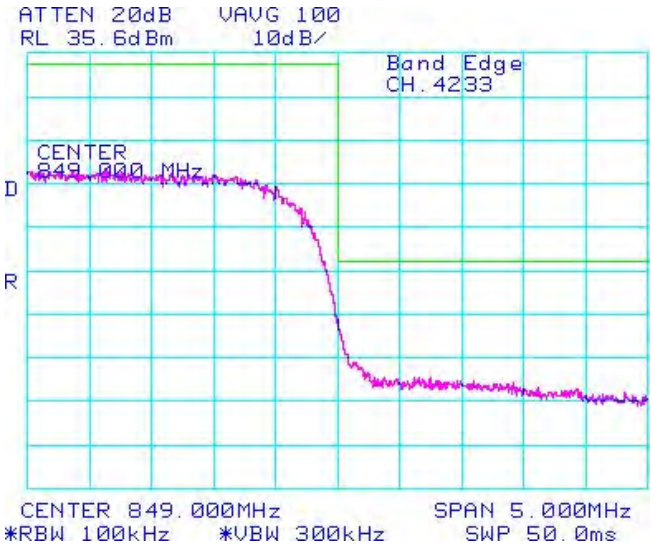


Figure 1-28b: Band 5 High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 24.238(a), CFR 22 Subpart H, RSS-132 and RSS - 133 were measured from 10 MHz to 20 GHz.

Date of Test: July 10, 2012

The environmental test conditions were: Temperature: 25.0 ºC
Relative Humidity: 37.0 %

Test Data for WCDMA Band 5 and WCDMA Band 2 selected Frequencies in HSUPA mode

WCDMA Band 5 Frequency (MHz)	99% Occupied Bandwidth (MHz)
826.400	4.133
836.400	4.150
846.600	4.142

WCDMA Band 2 Frequency (MHz)	99% Occupied Bandwidth (MHz)
1852.400	4.133
1880.000	4.133
1907.600	4.133

Measurement Plots for WCDMA Band 5 and WCDMA Band 2 in HSUPA mode
Refer to the following measurement plots for more detail:

See Figures 1-29b to 1-40b for the plots of the conducted spurious emissions.
See Figures 1-41b to 1-46b for the plots of 99% Occupied Bandwidth.
See Figures 1-47b to 1-50b for the plots of the Channel mask.

WCDMA Conducted RF Emission Test Data cont'd

Figure 1-29b: Band 5 , Spurious Conducted Emissions, Low channel

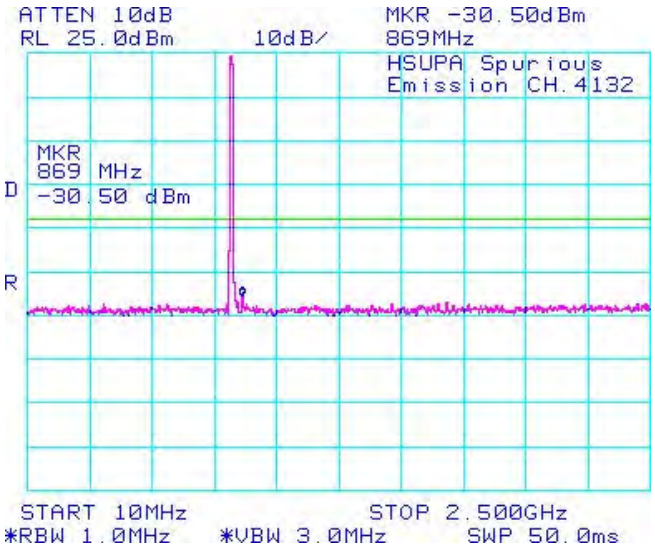


Figure 1-30b: Band 5 , Spurious Conducted Emissions, Low channel

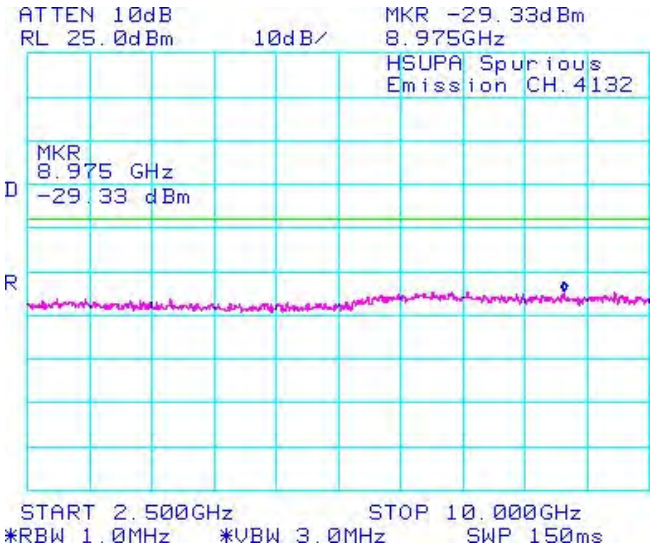


Figure 1-31b: Band 5 , Spurious Conducted Emissions, Middle channel

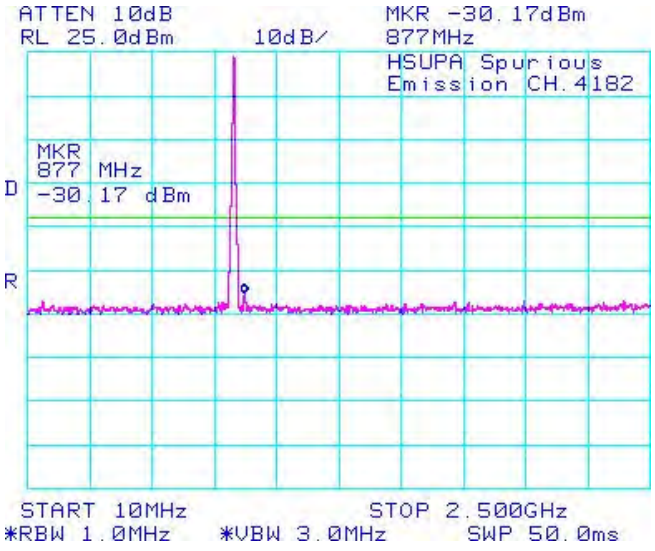
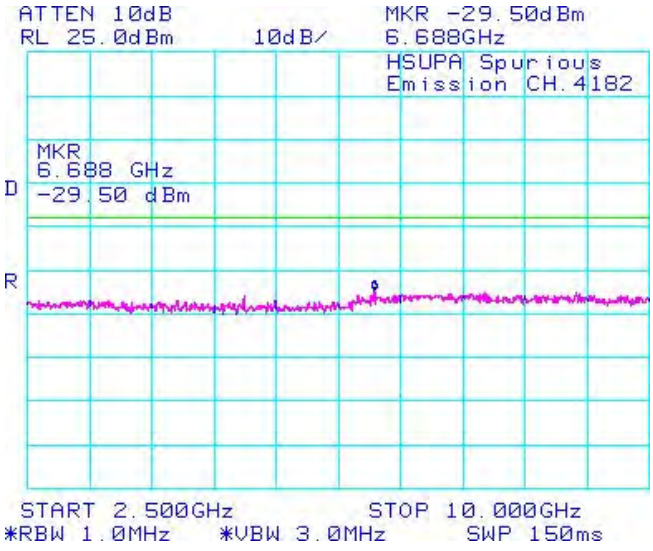


Figure 1-32b: Band 5 , Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-33b: Band 5 , Spurious Conducted Emissions, High Channel

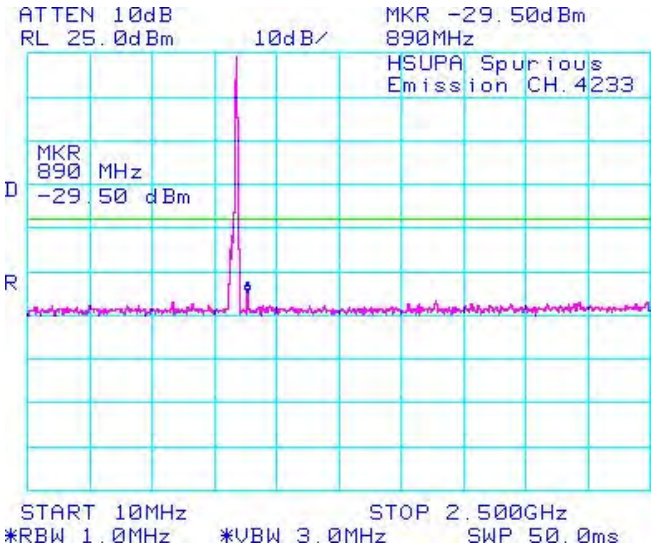


Figure 1-34b: Band 5 , Spurious Conducted Emissions, High Channel

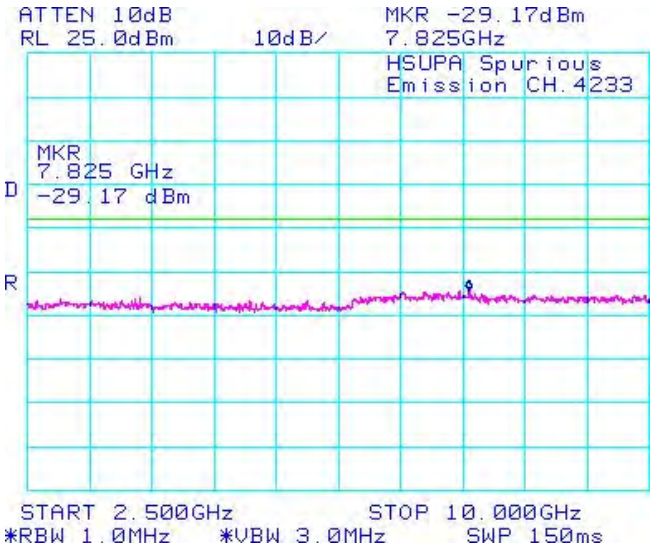


Figure 1-35b: Band 2, Spurious Conducted Emissions, Low Channel

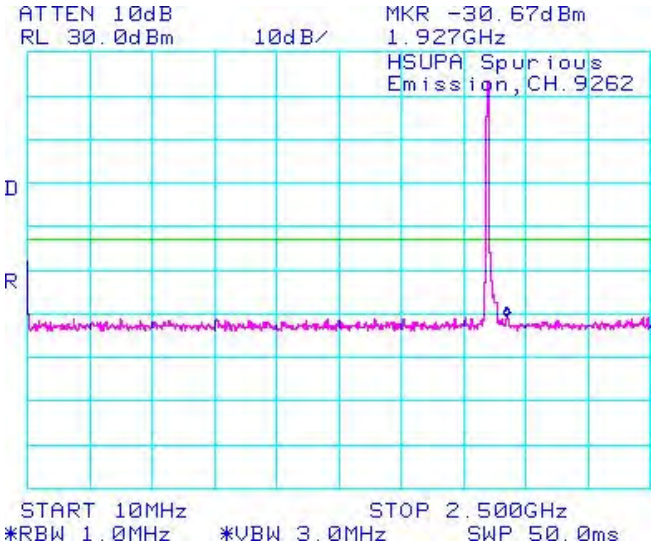
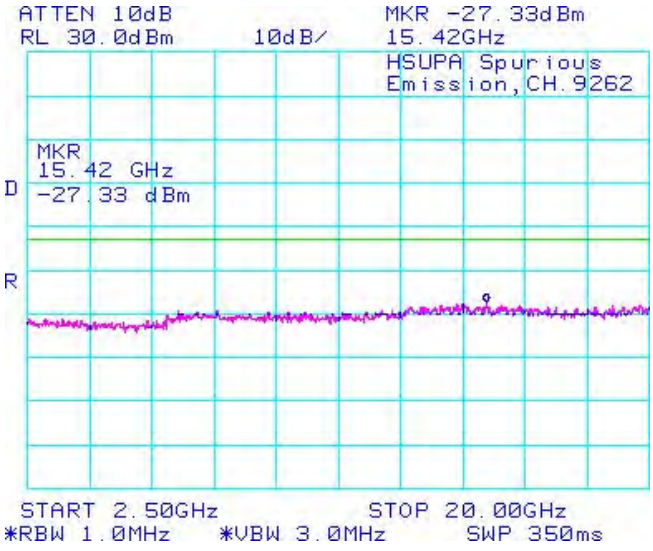


Figure 1-36b: Band 2, Spurious Conducted Emissions, Low Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-37b: Band 2, Spurious Conducted Emissions, Middle Channel

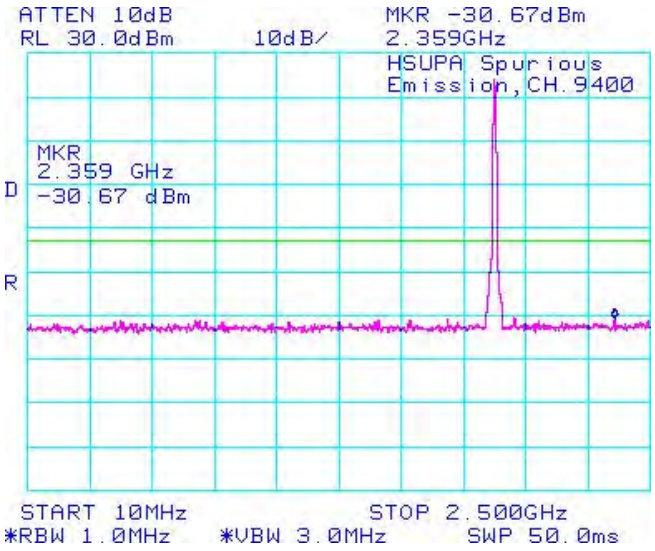


Figure 1-38b: Band 2, Spurious Conducted Emissions, Middle Channel

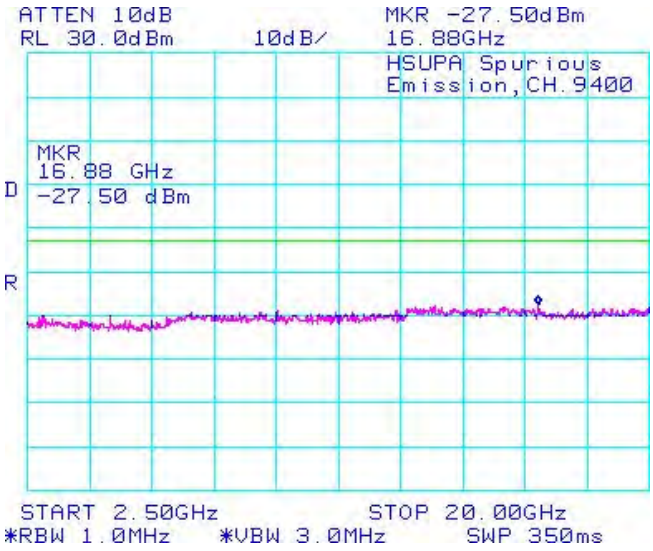


Figure 1-39b: Band 2, Spurious Conducted Emissions, High Channel

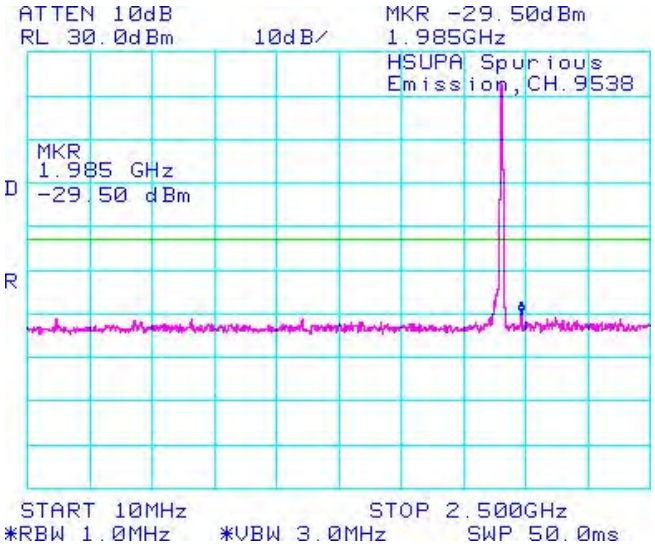
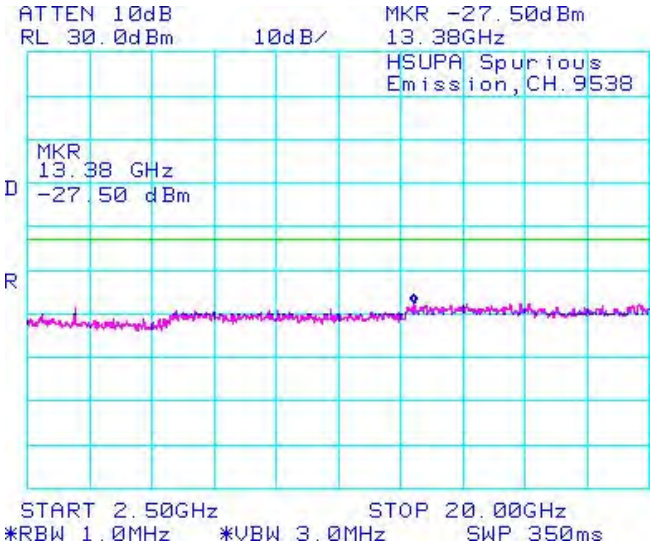


Figure 1-40b: Band 2, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-41b: Occupied Bandwidth, Band 5 Low Channel

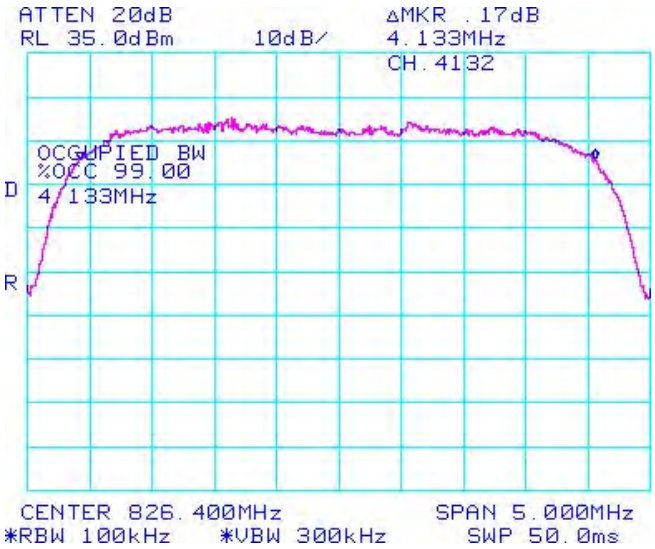


Figure 1-42b: Occupied Bandwidth, Band 5 Middle Channel

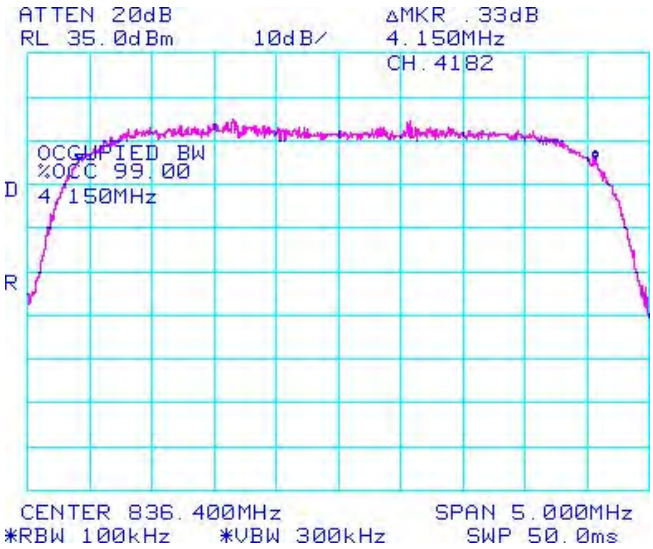


Figure 1-43b: Occupied Bandwidth, Band 5 High Channel

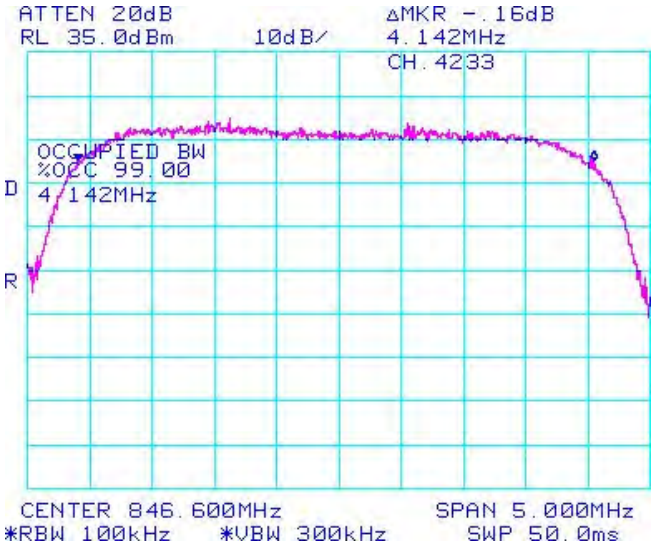
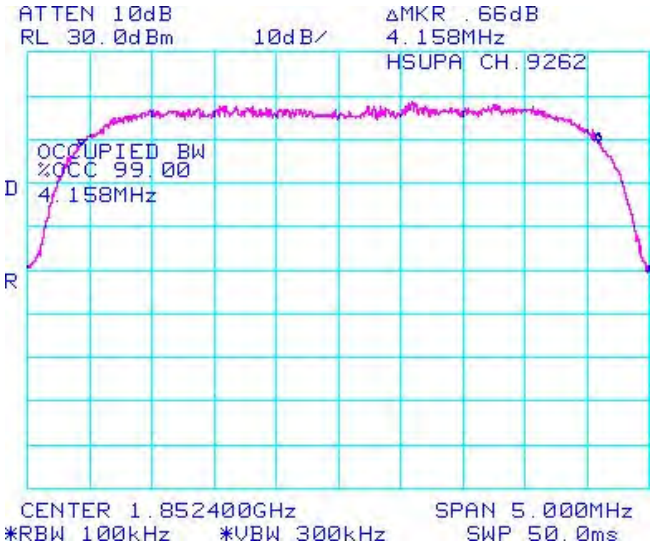


Figure 1-44b: Occupied Bandwidth, Band 2 Low Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-45b: Occupied Bandwidth, Band 2 Middle Channel

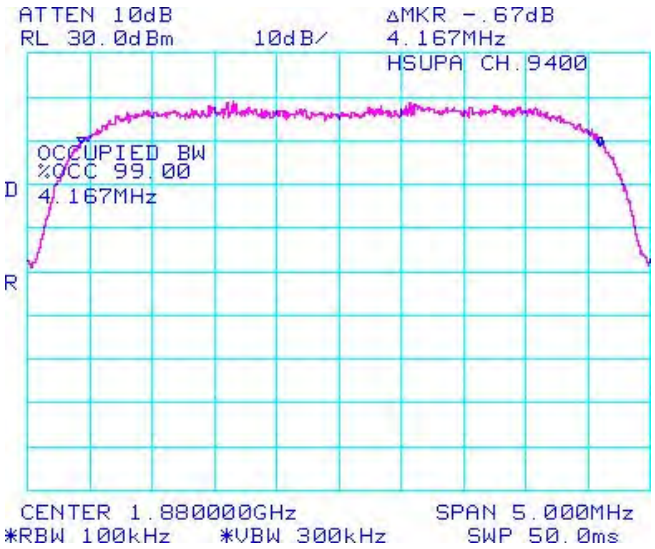


Figure 1-46b: Occupied Bandwidth, Band 2 High Channel

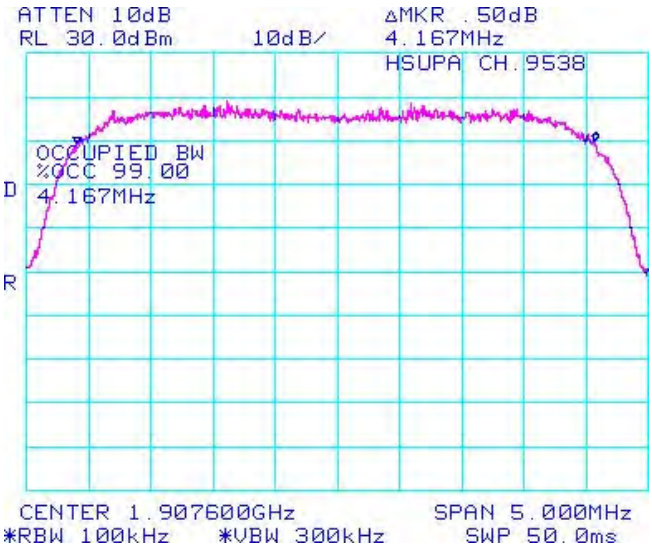


Figure 1-47b: Band 5 , Low Channel Mask

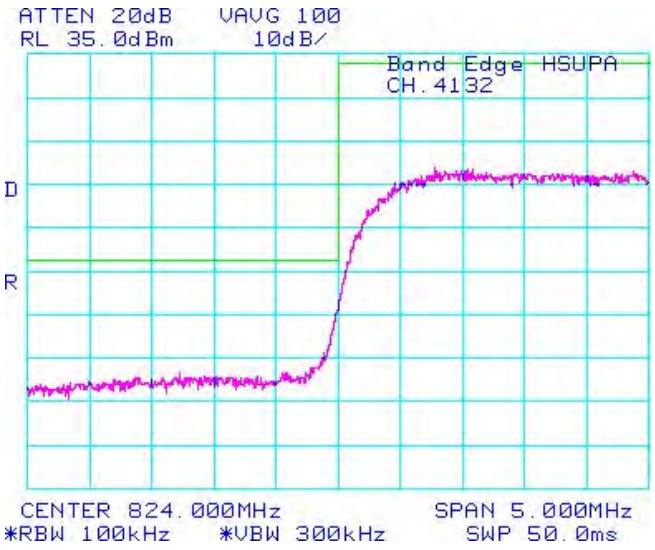
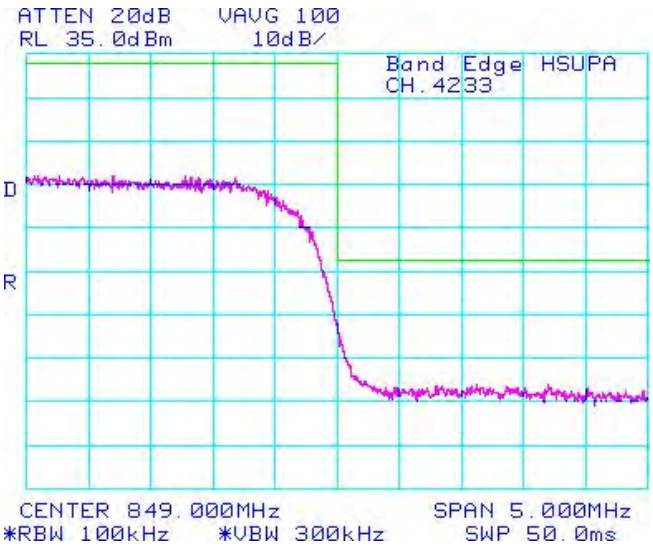


Figure 1-48b: Band 5 , High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-49b: Band 2, Low Channel Mask

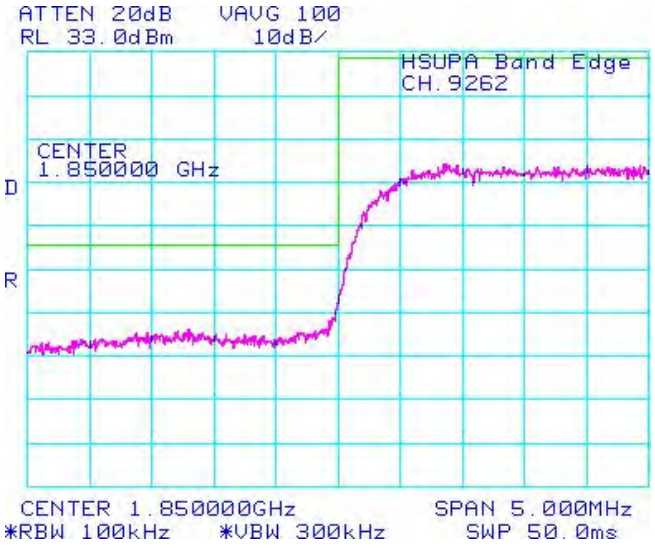
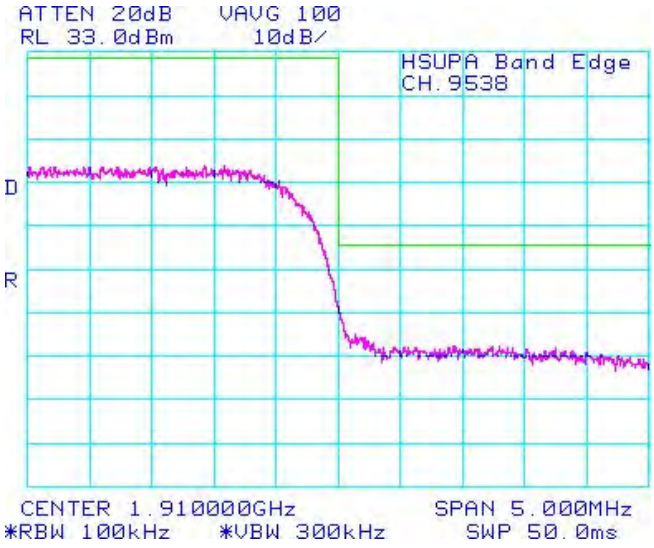


Figure 1-50b: Band 2, High Channel Mask



APPENDIX 2B – WCDMA Band 2/5 CONDUCTED RF OUTPUT POWER TEST DATA

WCDMA Band 2/5 Conducted RF Output Power Test Data

The conducted RF output power was measured using the CMU200 base station simulator. Low, middle and high channels were measured at maximum radio output power at different service options and modes.

Date of Test: June 20, 2012

The environmental conditions were: Temperature: 23.0 °C
Humidity: 37.6 %

The measurements were performed by Daoud Attayi.

WCDMA Band 5 RF Conducted RF Output Power

	Band	**WCDMA Band 5 (850)**		
	Channel	4132	4182	4233
	Freq (MHz)	826.4	836.4	846.6
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	24.6	24.7	24.1
Rel99	12.2 kbps, Voice, AMR, SRB 3.4 kbps	24.7	24.7	24.1
Rel6 HSUPA	1	23.1	23.1	22.6
Rel6 HSUPA	2	23.1	23.1	22.5
Rel6 HSUPA	3	23.6	23.7	23.0
Rel6 HSUPA	4	23.4	23.4	23.1
Rel6 HSUPA	5	22.0	22.1	21.5
Rel7 HSDPA+	1	22.4	22.3	22.5
Rel7 HSDPA+	2	22.0	22.0	21.9
Rel7 HSDPA+	3	22.1	22.2	21.8
Rel7 HSDPA+	4	21.6	21.8	21.3

WCDMA (Rel99) / HSPA/HSPA+ conducted power measurements
Rev 1

WCDMA Band 5 RF Conducted RF Output Power (Cont'd)

	Band	**WCDMA Band 5 (850)**		
	Channel	4132	4182	4233
	Freq (MHz)	826.4	836.4	846.6
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	24.4	24.6	24.4
Rel99	12.2 kbps, Voice, AMR, SRB 3.4 kbps			
Rel6 HSUPA	1			
Rel6 HSUPA	2			
Rel6 HSUPA	3			
Rel6 HSUPA	4			
Rel6 HSUPA	5			
Rel7 HSDPA+	1	23.5	23.4	23.3
Rel7 HSDPA+	2			
Rel7 HSDPA+	3			
Rel7 HSDPA+	4			

WCDMA (Rel99) / HSPA/HSPA+ conducted power measurements
Rev 2

WCDMA Band 2 RF Conducted RF Output Power

	Band	**WCDMA Band 2 (1900)**		
	Channel	9262	9400	9538
	Freq (MHz)	1852.4	1880.0	1907.6
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	23.7	23.7	23.7
Rel99	12.2 kbps, Voice, AMR, SRB 3.4 kbps	23.7	23.7	23.7
Rel6 HSUPA	1	21.9	21.9	21.9
Rel6 HSUPA	2	22.0	22.0	22.0
Rel6 HSUPA	3	22.5	22.5	22.5
Rel6 HSUPA	4	22.4	22.4	22.4
Rel6 HSUPA	5	21.1	21.1	21.1
Rel7 HSDPA+	1	22.1	22.1	22.1
Rel7 HSDPA+	2	21.3	21.3	21.3
Rel7 HSDPA+	3	21.5	21.5	21.5
Rel7 HSDPA+	4	21.1	21.1	21.1

WCDMA (Rel99) / HSPA/HSPA+ conducted power measurements
Rev 1

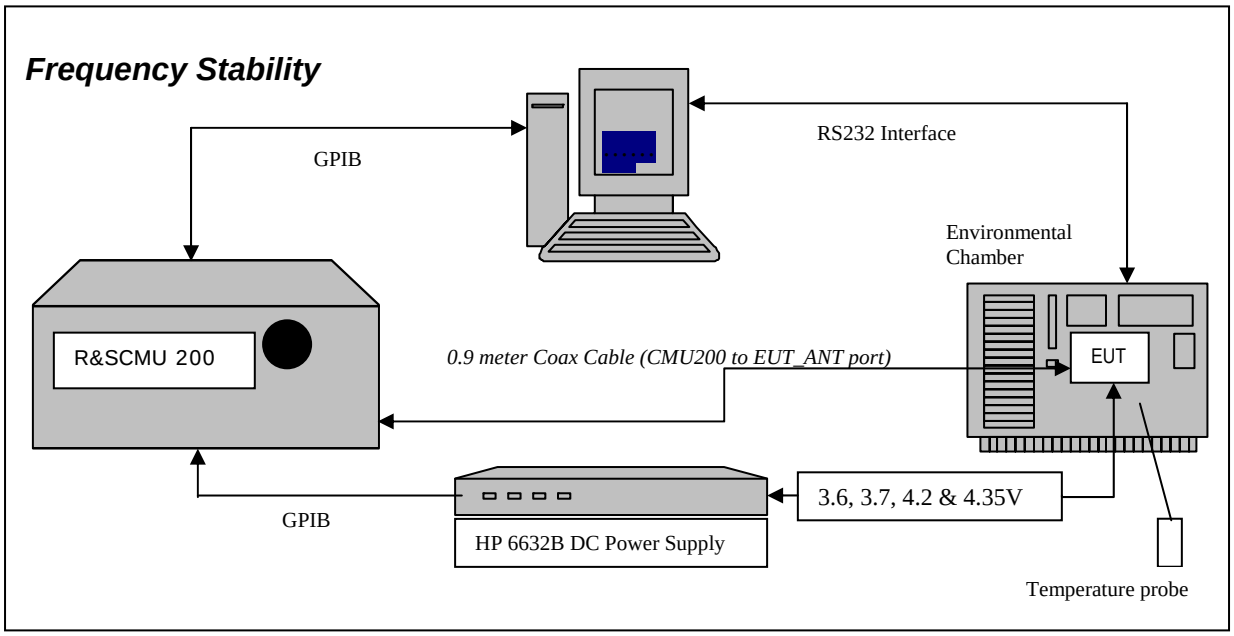
WCDMA Band 2 RF Conducted RF Output Power (Cont'd)

	Band	**WCDMA Band 2 (1900)**		
	Channel	9262	9400	9538
	Freq (MHz)	1852.4	1880.0	1907.6
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	23.6	23.9	23.5
Rel99	12.2 kbps, Voice, AMR, SRB 3.4 kbps			
Rel6 HSUPA	1			
Rel6 HSUPA	2			
Rel6 HSUPA	3			
Rel6 HSUPA	4			
Rel6 HSUPA	5			
Rel7 HSDPA+	1	23.3	23.5	23.1
Rel7 HSDPA+	2			
Rel7 HSDPA+	3			
Rel7 HSDPA+	4			

WCDMA (Rel99) / HSPA/HSPA+ conducted power measurements
Rev 2

APPENDIX 2C – WCDMA Band 2/5 FREQUENCY STABILITY TEST DATA

WCDMA Frequency Stability Test Data



The following measurements were performed by Kevin Guo.

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 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 CMU 200 and the EUT antenna port.

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, to 3.7 volts, 4.2 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, 3.7 volts, 4.2 volts and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 1852.4, 1880.0 and 1907.6 MHz for the WCDMA band 2. 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.

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 3.7 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 4.2 volts
15. 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, 3.7, 4.2 and 4.35 volts

The maximum frequency error in the WCDMA band 5 measured was **0.6902 PPM**.
The maximum frequency error in the WCDMA band 2 measured was **-0.0106 PPM.**

Date of test: June 29, 2012

WCDMA Band 5 results: channels 4132, 4182 and 4233 @ 20°C maximum transmitted power

Traffic Channel Number	WCDMA Band 5 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	3.6	20	15	0.5572
4182	836.4	3.6	20	19	0.6124
4233	846.6	3.6	20	27	0.5236

Traffic Channel Number	WCDMA Band 5 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	3.7	20	-24	0.5188
4182	836.4	3.7	20	-16	0.5808
4233	846.6	3.7	20	-27	0.6266

Traffic Channel Number	WCDMA Band 5 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.2	20	26	0.5559
4182	836.4	4.2	20	12	0.6237
4233	846.6	4.2	20	-17	0.5433

Traffic Channel Number	WCDMA Band 5 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.35	20	11	0.6281
4182	836.4	4.35	20	-7	0.6194
4233	846.6	4.35	20	13	0.6124

WCDMA Band 5 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	18	0.5610
4132	826.4	3.6	-20	-15	0.6095
4132	826.4	3.6	-10	-24	0.5470
4132	826.4	3.6	0	-23	0.6223
4132	826.4	3.6	10	-19	0.6053
4132	826.4	3.6	20	15	0.5572
4132	826.4	3.6	30	19	0.5534
4132	826.4	3.6	40	-15	0.5572
4132	826.4	3.6	50	18	0.5808
4132	826.4	3.6	60	-26	0.6223

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	3.7	-30	10	0.6012
4132	826.4	3.7	-20	-12	0.5781
4132	826.4	3.7	-10	-34	0.6237
4132	826.4	3.7	0	-21	0.6252
4132	826.4	3.7	10	21	0.5572
4132	826.4	3.7	20	-24	0.5188
4132	826.4	3.7	30	-13	0.5200
4132	826.4	3.7	40	18	0.6223
4132	826.4	3.7	50	-24	0.5598
4132	826.4	3.7	60	-35	0.5610

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.2	-30	11	0.5808
4132	826.4	4.2	-20	19	0.5741
4132	826.4	4.2	-10	29	0.5943
4132	826.4	4.2	0	13	0.5848
4132	826.4	4.2	10	17	0.5984
4132	826.4	4.2	20	26	0.5559
4132	826.4	4.2	30	-16	0.5808
4132	826.4	4.2	40	-13	0.6095
4132	826.4	4.2	50	11	0.5458
4132	826.4	4.2	60	16	0.6138

WCDMA Band 5 Results: channel 4132 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.35	-30	13	0.5957
4132	826.4	4.35	-20	16	0.6095
4132	826.4	4.35	-10	11	0.6383
4132	826.4	4.35	0	12	0.6339
4132	826.4	4.35	10	-11	0.6368
4132	826.4	4.35	20	11	0.6281
4132	826.4	4.35	30	12	0.6223
4132	826.4	4.35	40	-9	0.6457
4132	826.4	4.35	50	13	0.6339
4132	826.4	4.35	60	7	0.6383

WCDMA Band 5 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	12	0.6081
4182	836.4	3.6	-20	19	0.5702
4182	836.4	3.6	-10	15	0.5610
4182	836.4	3.6	0	-14	0.5702
4182	836.4	3.6	10	17	0.5598
4182	836.4	3.6	20	19	0.6124
4182	836.4	3.6	30	25	0.5768
4182	836.4	3.6	40	17	0.5943
4182	836.4	3.6	50	16	0.5808
4182	836.4	3.6	60	-24	0.5572

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4182	836.4	3.7	-30	15	0.5598
4182	836.4	3.7	-20	-12	0.5445
4182	836.4	3.7	-10	-25	0.6012
4182	836.4	3.7	0	29	0.5728
4182	836.4	3.7	10	24	0.5861
4182	836.4	3.7	20	-16	0.5808
4182	836.4	3.7	30	32	0.5572
4182	836.4	3.7	40	24	0.5861
4182	836.4	3.7	50	-24	0.5358
4182	836.4	3.7	60	15	0.5715

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4182	836.4	4.2	-30	13	0.5572
4182	836.4	4.2	-20	16	0.5495
4182	836.4	4.2	-10	13	0.4898
4182	836.4	4.2	0	29	0.6109
4182	836.4	4.2	10	-11	0.6223
4182	836.4	4.2	20	12	0.6237
4182	836.4	4.2	30	9	0.5572
4182	836.4	4.2	40	-12	0.6383
4182	836.4	4.2	50	-14	0.5200
4182	836.4	4.2	60	15	0.5546

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4182	836.4	4.35	-30	-8	0.6427
4182	836.4	4.35	-20	13	0.6471
4182	836.4	4.35	-10	-8	0.6471
4182	836.4	4.35	0	8	0.6180
4182	836.4	4.35	10	13	0.6095
4182	836.4	4.35	20	-7	0.6194
4182	836.4	4.35	30	8	0.6138
4182	836.4	4.35	40	8	0.6152
4182	836.4	4.35	50	-9	0.6266
4182	836.4	4.35	60	6	0.6053

WCDMA Band 5 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	13	0.4966
4233	846.6	3.6	-20	13	0.5370
4233	846.6	3.6	-10	20	0.5675
4233	846.6	3.6	0	16	0.6637
4233	846.6	3.6	10	23	0.5675
4233	846.6	3.6	20	27	0.5236
4233	846.6	3.6	30	-16	0.5508
4233	846.6	3.6	40	-18	0.6339
4233	846.6	3.6	50	31	0.6442
4233	846.6	3.6	60	5	0.5458

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4233	846.6	3.7	-30	10	0.5943
4233	846.6	3.7	-20	17	0.5861
4233	846.6	3.7	-10	18	0.5675
4233	846.6	3.7	0	29	0.5808
4233	846.6	3.7	10	19	0.5152
4233	846.6	3.7	20	-27	0.6266
4233	846.6	3.7	30	26	0.5534
4233	846.6	3.7	40	-25	0.5598
4233	846.6	3.7	50	-13	0.6266
4233	846.6	3.7	60	-14	0.5675

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4233	846.6	4.2	-30	10	0.5623
4233	846.6	4.2	-20	18	0.5012
4233	846.6	4.2	-10	23	0.5834
4233	846.6	4.2	0	24	0.5176
4233	846.6	4.2	10	-15	**0.6902**
4233	846.6	4.2	20	-17	0.5433
4233	846.6	4.2	30	7	0.5585
4233	846.6	4.2	40	-17	0.5623
4233	846.6	4.2	50	-15	0.6095
4233	846.6	4.2	60	18	0.5458

WCDMA Band 5 Results: channel 4233 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4233	846.6	4.35	-30	-11	0.6607
4233	846.6	4.35	-20	-9	0.6699
4233	846.6	4.35	-10	11	0.6501
4233	846.6	4.35	0	7	0.6095
4233	846.6	4.35	10	9	0.6180
4233	846.6	4.35	20	13	0.6124
4233	846.6	4.35	30	12	0.6012
4233	846.6	4.35	40	9	0.6053
4233	846.6	4.35	50	10	0.6095
4233	846.6	4.35	60	-8	0.6053

WCDMA Band 2 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	-8	-0.0043
9400	1880.00	3.6	20	-7	-0.0037
9538	1907.60	3.6	20	7	0.0037

Traffic Channel Number	WCDMA1900 Frequency (MHz	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	3.7	20	-7	-0.0049
9400	1880.00	3.7	20	-7	0.0053
9538	1907.60	3.7	20	6	0.0042

Traffic Channel Number	WCDMA1900 Frequency (MHz	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.2	20	-14	0.0065
9400	1880.00	4.2	20	-8	0.0032
9538	1907.60	4.2	20	11	-0.0052

Traffic Channel Number	WCDMA1900 Frequency (MHz	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.35	20	-14	-0.0076
9400	1880.00	4.35	20	-8	-0.0043
9538	1907.60	4.35	20	11	0.0058

WCDMA Band 2 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	-7	-0.0038
9262	1852.40	3.6	-20	-13	-0.0070
9262	1852.40	3.6	-10	-13	-0.0070
9262	1852.40	3.6	0	-12	-0.0065
9262	1852.40	3.6	10	-9	-0.0049
9262	1852.40	3.6	20	-8	-0.0043
9262	1852.40	3.6	30	7	0.0038
9262	1852.40	3.6	40	7	0.0038
9262	1852.40	3.6	50	10	0.0054
9262	1852.40	3.6	60	11	0.0059
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9262	1852.40	3.7	-30	-8	-0.0043
9262	1852.40	3.7	-20	-14	-0.0076
9262	1852.40	3.7	-10	-13	-0.0070
9262	1852.40	3.7	0	-15	-0.0081
9262	1852.40	3.7	10	-16	-0.0086
9262	1852.40	3.7	20	-9	-0.0049
9262	1852.40	3.7	30	13	0.0070
9262	1852.40	3.7	40	-9	-0.0049
9262	1852.40	3.7	50	11	0.0059
9262	1852.40	3.7	60	10	0.0054
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9262	1852.40	4.2	-30	-9	-0.0049
9262	1852.40	4.2	-20	-11	-0.0059
9262	1852.40	4.2	-10	-19	-0.0103
9262	1852.40	4.2	0	-16	-0.0086
9262	1852.40	4.2	10	18	0.0097
9262	1852.40	4.2	20	-7	-0.0038
9262	1852.40	4.2	30	-12	-0.0065
9262	1852.40	4.2	40	12	0.0065
9262	1852.40	4.2	50	12	0.0065
9262	1852.40	4.2	60	13	0.0070

WCDMA Band 2 Results: channel 9262 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.35	-30	-10	-0.0054
9262	1852.40	4.35	-20	-16	-0.0086
9262	1852.40	4.35	-10	-18	-0.0097
9262	1852.40	4.35	0	-13	-0.0070
9262	1852.40	4.35	10	-9	-0.0049
9262	1852.40	4.35	20	-14	-0.0076
9262	1852.40	4.35	30	7	0.0038
9262	1852.40	4.35	40	10	0.0054
9262	1852.40	4.35	50	12	0.0065
9262	1852.40	4.35	60	14	0.0076

WCDMA Band 2 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	-9	-0.0048
9400	1880.00	3.6	-20	7	0.0037
9400	1880.00	3.6	-10	15	0.0080
9400	1880.00	3.6	0	-8	-0.0043
9400	1880.00	3.6	10	7	0.0037
9400	1880.00	3.6	20	-7	-0.0037
9400	1880.00	3.6	30	-7	-0.0037
9400	1880.00	3.6	40	6	0.0032
9400	1880.00	3.6	50	-6	-0.0032
9400	1880.00	3.6	60	-20	**-0.0106**
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9400	1880.00	3.7	-30	15	0.0080
9400	1880.00	3.7	-20	12	0.0064
9400	1880.00	3.7	-10	10	0.0053
9400	1880.00	3.7	0	8	0.0043
9400	1880.00	3.7	10	7	0.0037
9400	1880.00	3.7	20	10	0.0053
9400	1880.00	3.7	30	-6	-0.0032
9400	1880.00	3.7	40	-8	-0.0043
9400	1880.00	3.7	50	8	0.0043
9400	1880.00	3.7	60	-7	-0.0037

WCDMA Band 2 Results: channel 9400 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9400	1880.00	4.2	-30	6	0.0032
9400	1880.00	4.2	-20	17	0.0090
9400	1880.00	4.2	-10	8	0.0043
9400	1880.00	4.2	0	-7	-0.0037
9400	1880.00	4.2	10	-6	-0.0032
9400	1880.00	4.2	20	-7	-0.0037
9400	1880.00	4.2	30	-9	-0.0048
9400	1880.00	4.2	40	6	0.0032
9400	1880.00	4.2	50	10	0.0053
9400	1880.00	4.2	60	15	0.0080
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9400	1880.00	4.35	-30	-8	-0.0043
9400	1880.00	4.35	-20	7	0.0037
9400	1880.00	4.35	-10	8	0.0043
9400	1880.00	4.35	0	18	0.0096
9400	1880.00	4.35	10	-10	-0.0053
9400	1880.00	4.35	20	-8	-0.0043
9400	1880.00	4.35	30	-11	-0.0059
9400	1880.00	4.35	40	10	0.0053
9400	1880.00	4.35	50	11	0.0059
9400	1880.00	4.35	60	-10	-0.0053

WCDMA Band 2 Results: channel 9538 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	21B**PPM**
9538	1907.60	3.6	-30	7	0.0037
9538	1907.60	3.6	-20	13	0.0068
9538	1907.60	3.6	-10	12	0.0063
9538	1907.60	3.6	0	15	0.0079
9538	1907.60	3.6	10	10	0.0052
9538	1907.60	3.6	20	7	0.0037
9538	1907.60	3.6	30	-10	-0.0052
9538	1907.60	3.6	40	16	0.0084
9538	1907.60	3.6	50	-13	-0.0068
9538	1907.60	3.6	60	-11	-0.0058

WCDMA Band 2 Results: channel 9538 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9538	1907.60	3.7	-30	8	0.0042
9538	1907.60	3.7	-20	13	0.0068
9538	1907.60	3.7	-10	13	0.0068
9538	1907.60	3.7	0	13	0.0068
9538	1907.60	3.7	10	13	0.0068
9538	1907.60	3.7	20	8	0.0042
9538	1907.60	3.7	30	8	0.0042
9538	1907.60	3.7	40	-10	-0.0052
9538	1907.60	3.7	50	-11	-0.0058
9538	1907.60	3.7	60	-13	-0.0068
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9538	1907.60	4.2	-30	7	0.0037
9538	1907.60	4.2	-20	12	0.0063
9538	1907.60	4.2	-10	13	0.0068
9538	1907.60	4.2	0	11	0.0058
9538	1907.60	4.2	10	10	0.0052
9538	1907.60	4.2	20	6	0.0031
9538	1907.60	4.2	30	-9	-0.0047
9538	1907.60	4.2	40	-10	-0.0052
9538	1907.60	4.2	50	11	0.0058
9538	1907.60	4.2	60	15	0.0079
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**21BPPM**
9538	1907.60	4.35	-30	8	0.0042
9538	1907.60	4.35	-20	15	0.0079
9538	1907.60	4.35	-10	12	0.0063
9538	1907.60	4.35	0	13	0.0068
9538	1907.60	4.35	10	16	0.0084
9538	1907.60	4.35	20	11	0.0058
9538	1907.60	4.35	30	-12	-0.0063
9538	1907.60	4.35	40	-11	-0.0058
9538	1907.60	4.35	50	-9	-0.0047
9538	1907.60	4.35	60	-16	-0.0084

APPENDIX 2D – WCDMA Band 2/5 RADIATED EMISSIONS TEST DATA

Radiated Power Test Data Results

Date of Test: September 25, 2012

The following measurements were performed by Feras Obeid.
The environmental tests conditions were: Temperature: 24.2 °C
Relative Humidity: 31.4 %

The BlackBerry® smartphone was standalone vertical, top down, 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.

WCDMA Band 5 Call Service Mode

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBm)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole) (dBm)	Corrected Reading (relative to Dipole) (W)	Limit (dBm)	Diff. To Limit (dB)
F0	4132	826.40	5	Dipole	V	-31.82	-31.82	V-V	1.75	19.49	0.09	38.5	-19.01
F0	4132	826.40	5	Dipole	H	-34.44		H-H	0.85				
F0	4182	836.40	5	Dipole	V	-31.72	-31.72	V-V	2.26	**19.70**	**0.09**	38.5	-18.80
F0	4182	836.40	5	Dipole	H	-34.44		H-H	1.85				
F0	4233	846.60	5	Dipole	V	-33.18	-33.18	V-V	1.30	18.75	0.07	38.5	-19.75
F0	4233	846.60	5	Dipole	H	-35.37		H-H	0.13				

WCDMA Band 5 HSUPA Mode

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method 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) (dBm)	Corrected Reading (relative to Dipole) (W)	Limit (dBm)	Diff. To Limit (dB)
F0	4132	826.40	5	Dipole	V	-33.90	-33.90	V-V	-0.39	17.35	0.05	38.50	-21.15
F0	4132	826.40	5	Dipole	H	-35.91		H-H	-1.27				
F0	4182	836.40	5	Dipole	V	-32.94	-32.94	V-V	1.08	**18.52**	**0.07**	38.50	-19.98
F0	4182	836.40	5	Dipole	H	-36.08		H-H	0.56				
F0	4233	846.60	5	Dipole	V	-33.92	-33.92	V-V	0.54	17.99	0.06	38.50	-20.51
F0	4233	846.60	5	Dipole	H	-37.07		H-H	-0.60				

Radiated Power Test Data Results cont'd

Date of Test: September 26, 2012

The following measurements were performed by Feras Obeid.
The environmental test conditions were: Temperature: 25.6 ºC
Relative Humidity: 32.4 %

The BlackBerry® smartphone was standalone, USB up 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.

WCDMA Band 2 Call Service Mode

								Substitution Method					
EUT				Rx 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	9262	1852.40	2	Horn	V	-22.47	-22.47	V-V	-13.21	26.63	0.46	33.0	-6.37
F0	9262	1852.40	2	Horn	H	-29.60		H-H	-12.46				
F0	9400	1880.00	2	Horn	V	-21.96	-21.96	V-V	-12.13	**27.76**	**0.60**	33.0	-5.24
F0	9400	1880.00	2	Horn	H	-29.82		H-H	-11.17				
F0	9538	1907.60	2	Horn	V	-22.82	-22.82	V-V	-13.20	26.85	0.48	33.0	-6.15
F0	9538	1907.60	2	Horn	H	-31.03		H-H	-12.18				

WCDMA Band 2 HSUPA Mode

								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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	9262	1852.40	2	Horn	V	-23.89	-23.89	V-V	-14.55	25.26	0.34	33.0	-7.74
F0	9262	1852.40	2	Horn	H	-30.21		H-H	-13.83				
F0	9400	1880.00	2	Horn	V	-23.67	-23.67	V-V	-13.80	**26.09**	**0.41**	33.0	-6.91
F0	9400	1880.00	2	Horn	H	-31.26		H-H	-12.84				
F0	9538	1907.60	2	Horn	V	-24.23	-24.23	V-V	-14.59	25.45	0.35	33.0	-7.55
F0	9538	1907.60	2	Horn	H	-32.42		H-H	-13.58				

Radiated Emissions Test Data Results cont'd

WCDMA Band 5 Call Service Mode

Date of Test: June 12 – June 13 and September 20, 2012

The following measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 24.1 - 25.3 ºC
Relative Humidity: 27.7 – 32.3 %

The BlackBerry® smartphone was standalone, with USB jack pointing up and 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 WCDMA band 5 Call mode on channels 4132, 4182, and 4233.

All emissions had test margins greater than 25.0 dB.

Date of Test: June 08 – June 14 and September 24 - 27, 2012

The following measurements were performed by Shuo Wang
The environmental test conditions were: Temperature: 23.2 - 25.4 ºC
Relative Humidity: 37.6 - 41.7 %

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 down and top pointing to the RX antenna when the turntable is at 0 degree position.

Measurements were performed in WCDMA Band 5 Call mode on channels 4132, 4182, and 4233.

All emissions had test margins greater than 25.0 dB.

Radiated Emissions Test Data Results cont'd

WCDMA 5 HSUPA Mode

Date of Test: June 12 – June 13, 2012

The environmental test conditions were: Temperature: 25.3 ºC
Relative Humidity: 32.3 %

The BlackBerry® smartphone was standalone, with USB jack pointing up and 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 WCDMA band 5 HSUPA mode on channels 4132, 4182, and 4233.

All emissions had test margins greater than 25.0 dB.

Date of Test: June 08 – June 14, 2012

The environmental test conditions were: Temperature: 23.2 - 25.4 ºC
Relative Humidity: 37.6 - 41.7 %

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 down and top pointing to the RX antenna when the turntable is at 0 degree position.

Measurements were performed in WCDMA Band 5 HSUPA mode on channels 4132, 4182, and 4233.

All emissions had test margins greater than 25.0 dB.

Radiated Emissions Test Data Results cont'd

WCDMA Band 2 Call Service mode

Date of Test: June 12 and September 20, 2012

The following measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 24.1 - 25.3 ºC
Relative Humidity: 27.7 – 32.3 %

The BlackBerry® smartphone was standalone, with USB jack pointing up and 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 WCDMA Band 2 Call mode on channels 9262, 9400, and 9538.

All emissions had test margins greater than 25.0 dB.

Date of Test: June 06 – June 11 and September 24, 2012

The following measurements were performed by Shuo Wang

The environmental test conditions were: Temperature: 23.2 - 25.4 ºC
Relative Humidity: 37.6 - 41.7 %

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height, and a frequency range of 1GHz to 20 GHz.

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

Measurements were performed in WCDMA Band 2 Call mode on channels 9262, 9400, 9538.

BlackBerry® smartphone PIN 2A8C6FD6										
Frequency (MHz)	Channel Of Occurrence	Antenna		Test Angle (Deg.)	Detector (PK or QP)	Measured Level (dBµV)	Correction Factor for preamp/antenna/ cables/ filter (dB)	Field Strength Level (reading+corr) (dBm)	Limit @ 3.0 m (dBm)	Test Margin (dB)
		Pol. (V/H)	Height (meters)							
5639.664	9400	H	2.50	170	PK	45.29	-72.46	-27.17	-13.00	-14.2

All other emissions had test margins greater than 25.0 dB.

Radiated Emissions Test Data Results cont'd

WCDMA Band 2 HSUPA Mode

Date of Test: June 12, 2012

The environmental test conditions were: Temperature: 25.3 ºC
Relative Humidity: 27.7 %

The BlackBerry® smartphone was standalone, with USB jack pointing up and 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 WCDMA Band 2 HSUPA mode on channels 9262, 9400, and 9538.

All emissions had test margins greater than 25.0 dB.

Date of Test: June 06 – June 11, 2012

The environmental test conditions were: Temperature: 23.2 - 25.4 ºC
Relative Humidity: 37.6 - 41.7 %

Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height, and a frequency range of 1GHz to 20 GHz.

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

Measurements were performed in WCDMA Band 2 HSUPA mode on channels 9262, 9400, 9538.

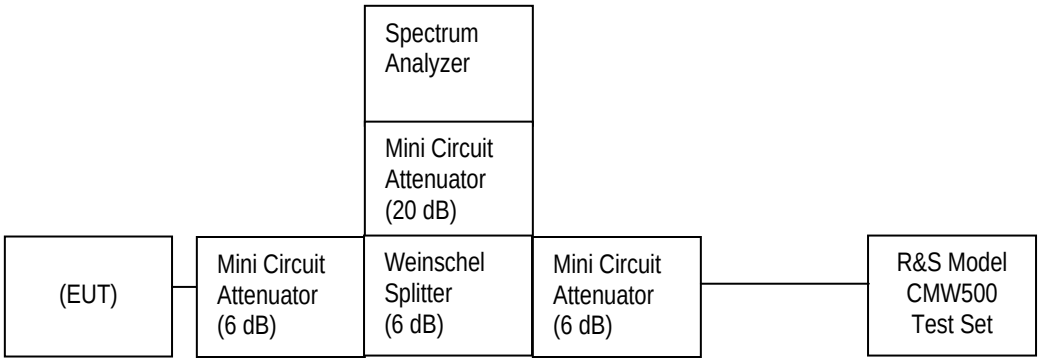
All emissions had test margins greater than 25.0 dB.

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

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



Date of Test: July 12, 2012

The environmental test conditions were: Temperature: 25.0ºC
Relative Humidity: 37.0 %

The following measurements were performed by Kevin Guo.

LTE Band 2 Conducted RF Emission Test Data cont'd

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 24.238(a), CFR 24.232(d), CFR 2.202, CFR 22 Subpart H, RSS-132 and RSS - 133 were measured from 10 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 resource blocks 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 resource block 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 18.64 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.

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)
1852.400	18.58	17.89
1880.000	18.58	17.95
1907.600	18.64	17.86

Peak to Average Ratio (PAR)

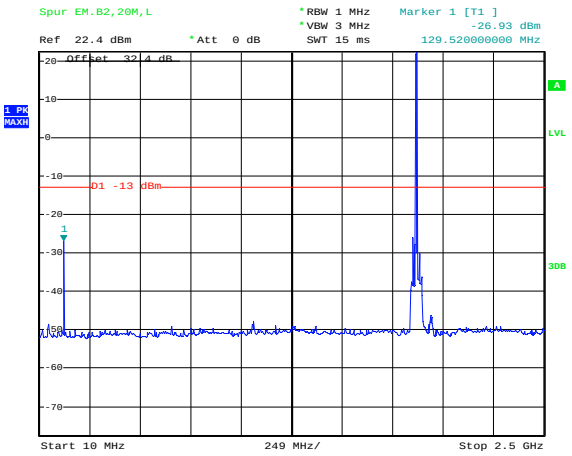
For each 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20 MHz with different number of resource blocks as per scalable bandwidths for LTE Band 2, the peak to average ratio was measured on the low, middle and high channels with QPSK modulation.
On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.
The worst case measured was 9.65 dB on middle channel in 20MHz bandwidth with 50 resource blocks.

Measurement Plots for LTE Band 2

Refer to the following measurement plots for more detail:
See Figures 1-1c to 1-18c for the plots of the conducted spurious emissions.
See Figures 1-19c to 1-24c for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.
See Figures 1-25c to 1-32c for the plots of the Channel mask.
See Figures 1-33c to 1-35c for the plots of the Peak to Average Ratio.

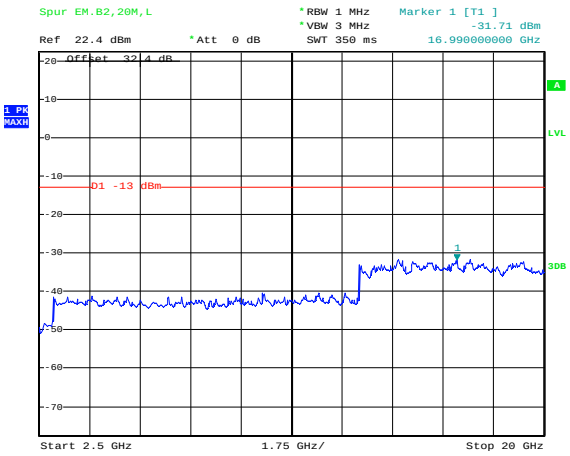
LTE Band 2 Conducted RF Emission Test Data (cont'd)

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



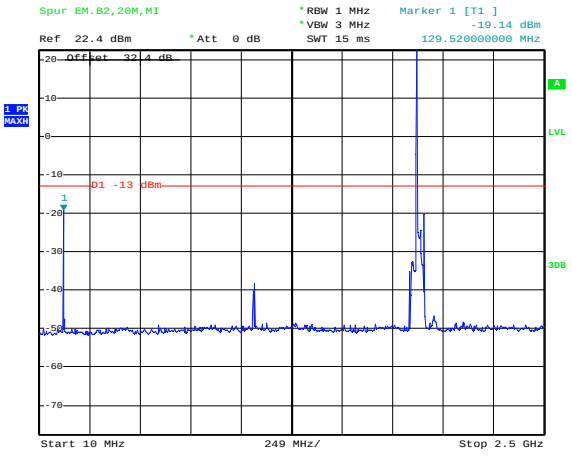
Date: 19.JUN.2012 22:24:41

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



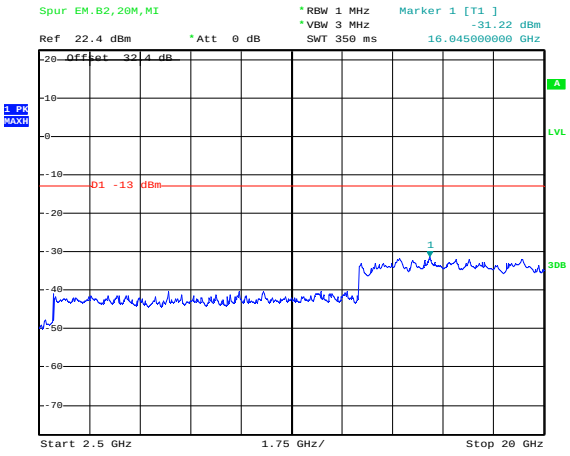
Date: 19.JUN.2012 22:25:46

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



Date: 19.JUN.2012 22:35:26

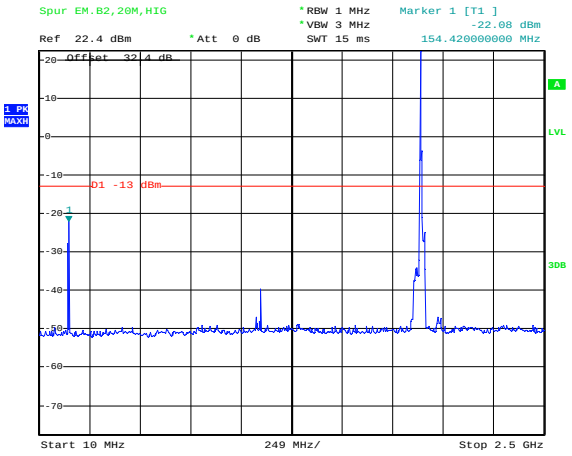
Figure 1-4c: Band 2, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 100)



Date: 19.JUN.2012 22:36:18

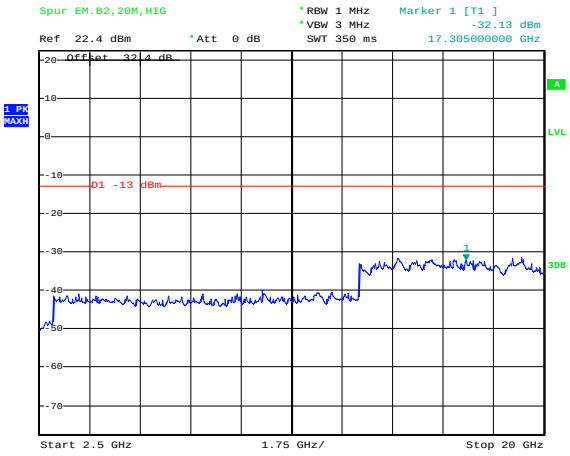
LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 1-5c: Band 2, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)



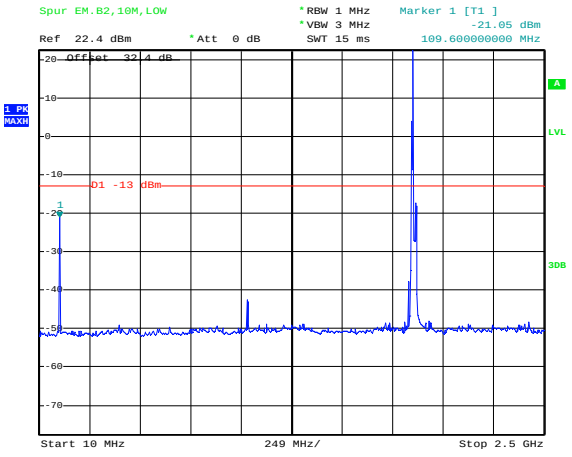
Date: 19.JUN.2012 22:42:06

Figure 1-6c: Band 2, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)



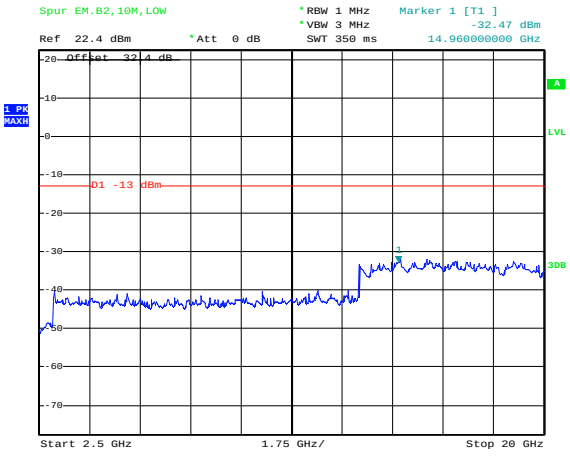
Date: 19.JUN.2012 22:41:15

Figure 1-7c: Band 2, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)



Date: 19.JUN.2012 23:00:42

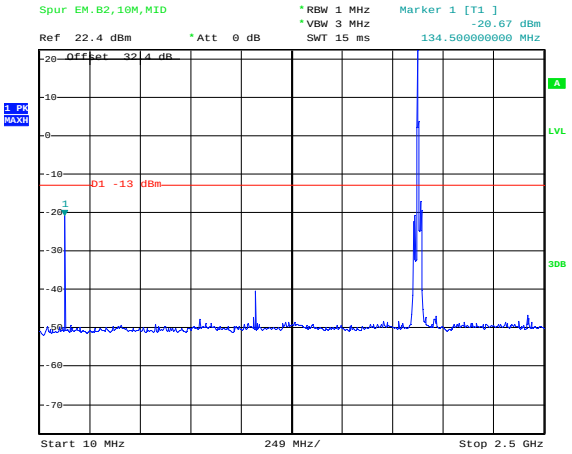
Figure 1-8c: Band 2, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)



Date: 19.JUN.2012 23:01:03

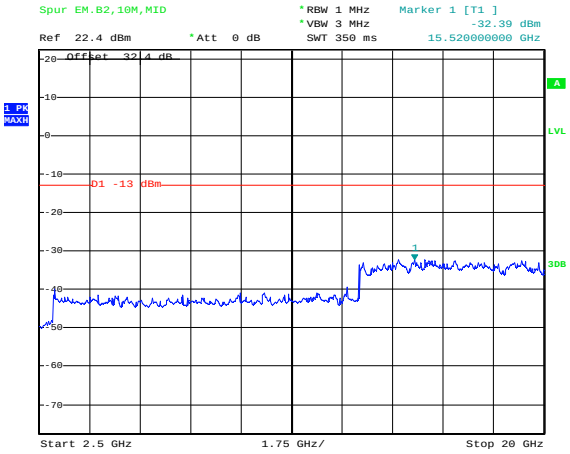
LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 1-9c: Band 2, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 50)



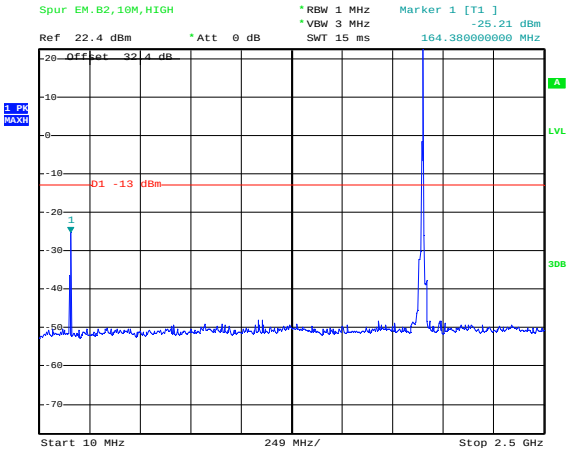
Date: 19.JUN.2012 23:04:08

Figure 1-10c: Band 2, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 50)



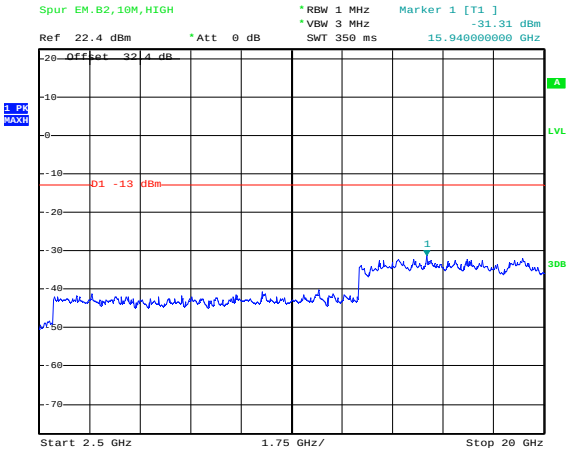
Date: 19.JUN.2012 23:04:31

Figure 1-11c: Band 2, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)



Date: 19.JUN.2012 23:05:25

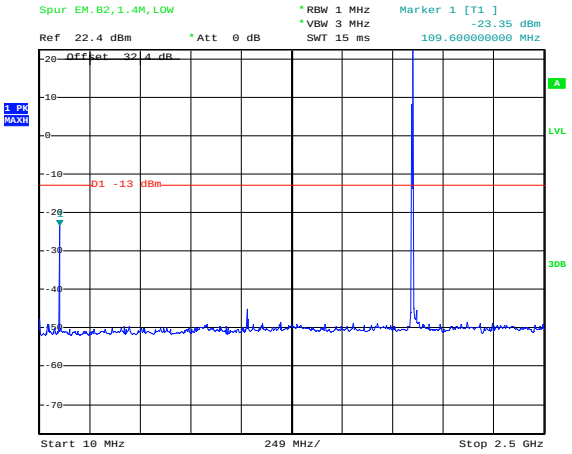
Figure 1-12c: Band 2, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)



Date: 19.JUN.2012 23:07:44

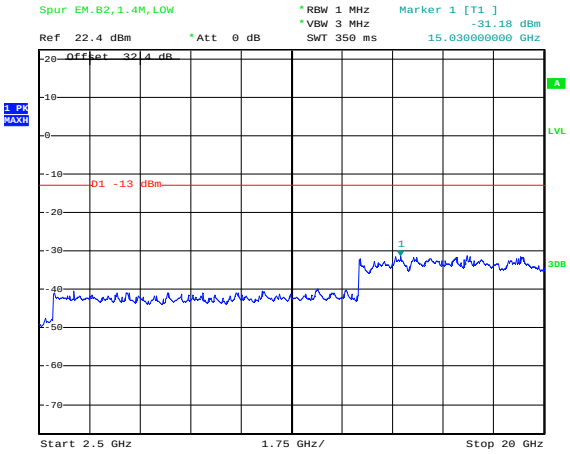
LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 1-13c: Band 2, Spurious Conducted Emissions, Low channel, 1.4MHz BW (RB= 6)



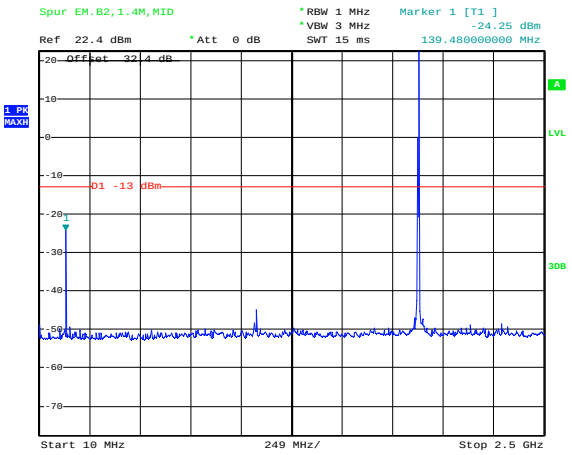
Date: 19.JUN.2012 23:26:46

Figure 1-14c: Band 2, Spurious Conducted Emissions, Low channel, 1.4MHz BW (RB= 6)



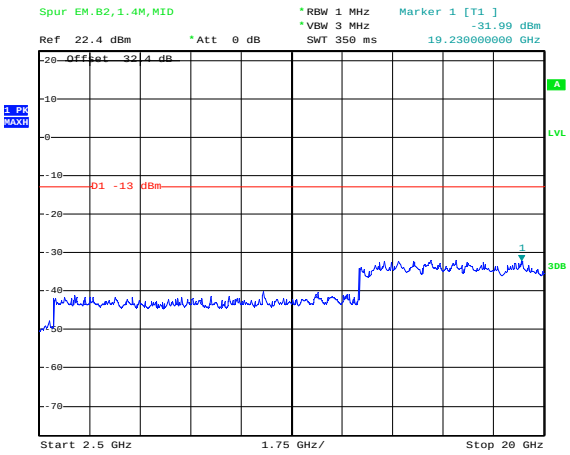
Date: 19.JUN.2012 23:28:29

Figure 1-15c: Band 2, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 6)



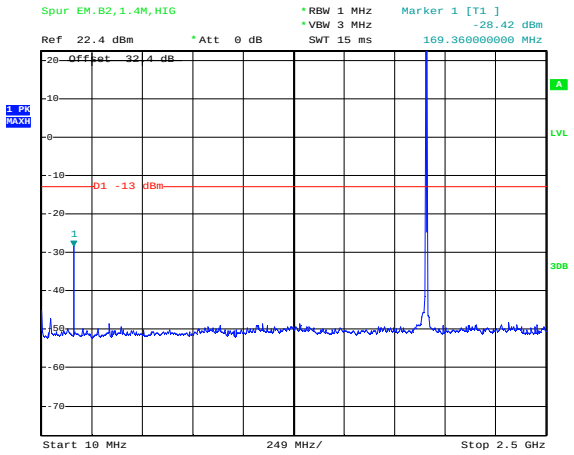
Date: 19.JUN.2012 23:30:23

Figure 1-16c: Band 2, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 6)



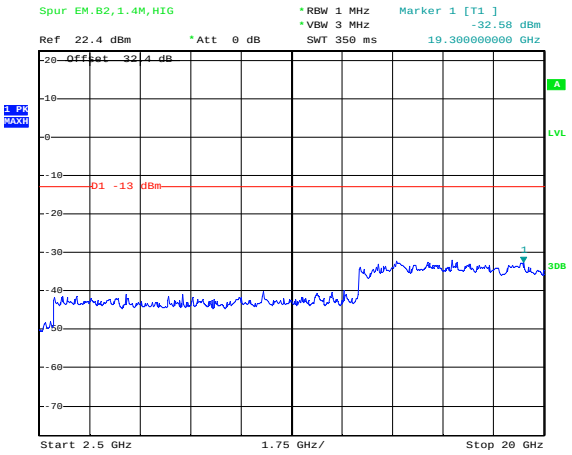
Date: 19.JUN.2012 23:30:53

Figure 1-17c: Band 2, Spurious Conducted Emissions, High Channel, 1.4MHz BW (RB= 6)



Date: 19.JUN.2012 23:32:28

Figure 1-18c: Band 2, Spurious Conducted Emissions, High Channel, 1.4MHz BW (RB= 6)



Date: 19.JUN.2012 23:33:06

Figure 1-19c: Occupied Bandwidth, Band 2 Low Channel, 20MHz BW (RB= 100)

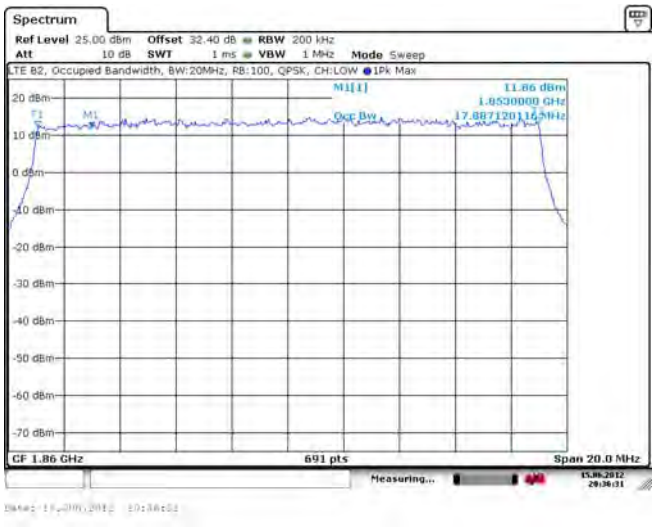


Figure 1-20c: Occupied Bandwidth, Band 2 Middle Channel, 20MHz BW (RB= 100)

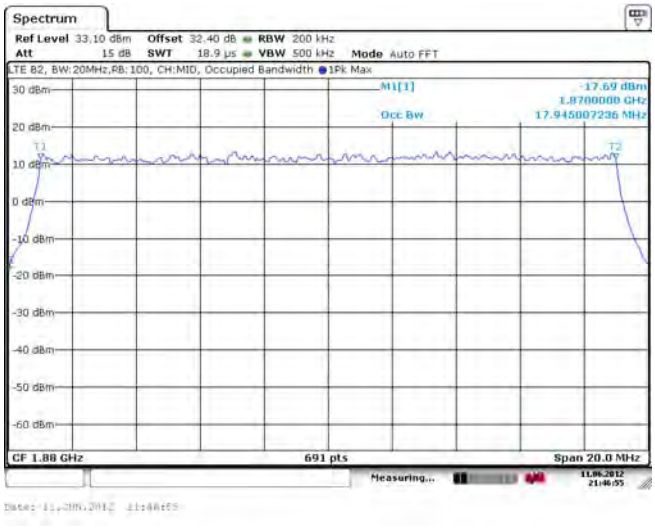


Figure 1-21c: Occupied Bandwidth, Band 2 High Channel, 20MHz BW (RB= 100)

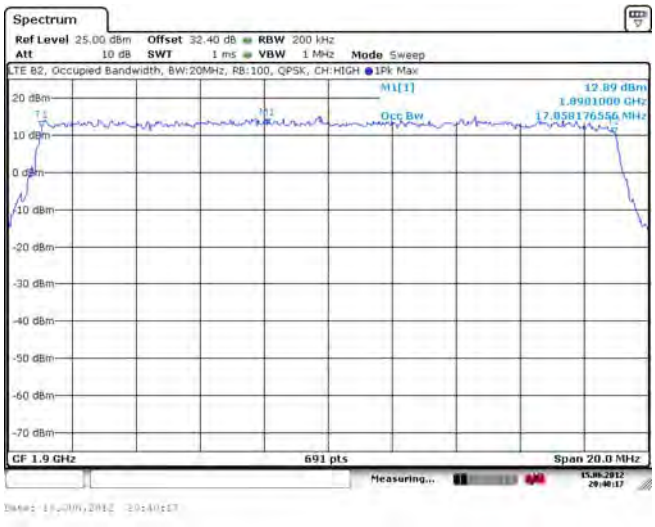


Figure 1-22c: -26 dBc Bandwidth, Band 2 Low Channel, 20MHz BW (RB= 100)

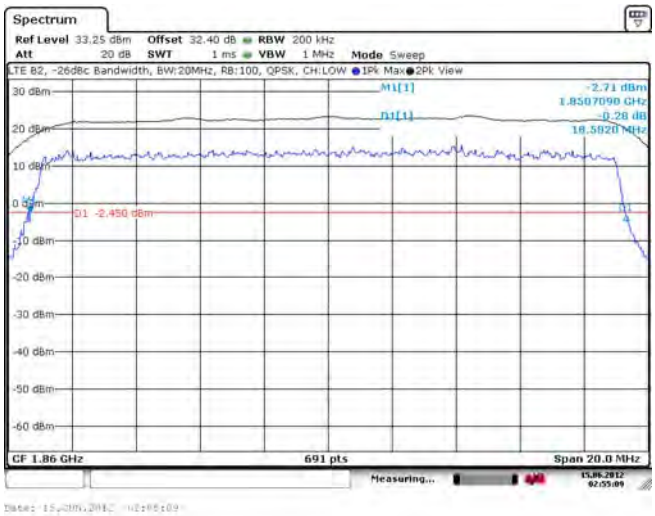
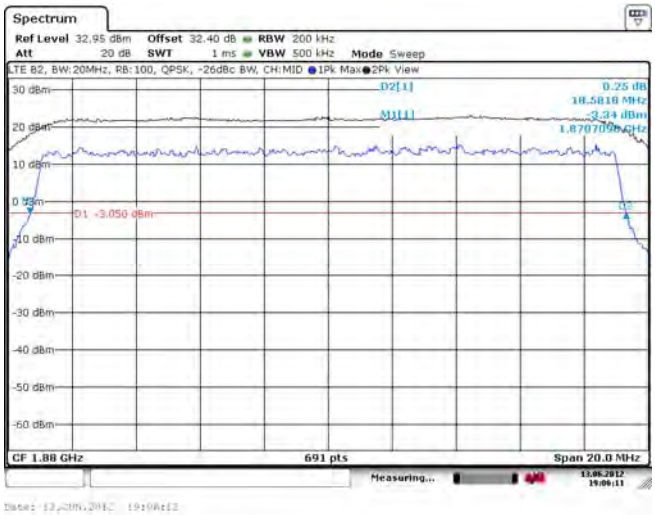


Figure 1-23c: -26 dBc Bandwidth, Band 2 Middle Channel, 20MHz BW (RB= 100)



LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 1-24c: -26 dBc Bandwidth, Band 2 High Channel, 20MHz BW (RB= 100)

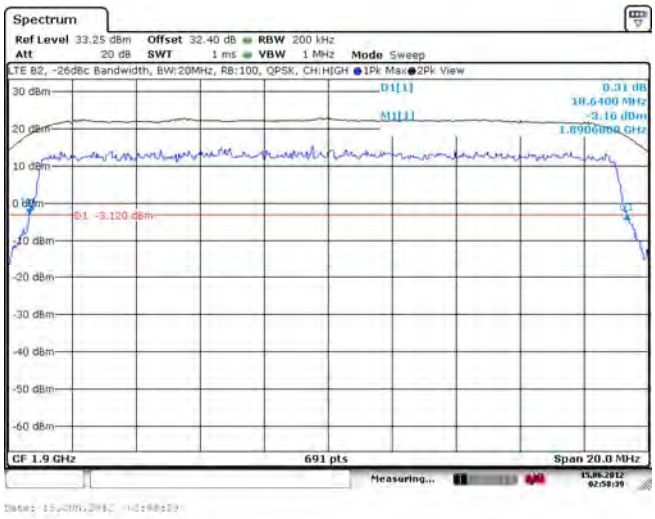


Figure 1-25c: Band 2 Low Channel Mask, 20MHz BW, RB = 100

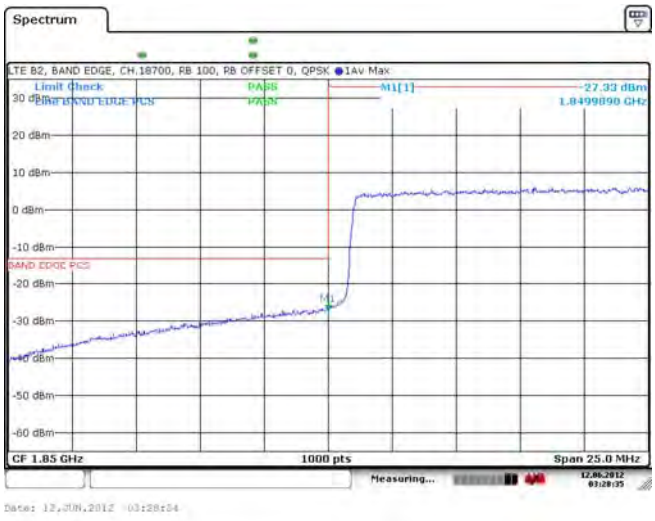


Figure 1-26c: Band 2 High Channel Mask, 20MHz BW, RB = 100

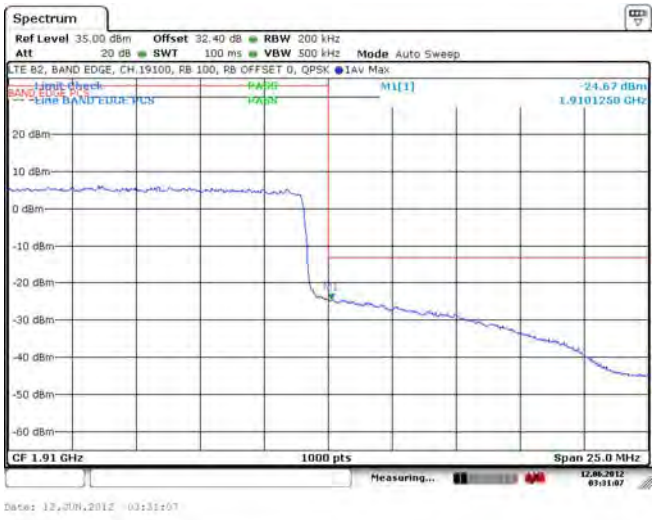


Figure 1-27c: Band 2 Low Channel Mask, 10MHz BW, RB = 50

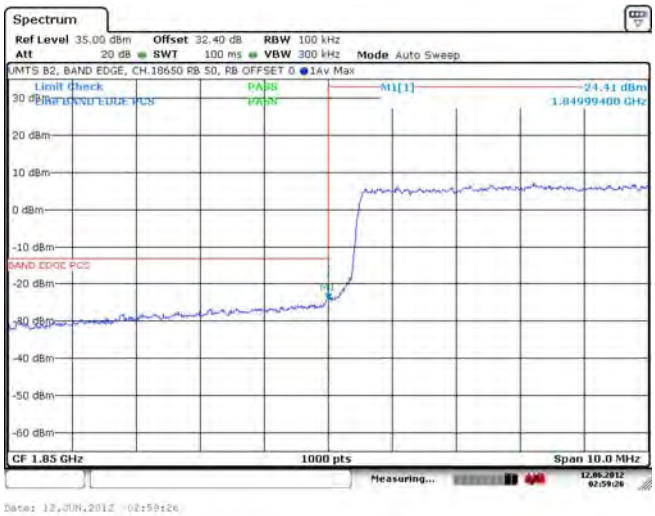


Figure 1-28c: Band 2 High Channel Mask, 10MHz BW, RB = 50

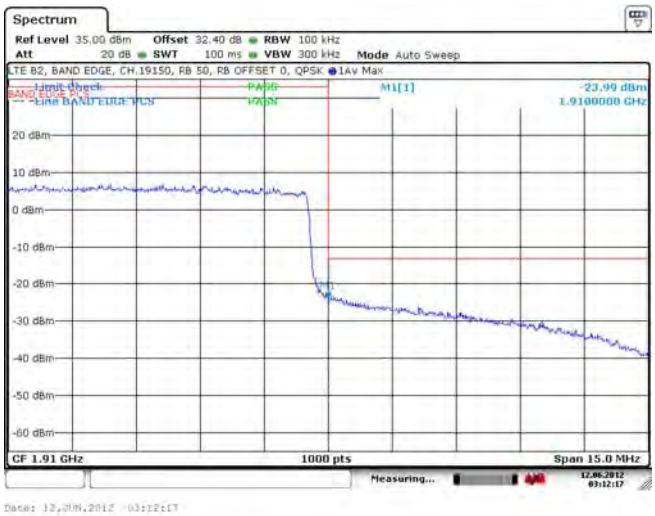


Figure 1-29c: Band 2 Low Channel Mask, 1.4MHz BW, RB = 6

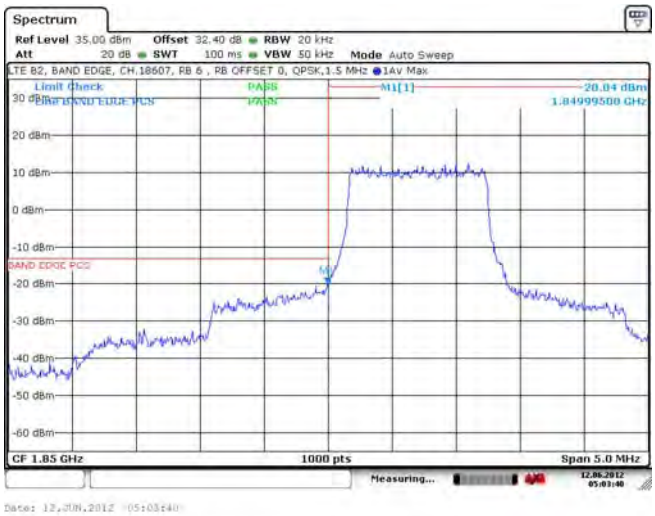


Figure 1-30c: Band 2 High Channel Mask, 1.4MHz BW, RB = 6

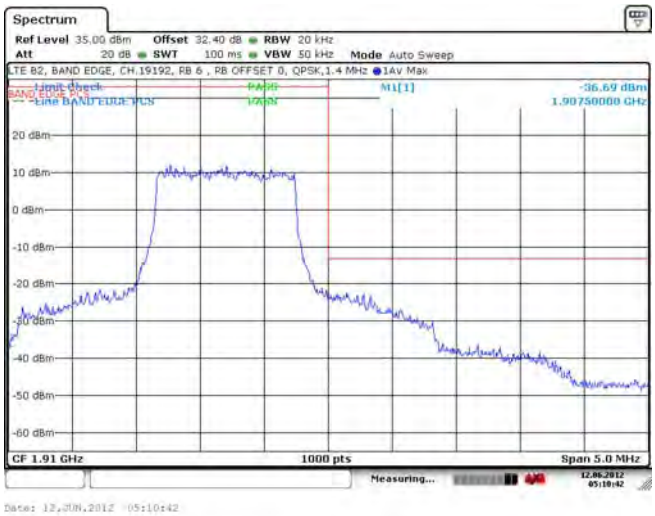


Figure 1-31c: Band 2 Low Channel Mask, 20 MHz BW, RB = 1

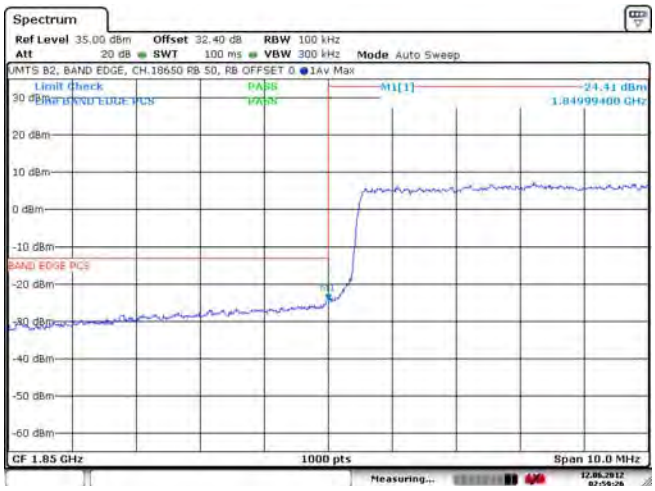


Figure 1-32c: Band 2 High Channel Mask, 20 MHz BW, RB = 1

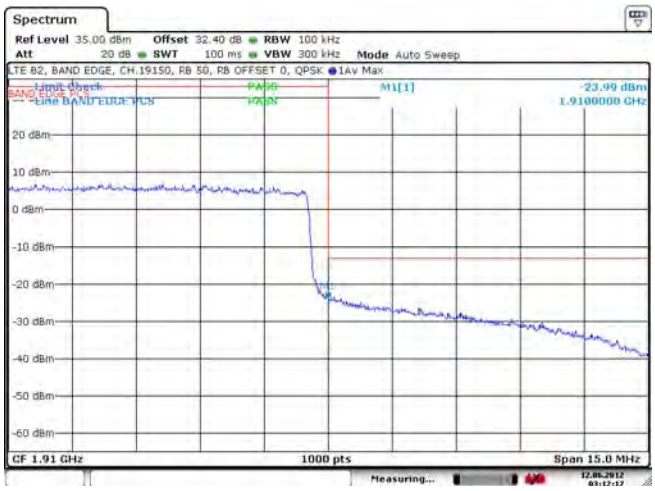


Figure 1-33c: Band 2 Low Channel PAR, 20 MHz BW, RB = 50

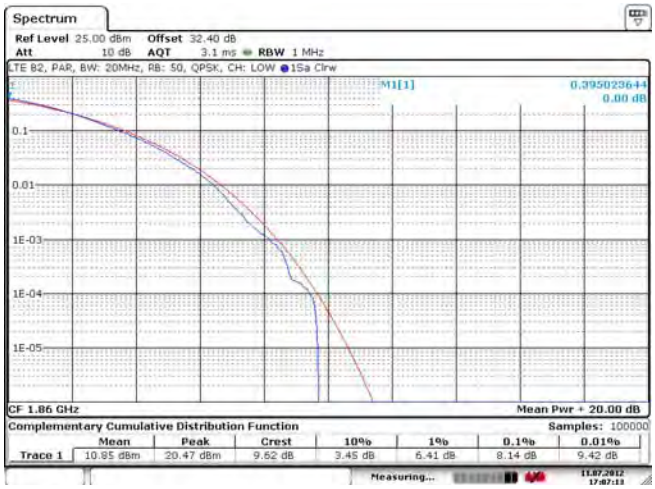


Figure 1-34c: Band 2 Middle Channel PAR, 20 MHz BW, RB = 50

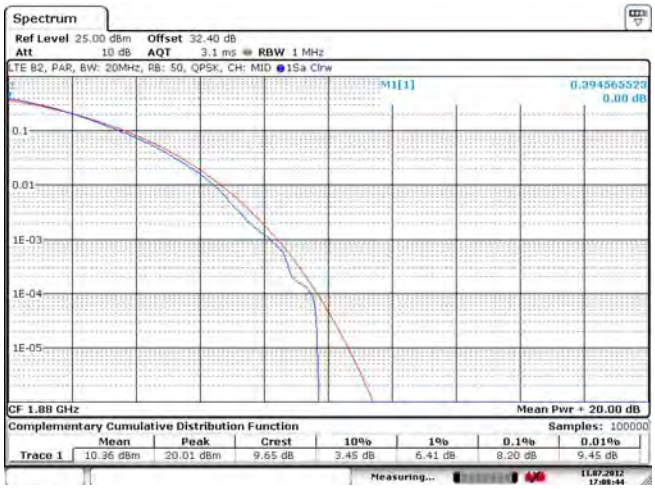
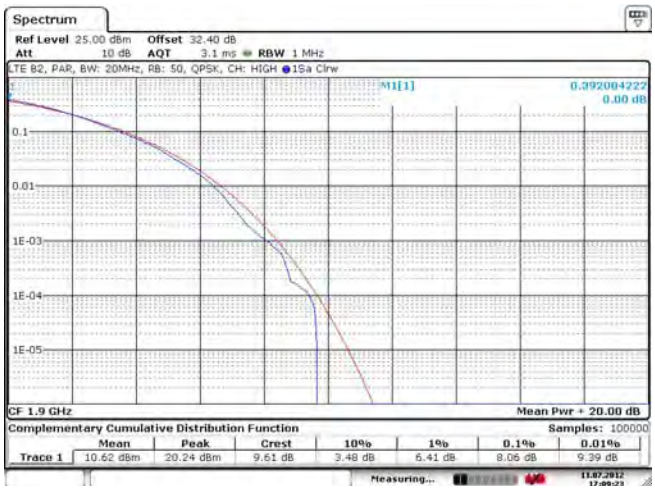


Figure 1-35c: Band 2 High Channel PAR, 20 MHz BW, RB = 50



APPENDIX 3B – LTE Band 2 CONDUCTED RF OUTPUT POWER TEST DATA

LTE Band 2 Conducted RF Output Power Test Data

The conducted RF output power was measured using the CMW500 base station simulator. Low, middle and high channels were measured at maximum radio output power at different service options and modes.

Date of Test: June 20, 2012

The environmental conditions were: Temperature: 23.0 °C
Humidity: 37.6 %

The measurements were performed by Daoud Attayi.

LTE Band 2 RF Conducted RF Output Power

Band	LTE Band 2					
Frequency (MHz)	**Channel**	**BW**	**Modulation**	**RB Size**	**RB Offset**	**Maximum Avg. Power (dBm)**
1850	18600	20 MHz	QPSK	1	0	20.90
			QPSK	1	99	23.10
			QPSK	50	0	22.40
			QPSK	100	0	22.35
			16QAM	1	0	20.00
			16QAM	1	99	22.00
			16QAM	75	0	21.50
			16QAM	100	0	21.65
1860	18700	20 MHz	QPSK	1	0	23.10
			QPSK	1	99	22.95
			QPSK	50	0	22.12
			QPSK	100	0	22.14
			16QAM	1	0	22.10
			16QAM	1	99	21.91
			16QAM	75	0	21.10
			16QAM	100	0	21.07
1880	18900	20 MHz	QPSK	1	0	23.30
			QPSK	1	99	23.20
			QPSK	50	0	22.60
			QPSK	100	0	22.50
			16QAM	1	0	22.70
			16QAM	1	99	22.60
			16QAM	75	0	21.50
			16QAM	100	0	21.50
1900	19100	20 MHz	QPSK	1	0	23.03
			QPSK	1	99	22.70
			QPSK	50	0	22.00
			QPSK	100	0	22.11
			16QAM	1	0	22.21
			16QAM	1	99	21.80
			16QAM	75	0	21.16
			16QAM	100	0	21.08
1909.9	19199	20 MHz	QPSK	1	0	22.85
			QPSK	1	99	10.36
			QPSK	50	0	21.96
			QPSK	100	0	21.85

LTE Band 2 Conducted RF Output Power (cont'd)

			16QAM	1	0	22.50
			16QAM	1	99	22.40
			16QAM	75	0	21.33
			16QAM	100	0	21.40
1880	18900	15 MHz	QPSK	1	0	22.92
			QPSK	1	74	23.00
			QPSK	36	0	22.42
			QPSK	75	0	22.44
			16QAM	1	0	21.57
			16QAM	1	74	21.70
			16QAM	75	0	22.50
1880	18900	10 MHz	QPSK	1	0	23.17
			QPSK	1	49	23.18
			QPSK	25	0	22.40
			QPSK	50	0	22.50
			16QAM	1	0	21.96
			16QAM	1	49	21.92
			16QAM	50	0	21.75
1880	18900	5 MHz	QPSK	1	0	23.14
			QPSK	1	24	23.20
			QPSK	15	0	22.52
			QPSK	25	0	22.49
			16QAM	1	0	21.77
			16QAM	1	24	21.93
			16QAM	25	0	21.55
1880	18900	3 MHz	QPSK	1	0	23.19
			QPSK	1	14	23.25
			QPSK	6	0	22.30
			QPSK	15	0	22.41
			16QAM	1	0	22.00
			16QAM	1	14	22.16
			16QAM	15	0	21.41
1880	18900	1.4 MHz	QPSK	1	0	23.13
			QPSK	1	5	23.20
			QPSK	3	3	23.27
			QPSK	6	0	22.12
			16QAM	1	0	22.42
			16QAM	1	5	22.54
			16QAM	6	0	21.36

LTE band 2 conducted power measurements
Rev 1

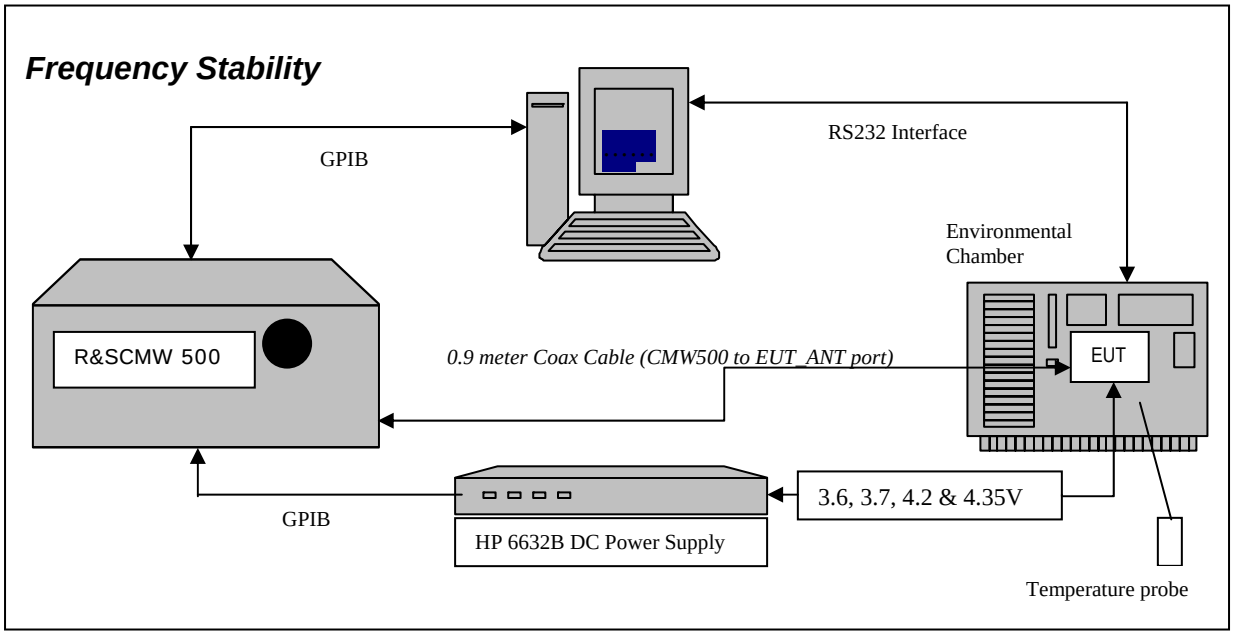
LTE Band 2 Conducted RF Output Power (cont'd)

Band	LTE Band 2					
Frequency (MHz)	**Channel**	**BW**	**Modulation**	**RB Size**	**RB Offset**	**Maximum Avg. Power (dBm)**
1860	18700	20 MHz	QPSK	1	0	23.5
			QPSK	1	99	
			QPSK	50	0	
			QPSK	100	0	
			16QAM	1	0	22.9
			16QAM	1	99	
			16QAM	75	0	
			16QAM	100	0	
1880	18900	20 MHz	QPSK	1	0	23.7
			QPSK	1	99	
			QPSK	50	0	
			QPSK	100	0	
			16QAM	1	0	22.4
			16QAM	1	99	
			16QAM	75	0	
			16QAM	100	0	
1900	19100	20 MHz	QPSK	1	0	23.9
			QPSK	1	99	
			QPSK	50	0	
			QPSK	100	0	
			16QAM	1	0	22.8
			16QAM	1	99	
			16QAM	75	0	
			16QAM	100	0	

LTE band 2 conducted power measurements
Rev 2

APPENDIX 3C – LTE Band 2 FREQUENCY STABILITY TEST DATA

LTE Frequency Stability Test Data



The following measurements were performed by Kevin Guo.

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.

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 3.7 volts, 4.2 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, 3.7 volts, 4.2 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) resource blocks. 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.

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 3.7 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 4.2 volts
15. 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, 3.7, 4.2 and 4.35 volts

The maximum frequency error in the LTE band 2 measured was **0.0107 PPM**.

Date of test: July 13, 2012

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	12	0.0063
18900	1880.0	3.6	20	10	0.0051
19199	1900.0	3.6	20	-13	-0.0069

Traffic Channel Number	LTE Band 2 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	3.7	20	11	0.0061
18900	1880.0	3.7	20	8	0.0045
19199	1900.0	3.7	20	-7	-0.0037

Traffic Channel Number	LTE Band 2 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	4.2	20	11	0.0059
18900	1880.0	4.2	20	10	0.0051
19199	1900.0	4.2	20	-8	-0.0044

Traffic Channel Number	LTE Band 2 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	4.35	20	-8	-0.0042
18900	1880.0	4.35	20	14	0.0074
19199	1900.0	4.35	20	8	0.0041

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	20	**0.0107**
18600	1860.0	3.6	-20	8	0.0043
18600	1860.0	3.6	-10	8	0.0041
18600	1860.0	3.6	0	8	0.0042
18600	1860.0	3.6	10	8	0.0041
18600	1860.0	3.6	20	12	0.0063
18600	1860.0	3.6	30	-14	-0.0075
18600	1860.0	3.6	40	8	0.0045
18600	1860.0	3.6	50	9	0.0047
18600	1860.0	3.6	60	8	0.0046
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
18600	1860.0	3.7	-30	8	0.0045
18600	1860.0	3.7	-20	7	0.0037
18600	1860.0	3.7	-10	7	0.0036
18600	1860.0	3.7	0	6	0.0034
18600	1860.0	3.7	10	6	0.0032
18600	1860.0	3.7	20	11	0.0061
18600	1860.0	3.7	30	-8	-0.0045
18600	1860.0	3.7	40	8	0.0045
18600	1860.0	3.7	50	-15	-0.0082
18600	1860.0	3.7	60	8	0.0043
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
18600	1860.0	4.2	-30	9	0.0046
18600	1860.0	4.2	-20	7	0.0039
18600	1860.0	4.2	-10	7	0.0036
18600	1860.0	4.2	0	9	0.0050
18600	1860.0	4.2	10	9	0.0046
18600	1860.0	4.2	20	11	0.0059
18600	1860.0	4.2	30	8	0.0043
18600	1860.0	4.2	40	9	0.0051
18600	1860.0	4.2	50	9	0.0049
18600	1860.0	4.2	60	6	0.0033

LTE band 2 Results: channel 18600 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	4.35	-30	6	0.0035
18600	1860.0	4.35	-20	9	0.0050
18600	1860.0	4.35	-10	9	0.0047
18600	1860.0	4.35	0	8	0.0043
18600	1860.0	4.35	10	8	0.0044
18600	1860.0	4.35	20	-8	-0.0042
18600	1860.0	4.35	30	8	0.0041
18600	1860.0	4.35	40	9	0.0050
18600	1860.0	4.35	50	-7	-0.0037
18600	1860.0	4.35	60	-6	-0.0033

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	8	0.0042
18900	1880.00	3.6	-20	-12	-0.0064
18900	1880.00	3.6	-10	9	0.0050
18900	1880.00	3.6	0	9	0.0047
18900	1880.00	3.6	10	9	0.0045
18900	1880.00	3.6	20	10	0.0051
18900	1880.00	3.6	30	7	0.0039
18900	1880.00	3.6	40	11	0.0059
18900	1880.00	3.6	50	8	0.0045
18900	1880.00	3.6	60	9	0.0048
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
18900	1880.00	3.7	-30	9	0.0049
18900	1880.00	3.7	-20	7	0.0035
18900	1880.00	3.7	-10	-10	-0.0051
18900	1880.00	3.7	0	8	0.0041
18900	1880.00	3.7	10	9	0.0047
18900	1880.00	3.7	20	8	0.0045
18900	1880.00	3.7	30	-12	-0.0066
18900	1880.00	3.7	40	10	0.0051
18900	1880.00	3.7	50	9	0.0049
18900	1880.00	3.7	60	8	0.0041

LTE band 2 Results: channel 18900 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18900	1880.00	4.2	-30	-13	-0.0067
18900	1880.00	4.2	-20	8	0.0041
18900	1880.00	4.2	-10	10	0.0052
18900	1880.00	4.2	0	8	0.0043
18900	1880.00	4.2	10	8	0.0044
18900	1880.00	4.2	20	10	0.0051
18900	1880.00	4.2	30	8	0.0041
18900	1880.00	4.2	40	7	0.0036
18900	1880.00	4.2	50	9	0.0047
18900	1880.00	4.2	60	9	0.0048
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
18900	1880.00	4.35	-30	7	0.0039
18900	1880.00	4.35	-20	-8	-0.0045
18900	1880.00	4.35	-10	8	0.0040
18900	1880.00	4.35	0	10	0.0052
18900	1880.00	4.35	10	11	0.0060
18900	1880.00	4.35	20	14	0.0074
18900	1880.00	4.35	30	10	0.0053
18900	1880.00	4.35	40	8	0.0040
18900	1880.00	4.35	50	7	0.0038
18900	1880.00	4.35	60	8	0.0044

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	-0.0046
19199	1900.0	3.6	-20	-7	-0.0038
19199	1900.0	3.6	-10	-7	-0.0036
19199	1900.0	3.6	0	-9	-0.0045
19199	1900.0	3.6	10	-7	-0.0039
19199	1900.0	3.6	20	-13	-0.0069
19199	1900.0	3.6	30	-7	-0.0035
19199	1900.0	3.6	40	-11	-0.0056
19199	1900.0	3.6	50	-9	-0.0048
19199	1900.0	3.6	60	-8	-0.0043

LTE band 2 Results: channel 19199 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
19199	1900.0	3.7	-30	-6	-0.0034
19199	1900.0	3.7	-20	-7	-0.0038
19199	1900.0	3.7	-10	7	0.0038
19199	1900.0	3.7	0	-6	-0.0030
19199	1900.0	3.7	10	-6	-0.0030
19199	1900.0	3.7	20	-7	-0.0037
19199	1900.0	3.7	30	-10	-0.0055
19199	1900.0	3.7	40	-8	-0.0041
19199	1900.0	3.7	50	12	0.0062
19199	1900.0	3.7	60	-7	-0.0037
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
19199	1900.0	4.2	-30	-9	-0.0048
19199	1900.0	4.2	-20	7	0.0035
19199	1900.0	4.2	-10	-7	-0.0038
19199	1900.0	4.2	0	-8	-0.0044
19199	1900.0	4.2	10	-6	-0.0032
19199	1900.0	4.2	20	-8	-0.0044
19199	1900.0	4.2	30	-9	-0.0046
19199	1900.0	4.2	40	-15	-0.0080
19199	1900.0	4.2	50	-11	-0.0060
19199	1900.0	4.2	60	-8	-0.0045
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
19199	1900.0	4.35	-30	-7	-0.0038
19199	1900.0	4.35	-20	-9	-0.0048
19199	1900.0	4.35	-10	-6	-0.0034
19199	1900.0	4.35	0	-7	-0.0037
19199	1900.0	4.35	10	-10	-0.0050
19199	1900.0	4.35	20	8	0.0041
19199	1900.0	4.35	30	-8	-0.0044
19199	1900.0	4.35	40	-7	-0.0036
19199	1900.0	4.35	50	-7	-0.0038
19199	1900.0	4.35	60	-9	-0.0046

APPENDIX 3D – LTE Band 2 RADIATED EMISSIONS TEST DATA

Radiated Power Test Data Results

Date of Test: October 19, 2012
The following measurements were performed by Savtej Sandhu.
The environmental tests conditions were: Temperature: 24.2 °C
Relative Humidity: 31.4 %
The BlackBerry® smartphone was standalone, with USB jack pointing 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, 20MHz 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 (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dB)
F0	18700	1860.00	2	Horn	V	-22.19	-22.19	V-V	-11.87	27.94	0.62	33.00	-5.06
F0	18700	1860.00	2	Horn	H	-28.84		H-H	-10.80				
F0	18900	1880.00	2	Horn	V	-22.11	-22.11	V-V	-11.17	28.35	0.68	33.00	-4.65
F0	18900	1880.00	2	Horn	H	-28.09		H-H	-10.30				
F0	19099	1899.90	2	Horn	V	-22.54	-22.54	V-V	-11.16	28.55	0.72	33.00	-4.45
F0	19099	1899.90	2	Horn	H	-29.29		H-H	-10.39				

LTE band 2, 1.4MHz BW, RB=6, 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 (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dB)
F0	18607	1850.70	2	Horn	V	-22.69	-22.69	V-V	-12.83	27.14	0.52	33.00	-5.86
F0	18607	1850.70	2	Horn	H	-28.89		H-H	-11.60				
F0	18900	1880.00	2	Horn	V	-23.09	-23.09	V-V	-12.17	27.37	0.55	33.00	-5.63
F0	18900	1880.00	2	Horn	H	-29.88		H-H	-11.28				
F0	19192	1909.20	2	Horn	V	-24.21	-24.21	V-V	-12.71	26.69	0.47	33.00	-6.31
F0	19192	1909.20	2	Horn	H	-31.35		H-H	-12.25				

Radiated Power Test Data Results (cont'd)

LTE band 2, 3MHz BW, RB=15, 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 (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dB)
F0	18615	1851.50	2	Horn	V	-22.61	-22.61	V-V	-12.61	27.37	0.55	33.00	-5.63
F0	18615	1851.50	2	Horn	H	-29.01		H-H	-11.37				
F0	18900	1880.00	2	Horn	V	-23.08	-23.08	V-V	-12.16	27.38	0.55	33.00	-5.62
F0	18900	1880.00	2	Horn	H	-29.29		H-H	-11.27				
F0	19184	1908.40	2	Horn	V	-23.32	-23.32	V-V	-11.91	27.56	0.57	33.00	-5.44
F0	19184	1908.40	2	Horn	H	-30.61		H-H	-11.38				

LTE band 2, 5MHz BW, RB=25, 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 (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dB)
F0	18625	1852.50	2	Horn	V	-22.58	-22.58	V-V	-11.97	27.47	0.56	33.00	-5.53
F0	18625	1852.50	2	Horn	H	-29.25		H-H	-11.27				
F0	18900	1880.00	2	Horn	V	-22.95	-22.95	V-V	-12.03	27.50	0.56	33.00	-5.50
F0	18900	1880.00	2	Horn	H	-29.08		H-H	-11.15				
F0	19174	1907.40	2	Horn	V	-23.21	-23.21	V-V	-12.15	27.64	0.58	33.00	-5.36
F0	19174	1907.40	2	Horn	H	-30.29		H-H	-11.30				

Radiated Power Test Data Results (cont'd)

LTE band 2, 10MHz BW, RB=50, 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 (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dB)
F0	18650	1855.00	2	Horn	V	-22.61	-22.61	V-V	-12.34	27.58	0.57	33.00	-5.42
F0	18650	1855.00	2	Horn	H	-29.68		H-H	-11.16				
F0	18900	1880.00	2	Horn	V	-22.65	-22.65	V-V	-11.71	27.85	0.61	33.00	-5.15
F0	18900	1880.00	2	Horn	H	-28.84		H-H	-10.80				
F0	19149	1904.90	2	Horn	V	-23.04	-23.04	V-V	-11.19	28.30	0.68	33.00	-4.70
F0	19149	1904.90	2	Horn	H	-29.85		H-H	-10.64				

LTE band 2, 15MHz BW, RB=75, 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 (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dB)
F0	18675	1857.50	2	Horn	V	-22.63	-22.63	V-V	-12.25	27.60	0.58	33.00	-5.40
F0	18675	1857.50	2	Horn	H	-29.68		H-H	-11.14				
F0	18900	1880.00	2	Horn	V	-22.69	-22.69	V-V	-11.76	27.80	0.60	33.00	-5.20
F0	18900	1880.00	2	Horn	H	-28.88		H-H	-10.85				
F0	19124	1902.40	2	Horn	V	-22.93	-22.93	V-V	-11.38	28.24	0.67	33.00	-4.76
F0	19124	1902.40	2	Horn	H	-30.30		H-H	-10.70				

Radiated Power Test Data Results (cont'd)

LTE band 2, 20MHz BW, RB=100, 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 (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dB)
F0	18700	1860.00	2	Horn	V	-22.73	-22.73	V-V	-12.38	27.40	0.55	33.00	-5.60
F0	18700	1860.00	2	Horn	H	-29.29		H-H	-11.34				
F0	18900	1880.00	2	Horn	V	-28.27	-22.86	V-V	-11.94	27.60	0.58	33.00	-5.40
F0	18900	1880.00	2	Horn	H	-22.86		H-H	-11.05				
F0	19099	1899.90	2	Horn	V	-23.03	-23.03	V-V	-11.68	28.02	0.63	33.00	-4.98
F0	19099	1899.90	2	Horn	H	-30.03		H-H	-10.92				

Radiated Emissions Test Data Results (cont'd)

Date of Test: June 20 and October 3, 2012

The following measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25.5 ºC
Relative Humidity: 35.7 %

The BlackBerry® smartphone was standalone, with USB jack pointing down and 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 2 with 1.4MHz BW (channel 18607, 18900 and 19192 with RB = 6), 5MHz BW (channel 18625, 18900 and 19174 with RB = 25) and 20MHz BW (channel18700, 18900, 19099 with RB = 100 and RB = 1), with QPSK modulation.

All emissions had test margins greater than 25.0 dB.

Date of Test: June 14 – July 09 and September 26, 2012

The following measurements were performed by Shuo Wang
The environmental test conditions were: Temperature: 25.4 ºC
Relative Humidity: 41.7 %

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 20 GHz.

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

Measurements were performed in LTE band 2 with 1.4MHz BW (channel 18607, 18900 and 19192 with RB = 6), 5MHz BW (channel 18625, 18900 and 19174 with RB = 25) and 20MHz BW (channel18700, 18900, 19099 with RB = 100 and RB = 1), with QPSK modulation.

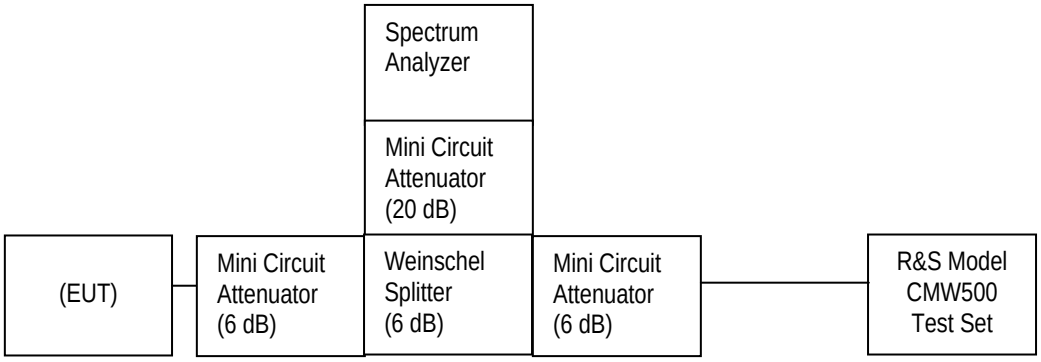
All emissions had test margins greater than 25.0 dB.

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

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



Date of Test: July 05, 2012

The environmental test conditions were: Temperature: 25.0ºC
Relative Humidity: 37.0 %

The following measurements were performed by Kevin Guo.

LTE Band 5 Conducted RF Emission Test Data cont'd

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 22.917 and RSS-132, 4.5 were measured from 10 MHz to 20 GHz.

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each 1.4MHz, 3MHz, 5MHz, 10MHz with different number of resource blocks 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 resource block 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 4.583 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 LTE Band 5 selected Frequencies in 10MHz BW (RB = 50)

LTE Band 5 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
829.0	9.276	8.929
836.5	9.291	8.929
843.9	9.233	8.900

Peak to Average Ratio (PAR)

For each 1.4MHz, 3MHz, 5MHz, 10MHz with different number of resource blocks as per scalable bandwidths for LTE band 5, 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 9.20 dB on the high channel in 10MHz bandwidth with 25 resource blocks.

Measurement Plots for LTE Band 5

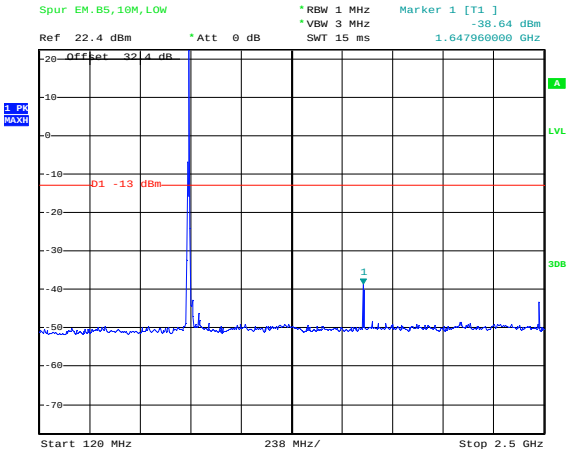
See Figures 1-1d to 1-18d for the plots of the conducted spurious emissions.

See Figures 1-19d to 1-34d for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.

See Figures 1-35d to 1-42d for the plots of the Channel mask.

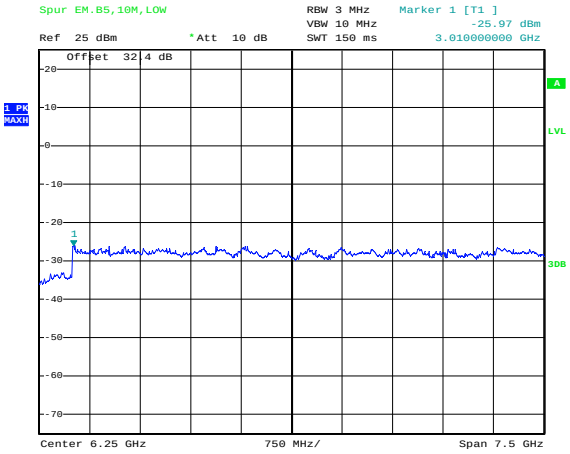
LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-1d: Band 5, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)



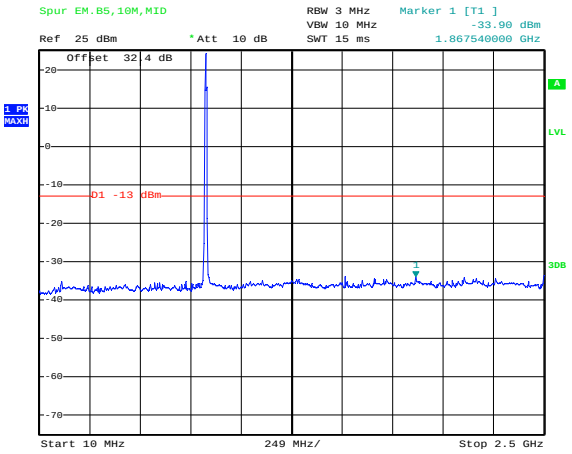
Date: 20.JUN.2012 02:47:14

Figure 1-2d: Band 5, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)



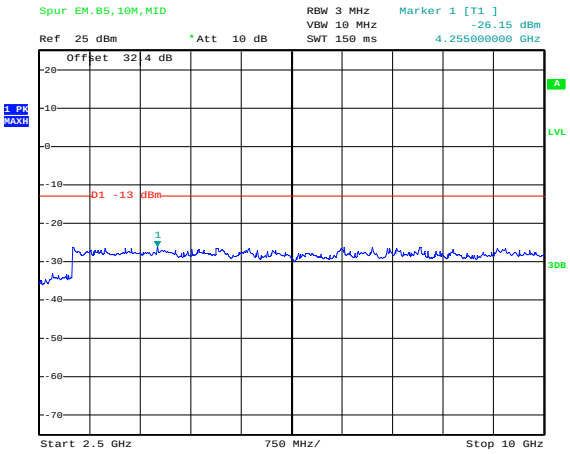
Date: 20.JUN.2012 02:49:46

Figure 1-3d: Band 5, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 50)



Date: 20.JUN.2012 02:52:22

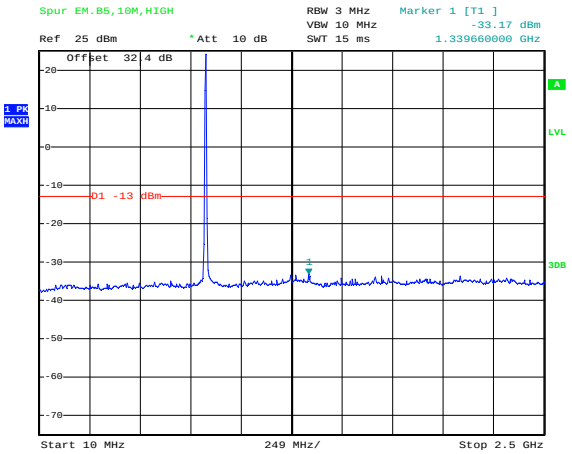
Figure 1-4d: Band 5, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 50)



Date: 20.JUN.2012 02:53:26

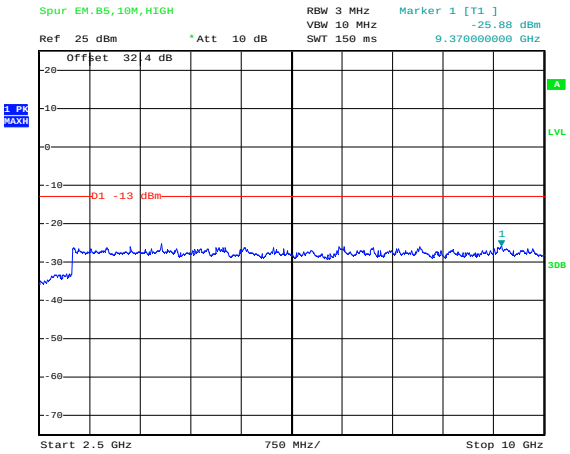
LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-5d: Band 5, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)



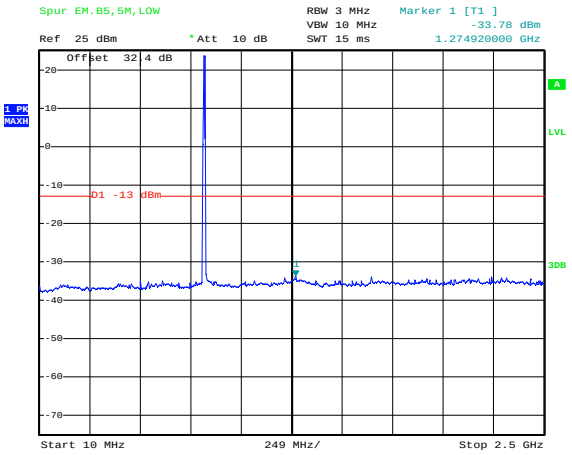
Date: 20.JUN.2012 03:03:00

Figure 1-6d: Band 5, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)



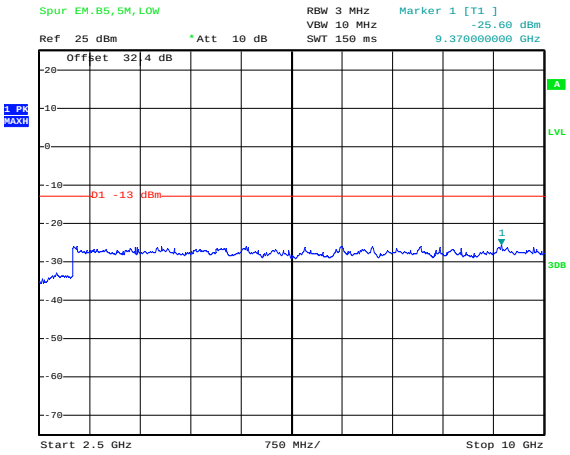
Date: 20.JUN.2012 02:58:29

Figure 1-7d: Band 5, Spurious Conducted Emissions, Low channel, 5MHz BW (RB= 25)



Date: 20.JUN.2012 03:07:08

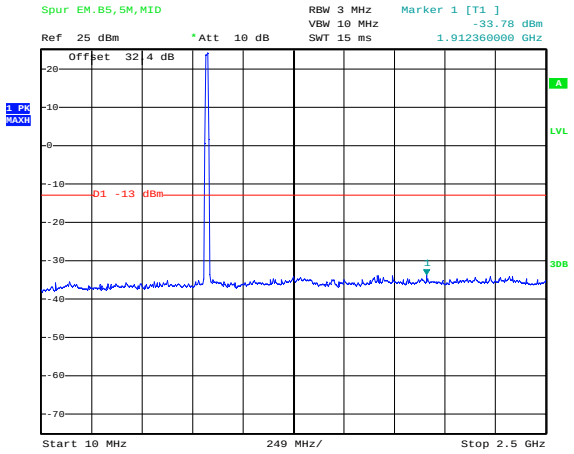
Figure 1-8d: Band 5, Spurious Conducted Emissions, Low channel, 5MHz BW (RB= 25)



Date: 20.JUN.2012 03:09:54

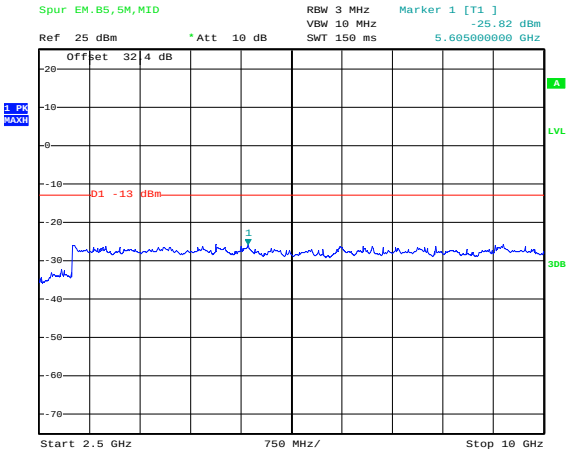
LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-9d: Band 5, Spurious Conducted Emissions, Middle Channel, 5MHz BW (RB= 25)



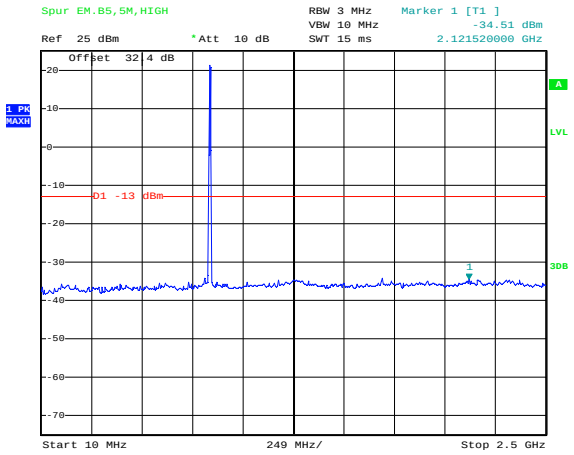
Date: 20.JUN.2012 03:12:03

Figure 1-10d: Band 5, Spurious Conducted Emissions, Middle Channel, 5MHz BW (RB= 25)



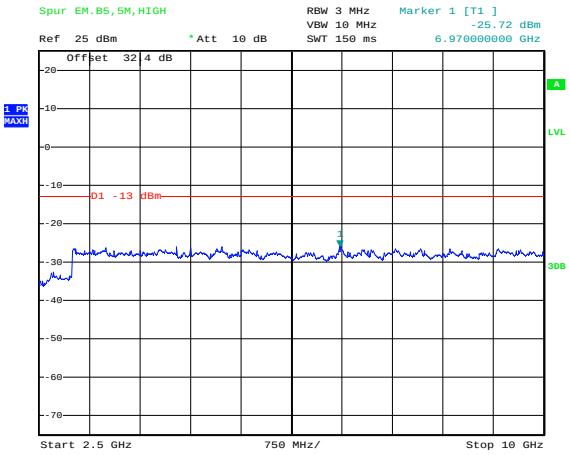
Date: 20.JUN.2012 03:14:17

Figure 1-11d: Band 5, Spurious Conducted Emissions, High channel, 5MHz BW (RB= 25)



Date: 20.JUN.2012 03:16:39

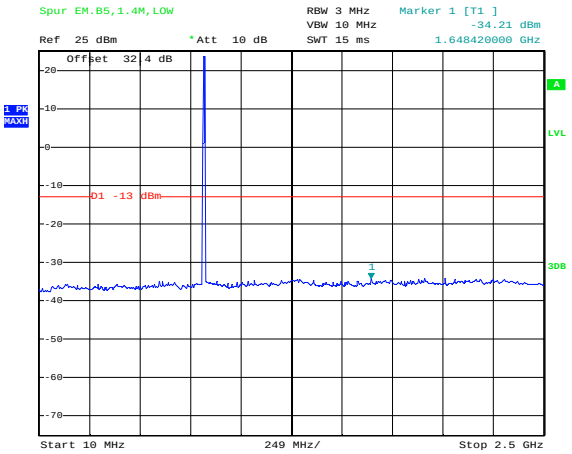
Figure 1-12d: Band 5, Spurious Conducted Emissions, High channel, 5MHz BW (RB= 25)



Date: 20.JUN.2012 03:19:42

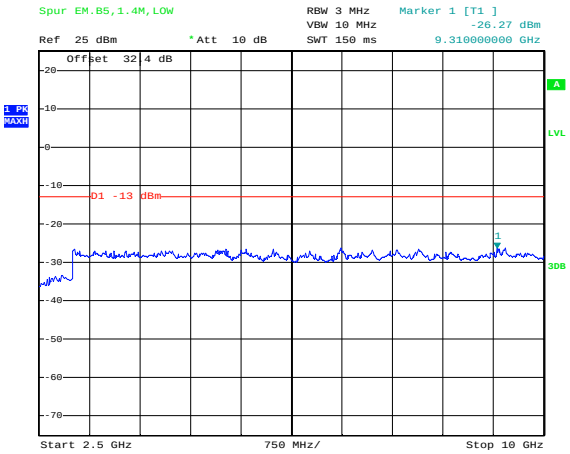
LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-13d: Band 5, Spurious Conducted Emissions, Low Channel, 1.4MHz BW (RB= 6)



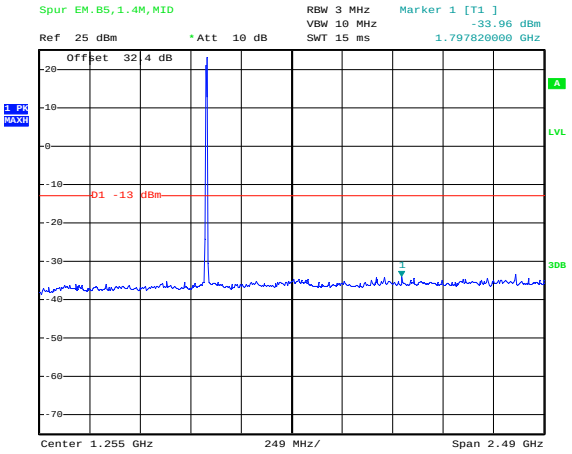
Date: 20.JUN.2012 03:33:05

Figure 1-14d: Band 5, Spurious Conducted Emissions, Low Channel, 1.4MHz BW (RB= 6)



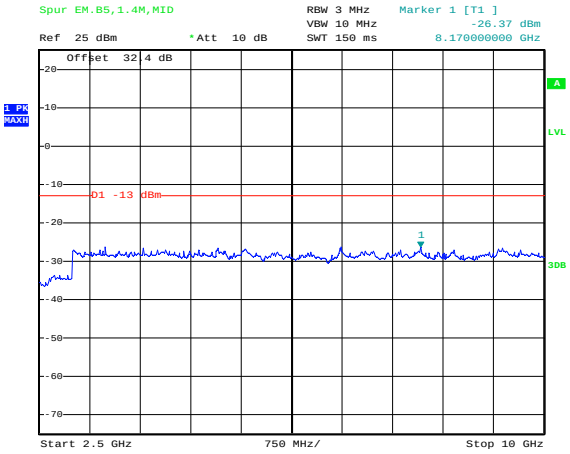
Date: 20.JUN.2012 03:33:30

Figure 1-15d: Band 5, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 6)



Date: 20.JUN.2012 03:36:30

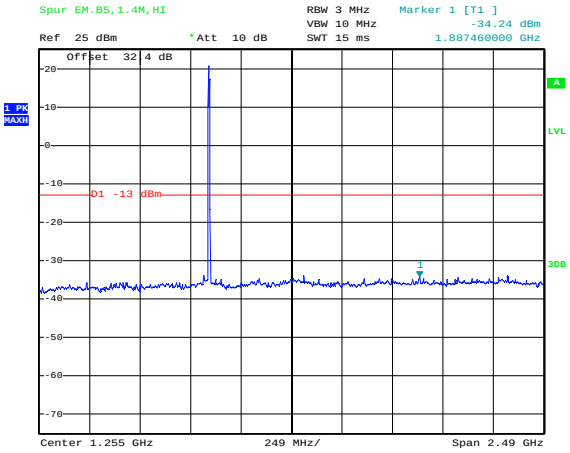
Figure 1-16d: Band 5, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 6)



Date: 20.JUN.2012 03:36:51

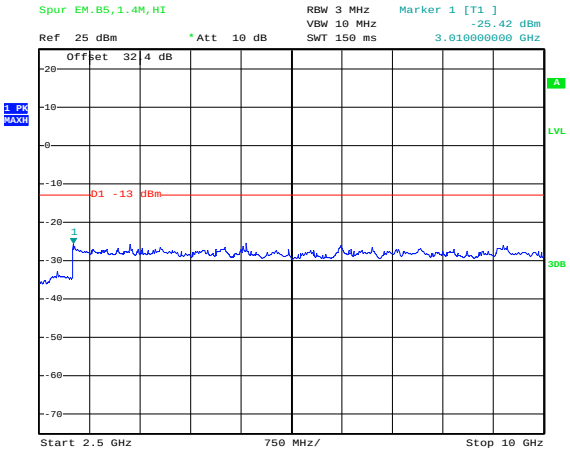
LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-17d: Band 5, Spurious Conducted Emissions, High channel, 1.4MHz BW (RB= 6)



Date: 20.JUN.2012 03:39:32

Figure 1-18d: Band 5, Spurious Conducted Emissions, High channel, 1.4MHz BW (RB= 6)



Date: 20.JUN.2012 03:40:19

LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-19d: Occupied Bandwidth, Band 5 Low Channel, 10MHz BW, RB=50

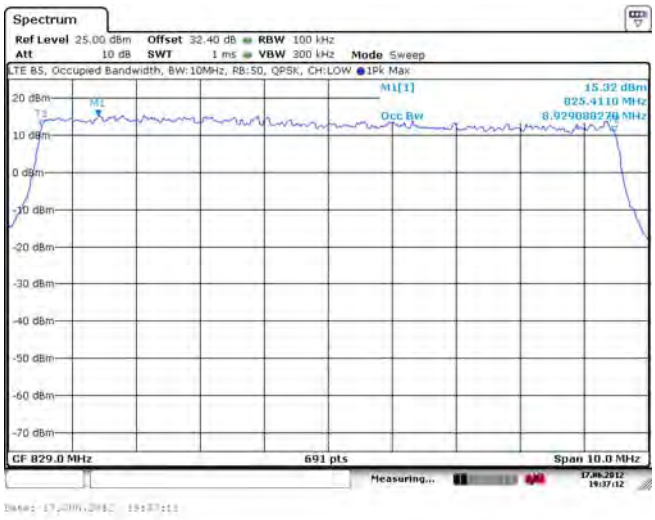


Figure 1-20d: Occupied Bandwidth, Band 5 Middle Channel, 10MHz BW, RB=50

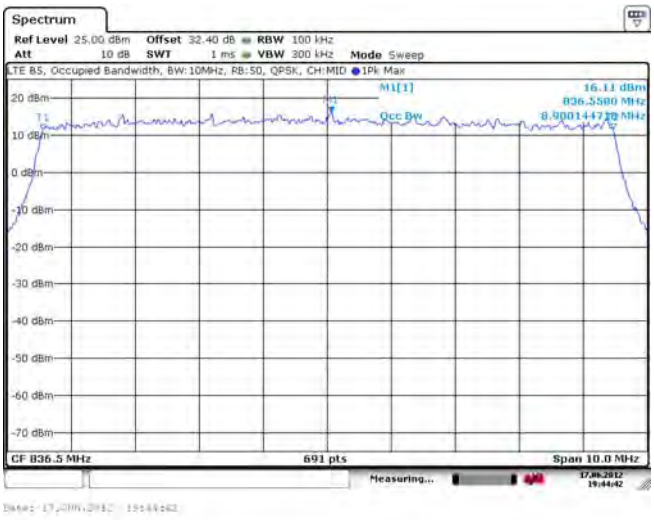
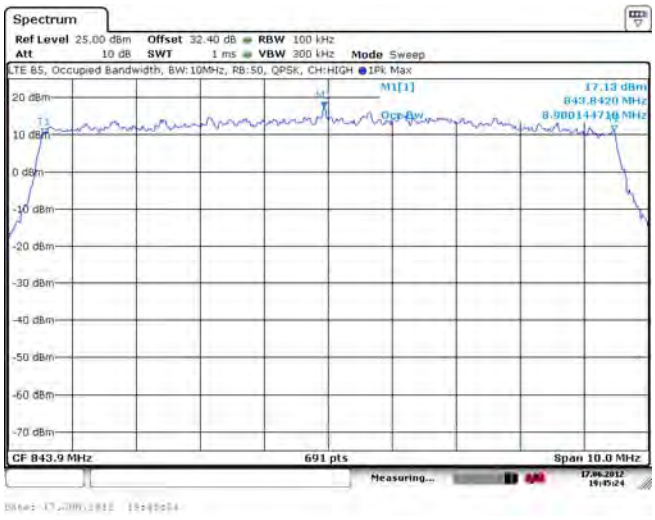


Figure 1-21d: Occupied Bandwidth, Band 5 High Channel, 10MHz BW, RB=50



LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-22d: Occupied Bandwidth, Band 5 Low Channel, 5MHz BW, RB=25

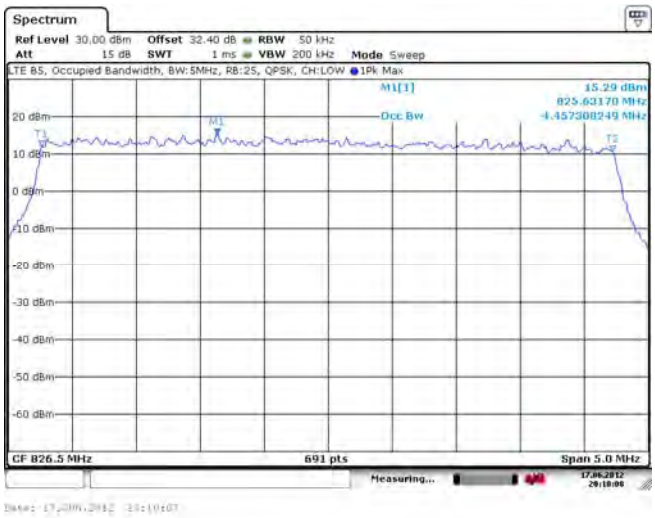


Figure 1-23d: Occupied Bandwidth, Band 5 Middle Channel, 5MHz BW, RB=25

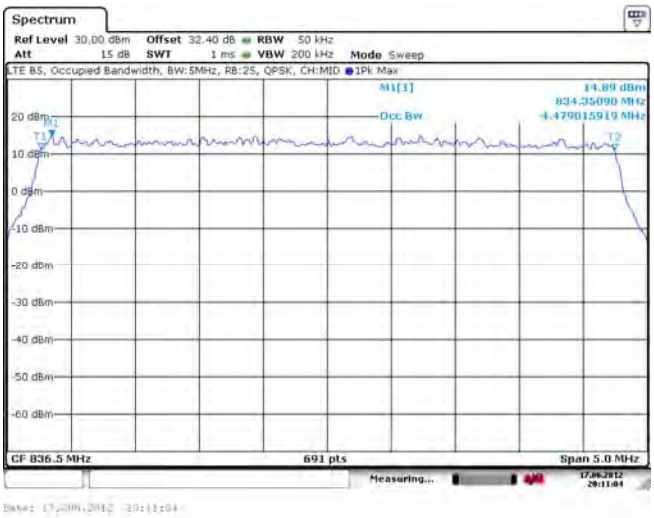
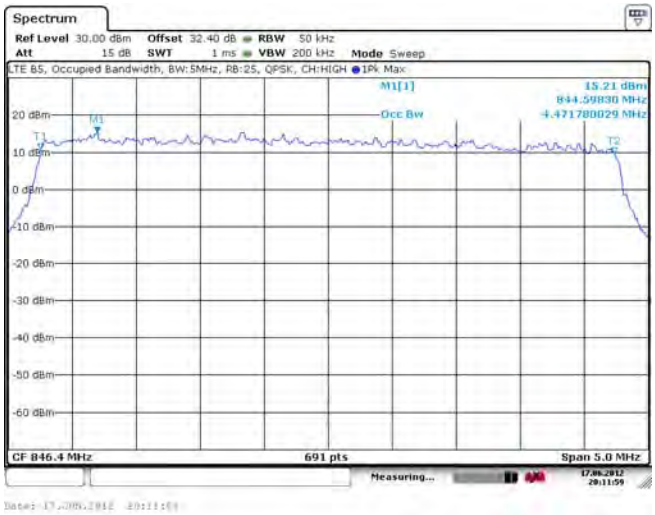


Figure 1-24d: Occupied Bandwidth, Band 5 High Channel, 5MHz BW, RB=25



LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-25d: Occupied Bandwidth, Band 5 Low Channel, 1.4MHz BW, RB=6

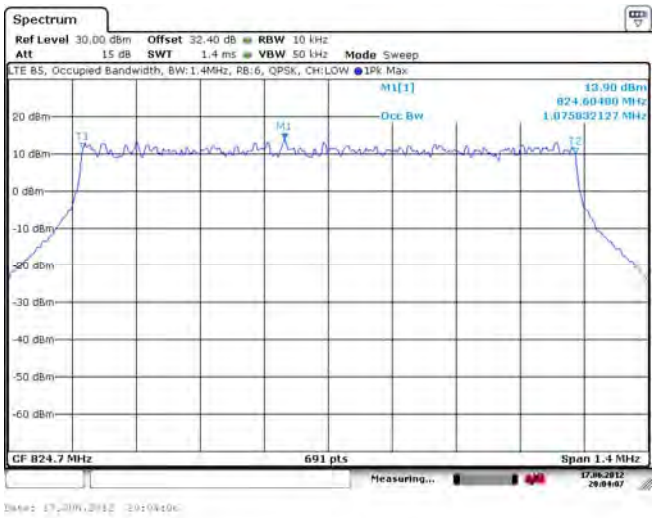


Figure 1-26d: Occupied Bandwidth, Band 5 Middle Channel, 1.4MHz BW, RB=6

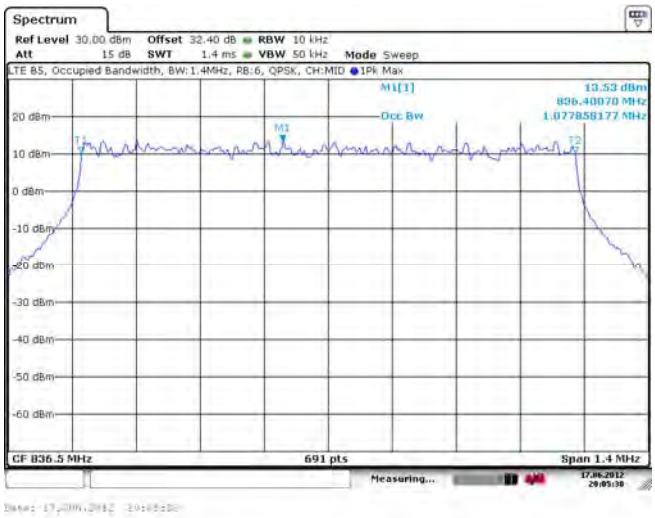
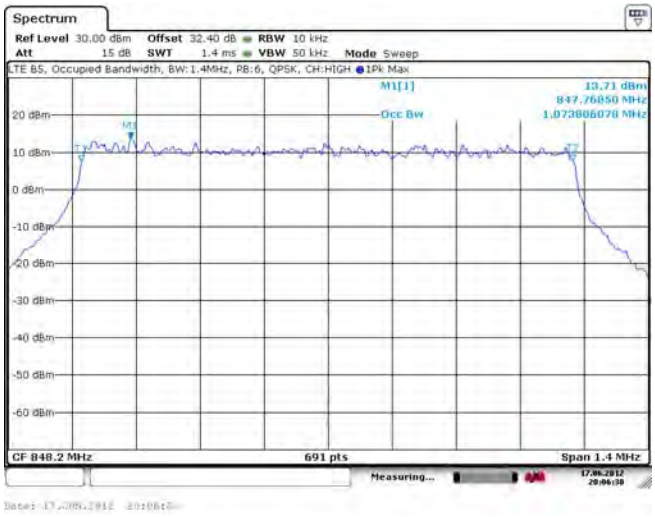


Figure 1-27d: Occupied Bandwidth, Band 5 High Channel, 1.4MHz BW, RB=6



LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-28d: -26 dBc Bandwidth, Band 5 Low Channel, 10MHz BW, RB=50

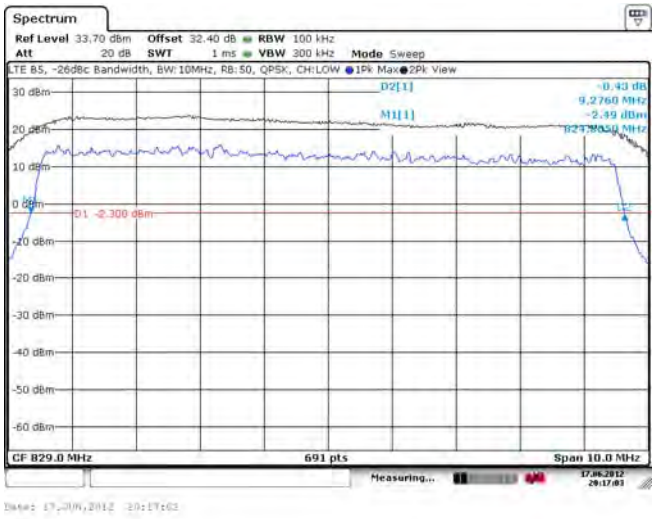


Figure 1-29d: -26 dBc Bandwidth, Band 5 Middle Channel, 10MHz BW, RB=50

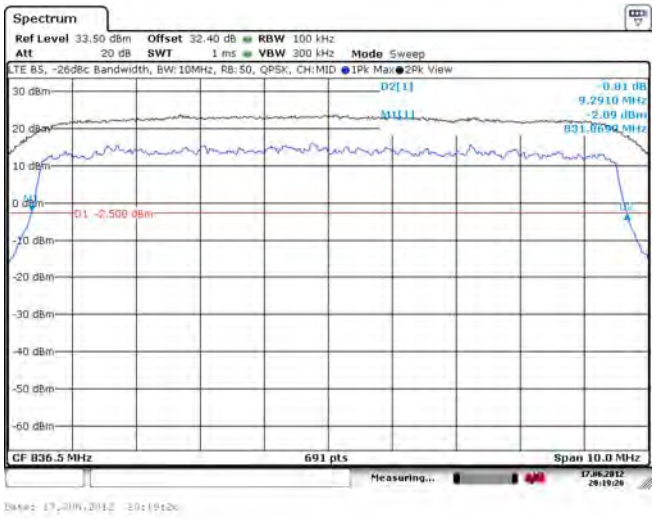


Figure 1-30d: -26 dBc Bandwidth, Band 5 High Channel, 10MHz BW, RB=50

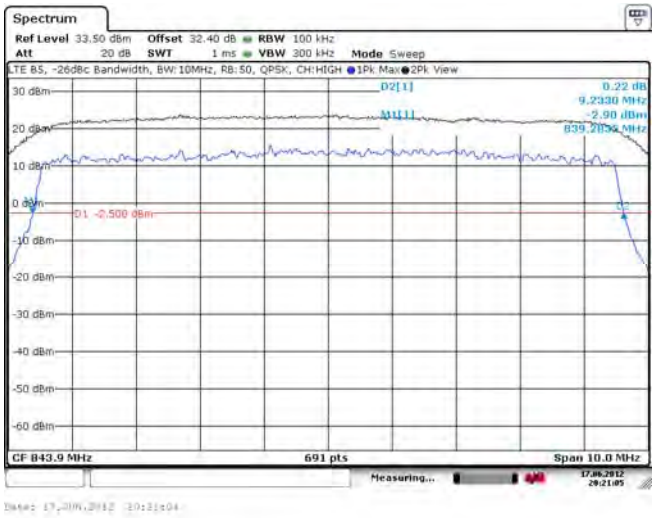
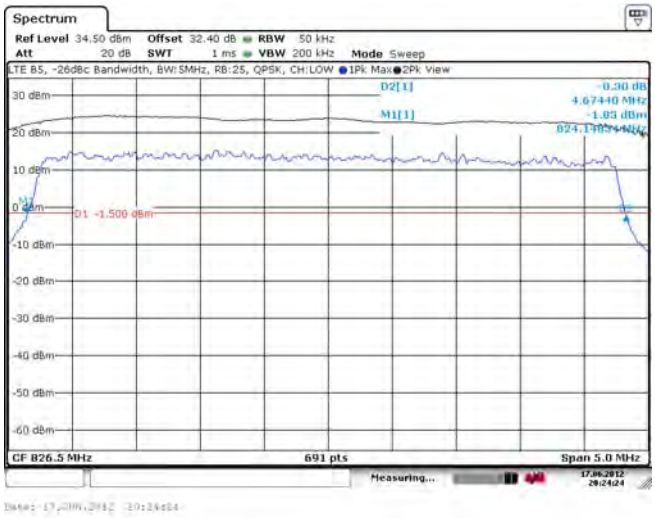


Figure 1-31d: -26 dBc Bandwidth, Band 5 Low Channel, 5MHz BW, RB=25



LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-30d: -26 dBc Bandwidth, Band 5 Middle Channel, 5MHz BW, RB=25

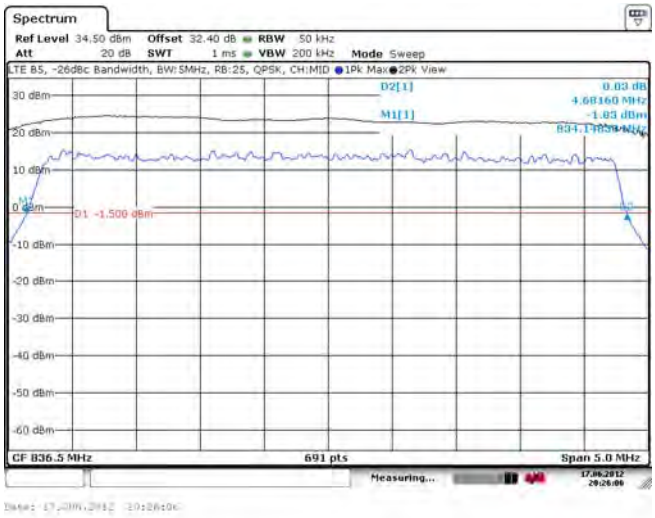


Figure 1-31d: -26 dBc Bandwidth, Band 5 High Channel, 5MHz BW, RB=25

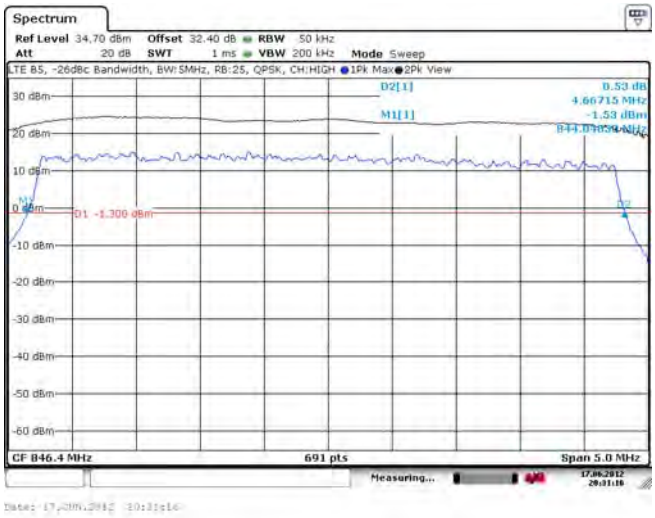


Figure 1-32d: -26 dBc Bandwidth, Band 5 Low Channel, 1.4MHz BW, RB=6

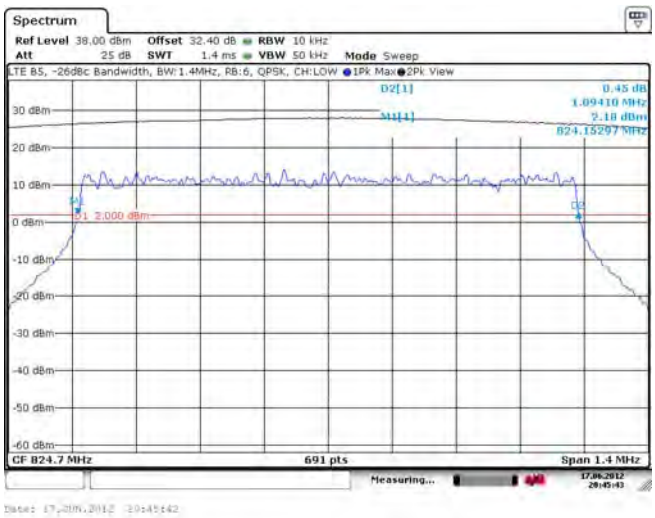
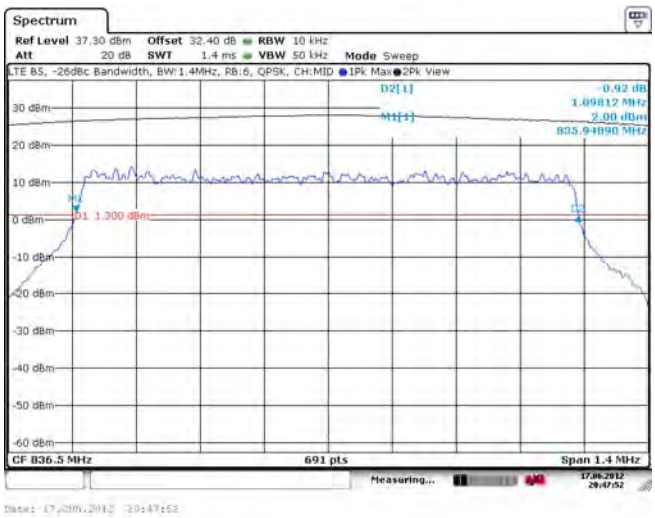


Figure 1-33d: -26 dBc Bandwidth, Band 5 Middle Channel, 1.4MHz BW, RB=6



LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-34d: -26 dBc Bandwidth, Band 5 High Channel, 1.4MHz BW, RB=6

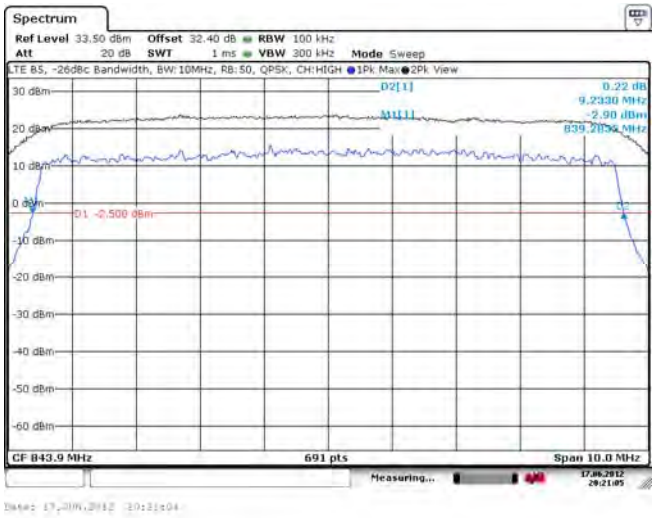


Figure 1-35d: Band 5 Low Channel Mask, 10MHz BW, RB=50

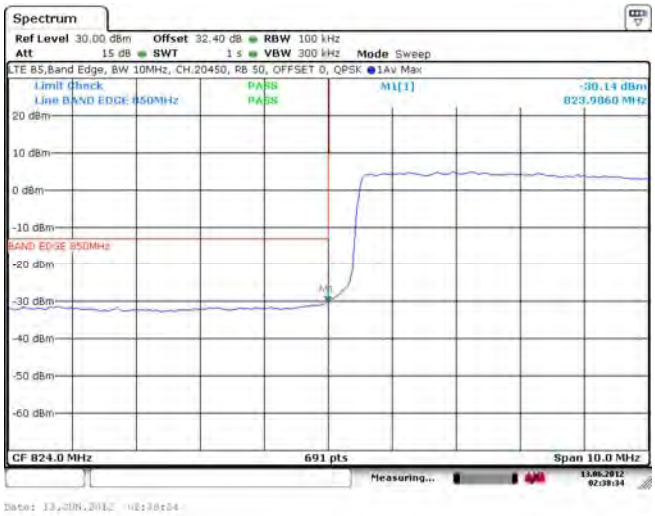
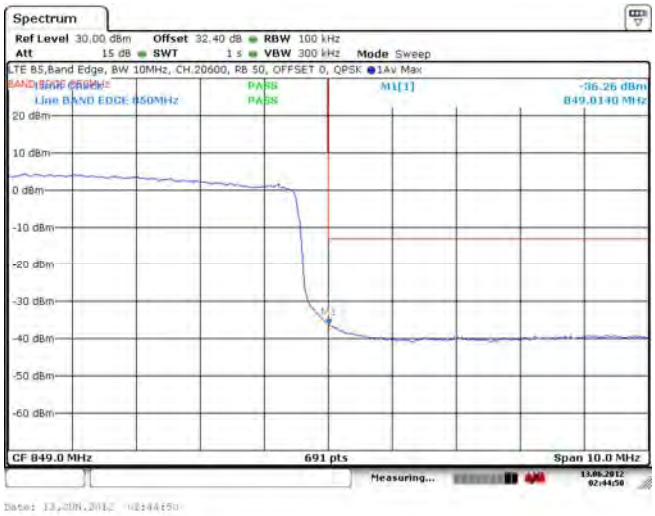


Figure 1-36d: Band 5 High Channel Mask, 10MHz BW, RB=50



LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-37d: Band 5 Low Channel Mask, 5MHz BW, RB=25

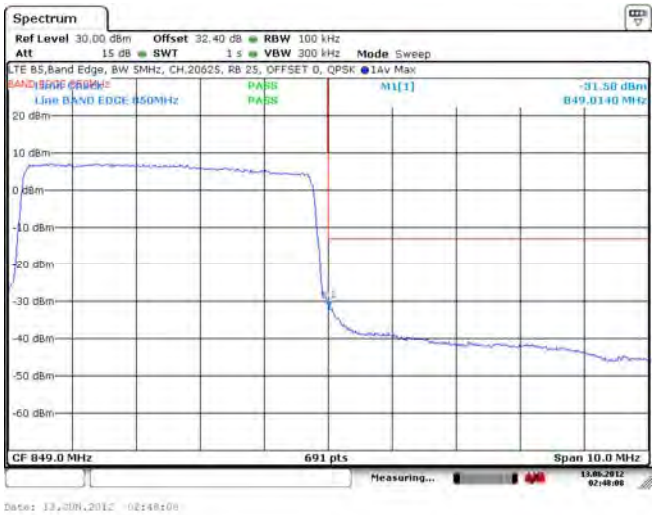


Figure 1-38d: Band 5 High Channel Mask, 5MHz BW, RB=25

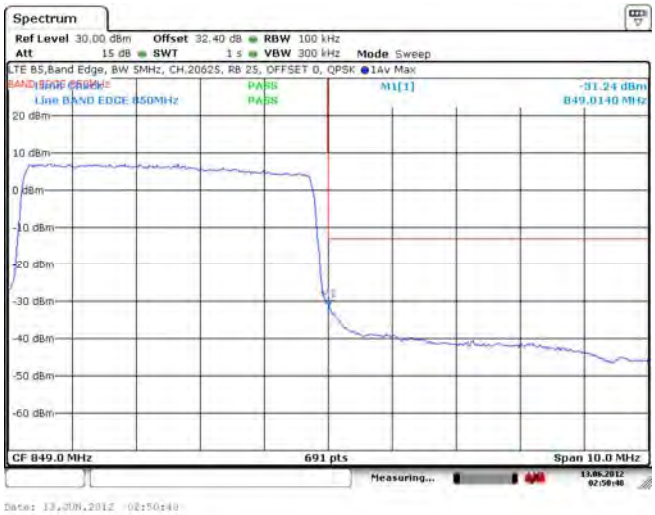


Figure 1-39d: Band 5 Low Channel Mask, 1.4MHz BW, RB=6

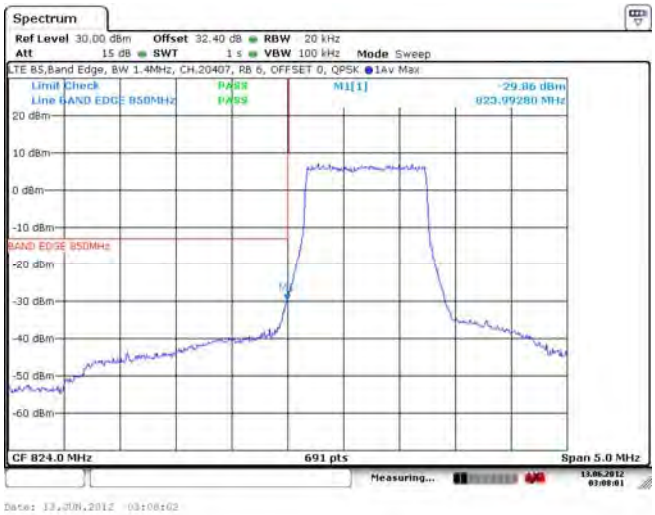
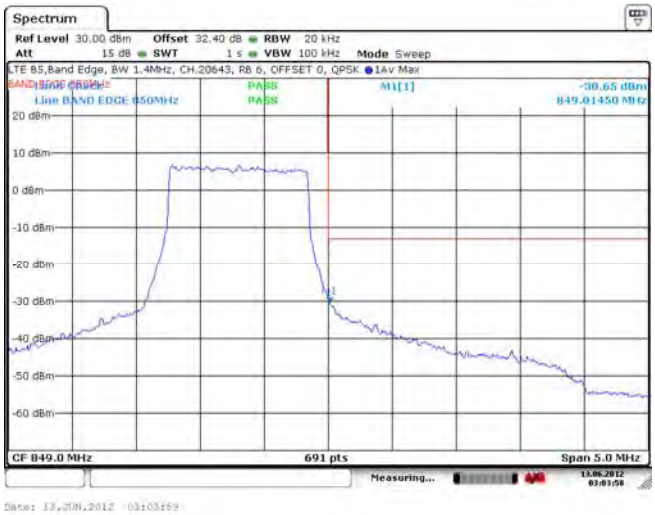


Figure 1-40d: Band 5 High Channel Mask, 1.4MHz BW, RB=6



LTE Band 5 Conducted RF Emission Test Data cont'd

Figure 1-41d: Band 5 Low Channel Mask, 10MHz BW, RB=1

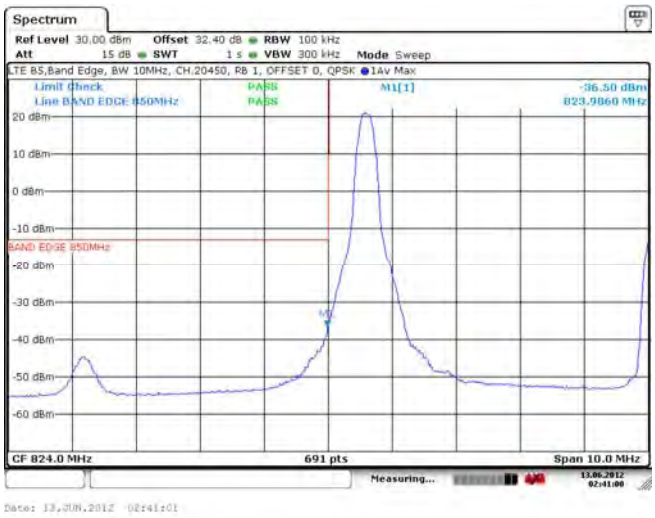
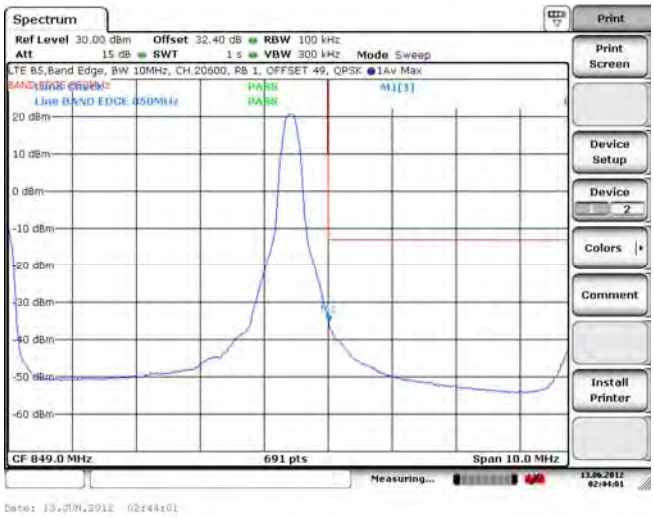


Figure 1-42d: Band 5 High Channel Mask, 10MHz BW, RB=1



APPENDIX 4B – LTE Band 5 CONDUCTED RF OUTPUT POWER TEST DATA

LTE Band 5 Conducted RF Output Power Test Data

The conducted RF output power was measured using the CMW500 base station simulator. Low, middle and high channels were measured at maximum radio output power at different service options and modes.

Date of Test: June 20, 2012

The environmental conditions were: Temperature: 23.0 °C
Humidity: 37.6 %

The measurements were performed by Daoud Attayi.

LTE Band 5 RF Conducted Power

Band	LTE Band 5					
Frequency (MHz)	**Channel**	**BW**	**Modulation**	**RB Size**	**RB Offset**	**Maximum Avg. Power (dBm)**
824	20400	10 MHz	QPSK	1	0	23.80
			QPSK	1	49	23.80
			QPSK	25	0	23.10
			QPSK	50	0	23.20
			16QAM	1	0	23.10
			16QAM	1	49	23.00
			16QAM	30	0	22.40
			16QAM	50	0	22.30
829	20450	10 MHz	QPSK	1	0	24.10
			QPSK	1	49	23.64
			QPSK	25	0	22.57
			QPSK	50	0	22.67
			16QAM	1	0	23.51
			16QAM	1	49	23.00
			16QAM	30	0	21.73
			16QAM	50	0	21.83
836.5	20525	10 MHz	QPSK	1	0	23.87
			QPSK	1	49	23.90
			QPSK	25	0	23.10
			QPSK	50	0	23.17
			16QAM	1	0	22.87
			16QAM	1	49	23.30
			16QAM	30	0	22.10
			16QAM	50	0	22.40
844.0	20600	10 MHz	QPSK	1	0	23.81
			QPSK	1	49	23.02
			QPSK	25	0	22.32
			QPSK	50	0	22.25
			16QAM	1	0	22.65
			16QAM	1	49	21.80
			16QAM	30	0	21.47
			16QAM	50	0	21.26
848.9	20649	10 MHz	QPSK	1	0	22.60
			QPSK	1	49	22.50
			QPSK	25	0	22.30
			QPSK	50	0	22.60
			16QAM	1	0	21.94
			16QAM	1	49	21.92

LTE Band 5 Conducted RF Output Power Test Data (cont'd)

			16QAM	30	0	21.50
			16QAM	50	0	21.90
836.5	20525	5 MHz	QPSK	1	0	23.80
			QPSK	1	24	23.80
			QPSK	12	1	22.90
			QPSK	25	0	23.00
			16QAM	1	0	22.24
			16QAM	1	24	22.10
			16QAM	12	6	22.10
			16QAM	25	0	22.10
836.5	20525	3 MHz	QPSK	1	0	23.80
			QPSK	1	14	23.80
			QPSK	6	9	22.98
			QPSK	15	0	22.90
			16QAM	1	0	22.30
			16QAM	1	5	22.30
			16QAM	6	0	22.10
			16QAM	6	0	22.00
836.5	20525	1.4 MHz	QPSK	1	0	23.80
			QPSK	1	5	23.70
			QPSK	6	0	23.70
			16QAM	1	0	23.10
			16QAM	1	5	23.10
			16QAM	6	0	23.20

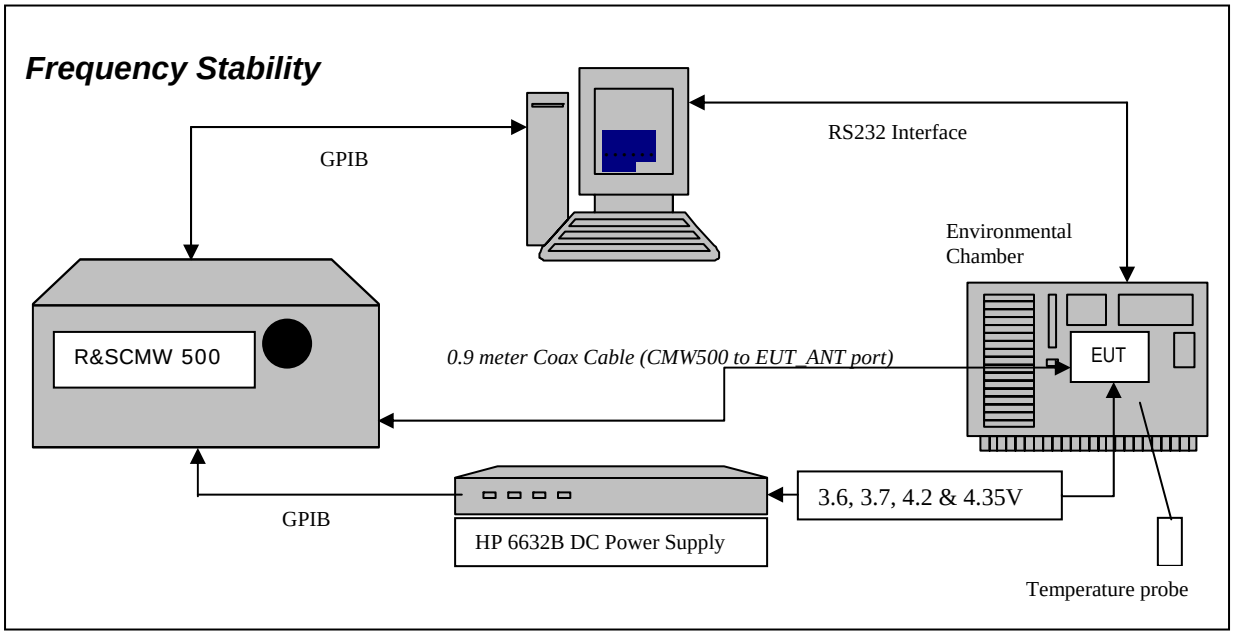
LTE band 5 conducted power measurements
Rev 1

Band	**LTE Band 5**					
Frequency (MHz)	**Channel**	**BW**	**Modulation**	**RB Size**	**RB Offset**	**Maximum Avg. Power (dBm)**
829	20450	10 MHz	QPSK	1	0	23.8
			QPSK	1	49	
			QPSK	25	0	
			QPSK	50	0	
			16QAM	1	0	22.9
			16QAM	1	49	
			16QAM	30	0	
			16QAM	50	0	
836.5	20525	10 MHz	QPSK	1	0	23.7
			QPSK	1	49	
			QPSK	25	0	
			QPSK	50	0	
			16QAM	1	0	21.7
			16QAM	1	49	
			16QAM	30	0	
			16QAM	50	0	
844.0	20600	10 MHz	QPSK	1	0	23.7
			QPSK	1	49	
			QPSK	25	0	
			QPSK	50	0	
			16QAM	1	0	22.7
			16QAM	1	49	
			16QAM	30	0	
			16QAM	50	0	

LTE band 5 conducted power measurements
Rev 1

APPENDIX 4C – LTE Band 5 FREQUENCY STABILITY TEST DATA

LTE Band 5 Frequency Stability Test Data



The following measurements were performed by Kevin Guo.

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

24.237 *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.

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 3.7 volts, 4.2 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, 3.7 volts, 4.2 volts and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 829.0 MHz, 836.5 MHz and 848.9 MHz each was measured under 10 MHz bandwidth with maximum (50) resource blocks. 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.

Procedure:

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

16. Switch on the HP 6632B power supply; CMW 500 Communications test Set, and Environmental Chamber.
17. Start test program
18. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
19. Set power supply voltage to 3.6 volts.
20. Set up CMW 500 Radio Communication Tester.
21. Command the CMW 500 to switch to the low channel.
22. Enable the voltage to the EUT, and connect a link to the CMW 500 test set.
23. EUT is commanded to Transmit 100 Bursts.
24. 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.
25. The CMW 500 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
26. Repeat steps 5 to 10 changing the supply voltage to 3.7 Volts
27. Increase temperature by 10°C and soak for 1/2 hour.
28. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
29. Repeat steps 5 to 10 changing the supply voltage to 4.2 volts
30. 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, 3.7, 4.2 and 4.35 volts

The maximum frequency error in the LTE Band 5 measured was **0.0163 PPM**.

Date of test: June 29, 2012

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
20400	829.0	3.6	20	4	0.0049
20525	836.5	3.6	20	4	0.0044
20649	848.9	3.6	20	-3	-0.0032

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20400	829.0	3.7	20	4	0.0046
20525	836.5	3.7	20	-2	-0.0022
20649	848.9	3.7	20	3	0.0032

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20400	829.0	4.2	20	7	0.0083
20525	836.5	4.2	20	4	0.0044
20649	848.9	4.2	20	6	0.0065

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20400	829.0	4.35	20	-3	-0.0041
20525	836.5	4.35	20	4	0.0048
20649	848.9	4.35	20	-4	-0.0043

LTE band 5 Results: channel 20400 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20400	829.0	3.6	-30	-4	-0.0051
20400	829.0	3.6	-20	-7	-0.0086
20400	829.0	3.6	-10	-6	-0.0070
20400	829.0	3.6	0	-3	-0.0041
20400	829.0	3.6	10	4	0.0052
20400	829.0	3.6	20	4	0.0049
20400	829.0	3.6	30	4	0.0042
20400	829.0	3.6	40	-4	-0.0048
20400	829.0	3.6	50	11	0.0132
20400	829.0	3.6	60	-5	-0.0061

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20400	829.0	3.7	-30	-3	-0.0042
20400	829.0	3.7	-20	-4	-0.0051
20400	829.0	3.7	-10	-4	-0.0045
20400	829.0	3.7	0	-3	-0.0036
20400	829.0	3.7	10	3	0.0034
20400	829.0	3.7	20	4	0.0046
20400	829.0	3.7	30	4	0.0046
20400	829.0	3.7	40	-3	-0.0037
20400	829.0	3.7	50	4	0.0046
20400	829.0	3.7	60	-3	-0.0040

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20400	829.0	4.2	-30	-4	-0.0047
20400	829.0	4.2	-20	-3	-0.0041
20400	829.0	4.2	-10	-3	-0.0039
20400	829.0	4.2	0	-4	-0.0047
20400	829.0	4.2	10	4	0.0052
20400	829.0	4.2	20	7	0.0083
20400	829.0	4.2	30	5	0.0057
20400	829.0	4.2	40	-4	-0.0046
20400	829.0	4.2	50	-5	-0.0055
20400	829.0	4.2	60	-4	-0.0043

LTE band 5 Results: channel 20400 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20400	829.0	4.35	-30	-4	-0.0051
20400	829.0	4.35	-20	-4	-0.0048
20400	829.0	4.35	-10	-5	-0.0059
20400	829.0	4.35	0	-4	-0.0043
20400	829.0	4.35	10	-4	-0.0046
20400	829.0	4.35	20	-3	-0.0041
20400	829.0	4.35	30	-5	-0.0064
20400	829.0	4.35	40	16	0.0189
20400	829.0	4.35	50	-12	-0.0146
20400	829.0	4.35	60	11	0.0131

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	4	0.0048
20525	836.5	3.6	-20	-3	-0.0036
20525	836.5	3.6	-10	5	0.0056
20525	836.5	3.6	0	4	0.0045
20525	836.5	3.6	10	-4	-0.0045
20525	836.5	3.6	20	4	0.0044
20525	836.5	3.6	30	-5	-0.0057
20525	836.5	3.6	40	5	0.0056
20525	836.5	3.6	50	5	0.0055
20525	836.5	3.6	60	5	0.0061

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20525	836.5	3.7	-30	5	0.0055
20525	836.5	3.7	-20	4	0.0053
20525	836.5	3.7	-10	4	0.0046
20525	836.5	3.7	0	3	0.0042
20525	836.5	3.7	10	-4	-0.0048
20525	836.5	3.7	20	-2	-0.0022
20525	836.5	3.7	30	-2	-0.0023
20525	836.5	3.7	40	5	0.0059
20525	836.5	3.7	50	7	0.0087
20525	836.5	3.7	60	-7	-0.0085

LTE band 5 Results: channel 20525 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20525	836.5	4.2	-30	5	0.0059
20525	836.5	4.2	-20	5	0.0062
20525	836.5	4.2	-10	4	0.0045
20525	836.5	4.2	0	4	0.0046
20525	836.5	4.2	10	-4	-0.0045
20525	836.5	4.2	20	4	0.0044
20525	836.5	4.2	30	4	0.0047
20525	836.5	4.2	40	4	0.0053
20525	836.5	4.2	50	4	0.0052
20525	836.5	4.2	60	3	0.0039

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20525	836.5	4.35	-30	6	0.0069
20525	836.5	4.35	-20	3	0.0040
20525	836.5	4.35	-10	-7	-0.0079
20525	836.5	4.35	0	3	0.0041
20525	836.5	4.35	10	4	0.0048
20525	836.5	4.35	20	4	0.0048
20525	836.5	4.35	30	5	0.0059
20525	836.5	4.35	40	5	0.0063
20525	836.5	4.35	50	5	0.0062
20525	836.5	4.35	60	5	0.0054

LTE band 5 Results: channel 20649 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20649	848.9	3.6	-30	3	0.0039
20649	848.9	3.6	-20	4	0.0044
20649	848.9	3.6	-10	4	0.0044
20649	848.9	3.6	0	3	0.0032
20649	848.9	3.6	10	-5	-0.0059
20649	848.9	3.6	20	-3	-0.0032
20649	848.9	3.6	30	2	0.0021
20649	848.9	3.6	40	4	0.0046
20649	848.9	3.6	50	4	0.0044
20649	848.9	3.6	60	4	0.0043

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20649	848.9	3.7	-30	4	0.0045
20649	848.9	3.7	-20	4	0.0044
20649	848.9	3.7	-10	4	0.0042
20649	848.9	3.7	0	3	0.0039
20649	848.9	3.7	10	2	0.0027
20649	848.9	3.7	20	3	0.0032
20649	848.9	3.7	30	-3	-0.0034
20649	848.9	3.7	40	-7	-0.0081
20649	848.9	3.7	50	4	0.0045
20649	848.9	3.7	60	5	0.0053

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20649	848.9	4.2	-30	4	0.0053
20649	848.9	4.2	-20	4	0.0043
20649	848.9	4.2	-10	3	0.0032
20649	848.9	4.2	0	5	0.0058
20649	848.9	4.2	10	3	0.0037
20649	848.9	4.2	20	6	0.0065
20649	848.9	4.2	30	2	0.0020
20649	848.9	4.2	40	4	0.0049
20649	848.9	4.2	50	4	0.0051
20649	848.9	4.2	60	4	0.0048

LTE band 5 Results: channel 20649 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20649	848.9	4.35	-30	10	0.0117
20649	848.9	4.35	-20	4	0.0047
20649	848.9	4.35	-10	4	0.0045
20649	848.9	4.35	0	3	0.0038
20649	848.9	4.35	10	3	0.0035
20649	848.9	4.35	20	-4	-0.0043
20649	848.9	4.35	30	4	0.0047
20649	848.9	4.35	40	-5	-0.0062
20649	848.9	4.35	50	6	0.0073
20649	848.9	4.35	60	14	**0.0163**

APPENDIX 4D – LTE Band 5 RADIATED EMISSIONS TEST DATA

Radiated Power Test Data Results

Date of Test: October 16, 2012
The following measurements were performed by Savtej Sandhu.
The environmental tests conditions were: Temperature: 24.2 °C
Relative Humidity: 31.4 %
The BlackBerry® smartphone was standalone horizontally, LCD facing down and top 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, 10MHz 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	20500	834.00	5	Dipole	V	-37.66	-28.68	V-V	5.99	23.64	0.23	38.50	-14.86
F0	20500	834.00	5	Dipole	H	-28.68		H-H	5.25				
F0	20525	836.50	5	Dipole	V	-36.57	-27.49	V-V	7.08	24.60	0.29	38.50	-13.90
F0	20525	836.50	5	Dipole	H	-27.49		H-H	6.34				
F0	20549	838.90	5	Dipole	V	-35.88	-27.11	V-V	7.50	**25.02**	**0.32**	38.50	-13.48
F0	20549	838.90	5	Dipole	H	-27.11		H-H	6.82				

LTE band 5, 1.4MHz BW, RB=6, 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	20407	824.70	5	Dipole	V	-38.16	-28.07	V-V	6.22	23.87	0.24	38.50	-14.63
F0	20407	824.70	5	Dipole	H	-28.07		H-H	4.86				
F0	20525	836.50	5	Dipole	V	-38.73	-28.53	V-V	5.93	23.45	0.22	38.50	-15.05
F0	20525	836.50	5	Dipole	H	-28.53		H-H	4.86				
F0	20642	848.20	5	Dipole	V	-39.49	-30.23	V-V	4.82	22.34	0.17	38.50	-16.16
F0	20642	848.20	5	Dipole	H	-30.23		H-H	4.72				

Radiated Power Test Data Results (con'd)

LTE band 5, 3MHz BW, RB=15, 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	20415	825.50	5	Dipole	V	-38.53	-28.38	V-V	6.05	23.70	0.23	38.50	-14.80
F0	20415	825.50	5	Dipole	H	-28.38		H-H	4.44				
F0	20525	836.50	5	Dipole	V	-39.08	-28.24	V-V	6.22	23.74	0.24	38.50	-14.76
F0	20525	836.50	5	Dipole	H	-28.24		H-H	5.16				
F0	20634	847.40	5	Dipole	V	-39.95	-29.99	V-V	4.95	22.68	0.19	38.50	-15.82
F0	20634	847.40	5	Dipole	H	-29.99		H-H	4.77				

LTE band 5, 5MHz BW, RB=25, 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	20425	826.50	5	Dipole	V	-38.83	-28.22	V-V	6.16	23.81	0.24	38.50	-14.69
F0	20425	826.50	5	Dipole	H	-28.22		H-H	4.55				
F0	20525	836.50	5	Dipole	V	-39.37	-28.04	V-V	6.42	23.94	0.25	38.50	-14.56
F0	20525	836.50	5	Dipole	H	-28.04		H-H	5.33				
F0	20624	846.40	5	Dipole	V	-40.75	-29.75	V-V	5.05	22.64	0.18	38.50	-15.86
F0	20624	846.40	5	Dipole	H	-29.75		H-H	5.12				

Radiated Power Test Data Results (con'd)

LTE band 5, 10MHz BW, RB=50, 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	20500	834.00	5	Dipole	V	-38.73	-28.82	V-V	5.72	23.37	0.22	38.50	-15.13
F0	20500	834.00	5	Dipole	H	-28.82		H-H	4.30				
F0	20525	836.50	5	Dipole	V	-37.82	-28.42	V-V	6.03	23.55	0.23	38.50	-14.95
F0	20525	836.50	5	Dipole	H	-28.42		H-H	4.94				
F0	20549	838.90	5	Dipole	V	-37.54	-29.27	V-V	6.68	24.20	0.26	38.50	-14.30
F0	20549	838.90	5	Dipole	H	-29.27		H-H	5.98				

Radiated Emissions Test Data Results cont'd

Date of Test: June 21, 2012

The following measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25.5 ºC
Relative Humidity: 35.7 %

The BlackBerry® smartphone was standalone horizontally, 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, and the frequency range scanned was 30MHz – 1GHz.

Measurements were performed in LTE band 5 with 1.4MHz BW (channel 20407, 20525 and 20642 with RB = 6), 5MHz BW (channel 20425, 20525 and 20624 with RB = 25) and 10MHz BW (channel 20500, 20525, 20549 with RB = 50 and RB = 1), with QPSK modulation.

All emissions had test margins greater than 25.0 dB.

Date of Test: June 14 – July 09, 2012

The following measurements were performed by Shuo Wang
The environmental test conditions were: Temperature: 25.4 ºC
Relative Humidity: 41.7 %

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 10 GHz.

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

Measurements were performed in LTE band 5 with 1.4MHz BW (channel 20407, 20525 and 20642 with RB = 6), 5MHz BW (channel 20425, 20525 and 20624 with RB = 25) and 10MHz BW (channel 20500, 20525, 20549 with RB = 50 and RB = 1), with QPSK modulation.

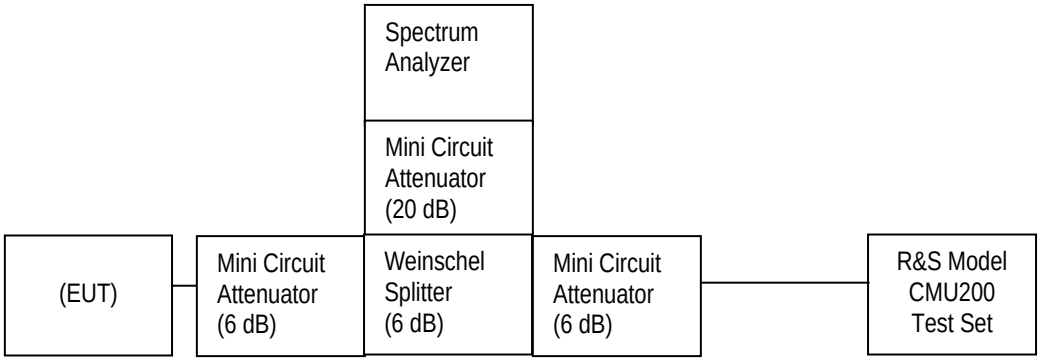
All emissions had test margins greater than 25.0 dB.

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

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



Date of Test: June 03, 2012

The environmental test conditions were: Temperature: 25.7ºC
Relative Humidity: 35.9 %

The following measurements were performed by Kevin Guo.

LTE Band 4 Conducted RF Emission Test Data cont'd

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 27.53, RSS-139, 6.5 were measured from 10 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 resource blocks 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 resource block 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 18.81 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 LTE Band 4 selected Frequencies in 20MHz BW (RB = 100)

LTE Band 4 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
1720.0	18.55	17.80
1732.5	18.47	17.80
1745.0	18.81	17.92

Peak to Average Ratio (PAR)

For each 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz with different number of resource blocks 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 measured was 9.78 dB on the high channel in 20MHz bandwidth with 50 resource blocks.

Measurement Plots for LTE Band 4

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

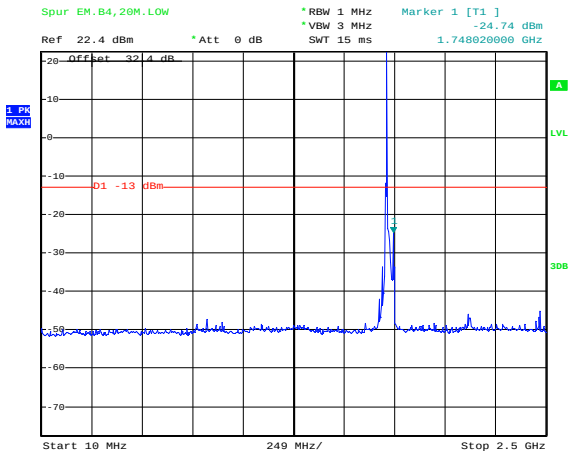
See Figures 1-19e to 1-34e for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.

See Figures 1-35e to 1-44e for the plots of the Channel mask.

See Figures 1-45e to 1-47e for the plots of the Peak to Average Ratios.

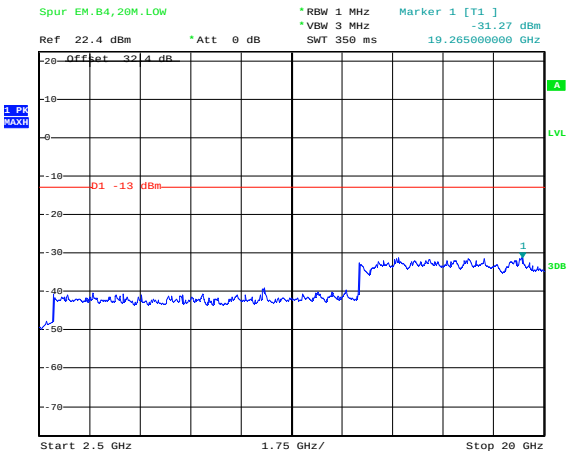
LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-1e: Band 4, Spurious Conducted Emissions, Low channel, 20MHz BW (RB= 100)



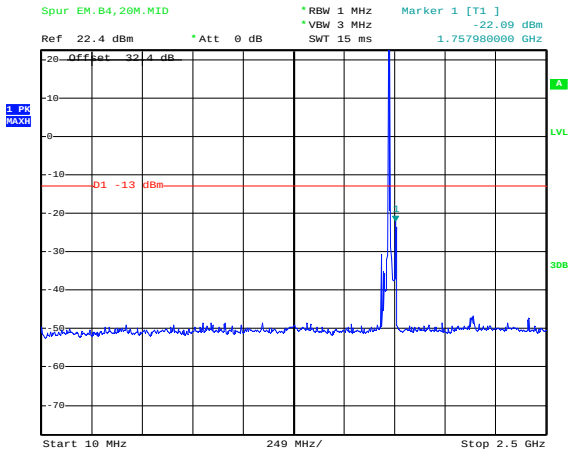
Date: 19.JUN.2012 23:52:10

Figure 1-2e: Band 4, Spurious Conducted Emissions, Low channel, 20MHz BW (RB= 100)



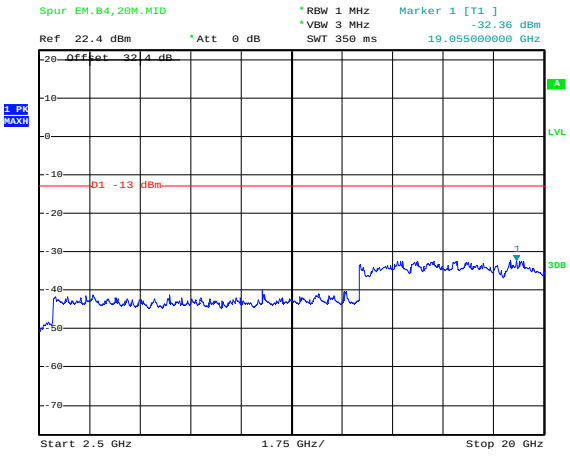
Date: 19.JUN.2012 23:55:06

Figure 1-3e: Band 4, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 100)



Date: 19.JUN.2012 23:56:25

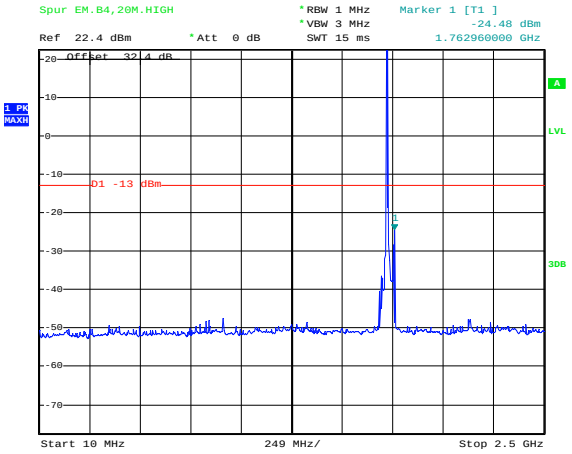
Figure 1-4e: Band 4, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 100)



Date: 19.JUN.2012 23:57:11

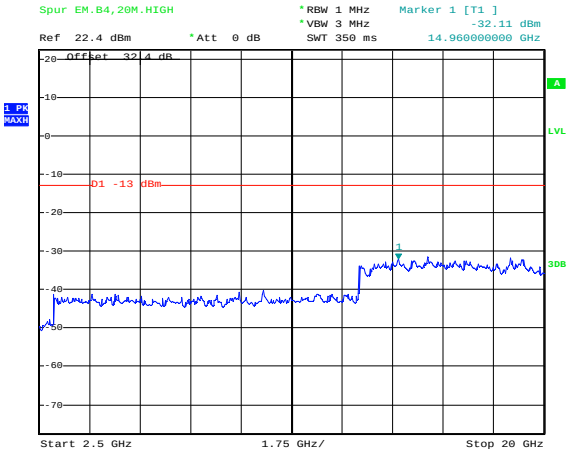
LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-5e: Band 4, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)



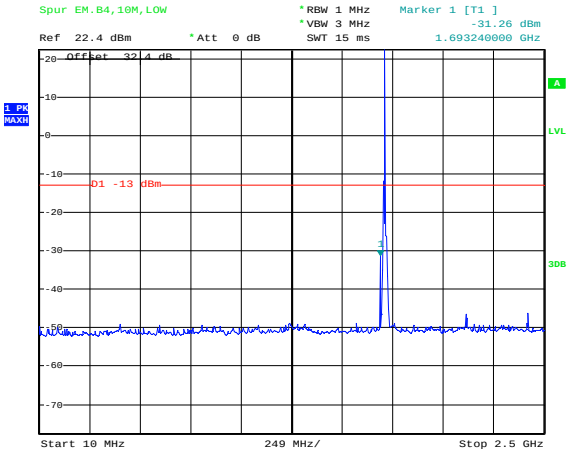
Date: 19.JUN.2012 23:58:01

Figure 1-6e: Band 4, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)



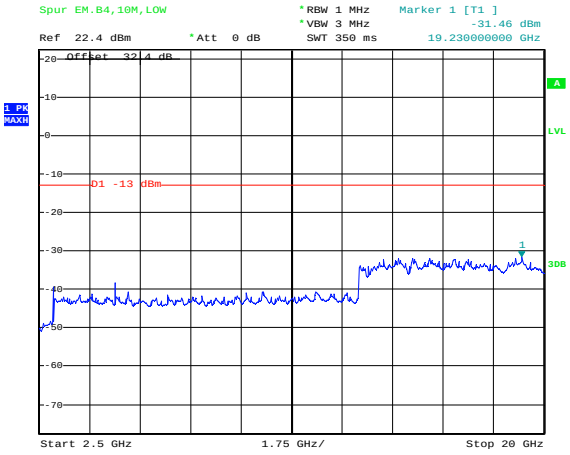
Date: 19.JUN.2012 23:58:30

Figure 1-7e: Band 4, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)



Date: 20.JUN.2012 02:08:05

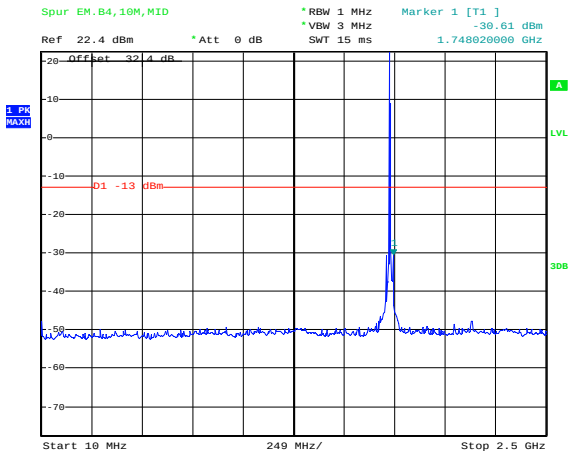
Figure 1-8e: Band 4, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)



Date: 20.JUN.2012 02:08:33

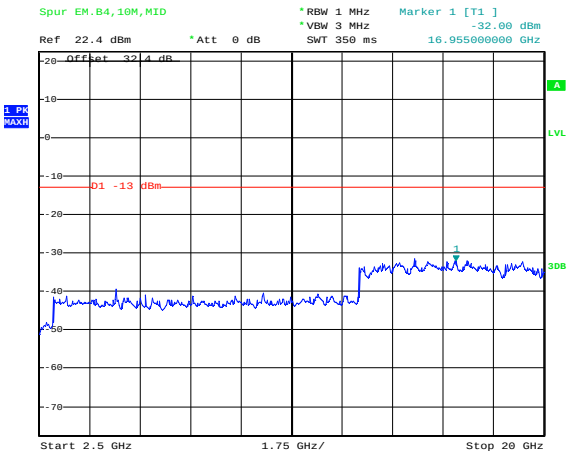
LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-9e: Band 4, Spurious Conducted Emissions, Middle Channel, 10MHz BW (RB= 50)



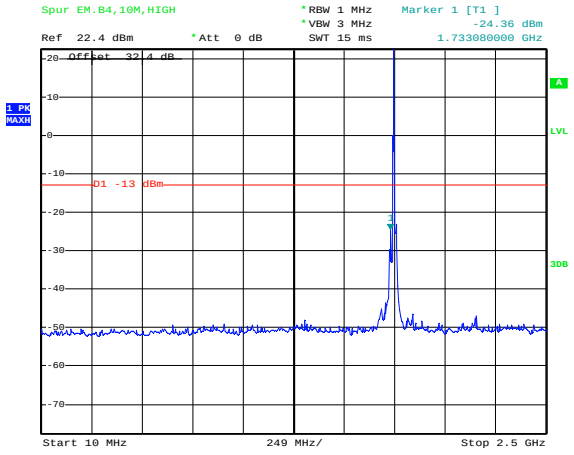
Date: 20.JUN.2012 02:13:32

Figure 1-10e: Band 4, Spurious Conducted Emissions, Middle Channel, 10MHz BW (RB= 50)



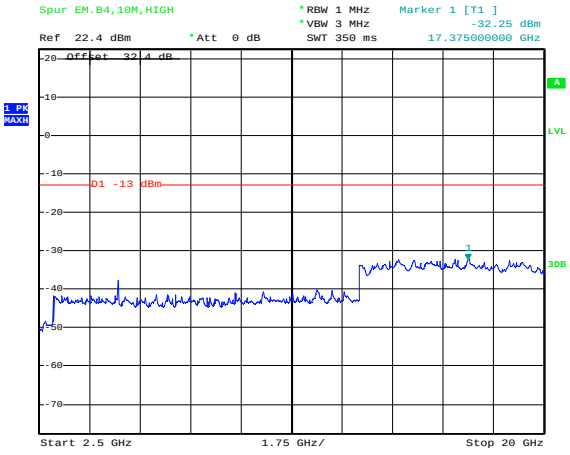
Date: 20.JUN.2012 02:14:48

Figure 1-11e: Band 4, Spurious Conducted Emissions, High channel, 10MHz BW (RB= 50)



Date: 20.JUN.2012 02:16:32

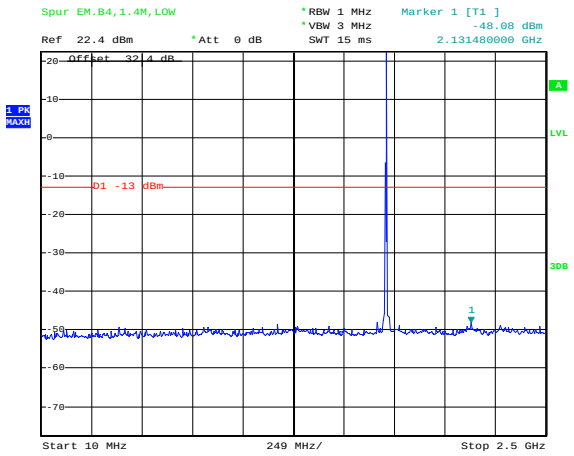
Figure 1-12e: Band 4, Spurious Conducted Emissions, High channel, 10MHz BW (RB= 50)



Date: 20.JUN.2012 02:17:04

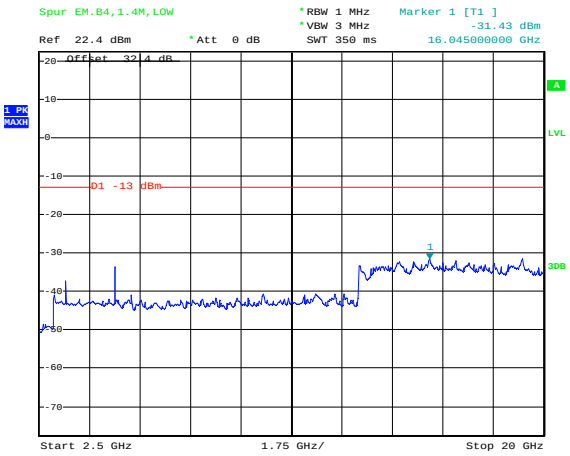
LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-13e: Band 4, Spurious Conducted Emissions, Low Channel, 1.4MHz BW (RB= 6)



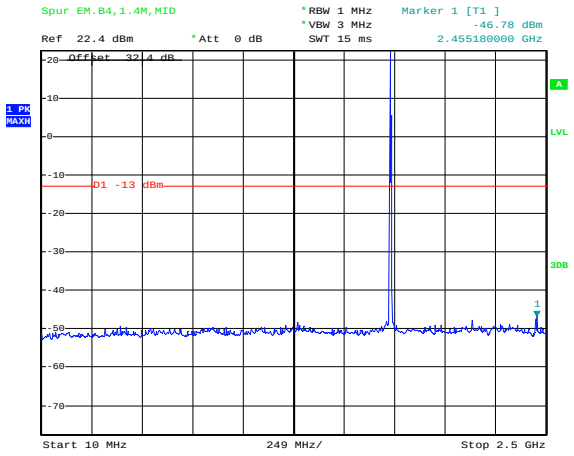
Date: 20.JUN.2012 02:32:55

Figure 1-14e: Band 4, Spurious Conducted Emissions, Low Channel, 1.4MHz BW (RB= 6)



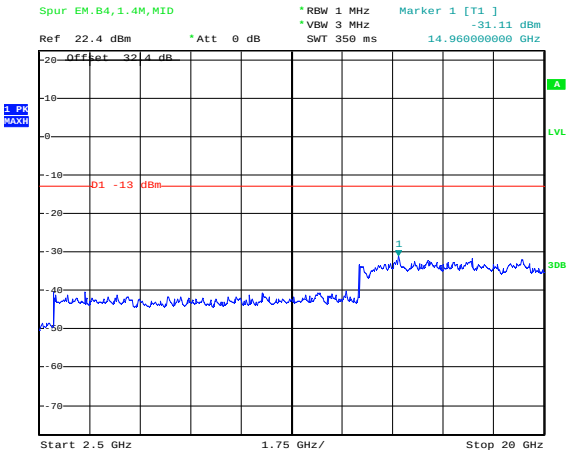
Date: 20.JUN.2012 02:33:18

Figure 1-15e: Band 4, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 6)



Date: 20.JUN.2012 02:35:12

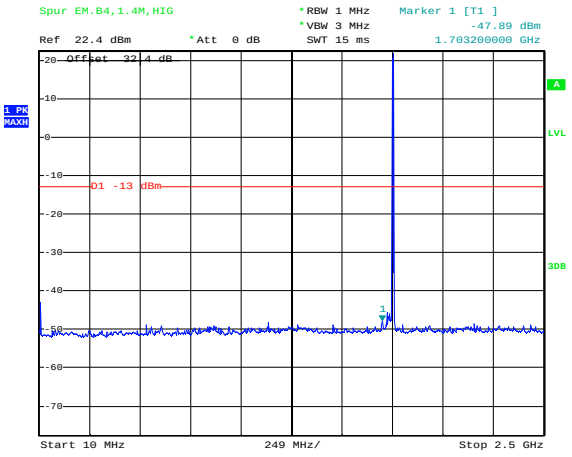
Figure 1-16e: Band 4, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 6)



Date: 20.JUN.2012 02:35:46

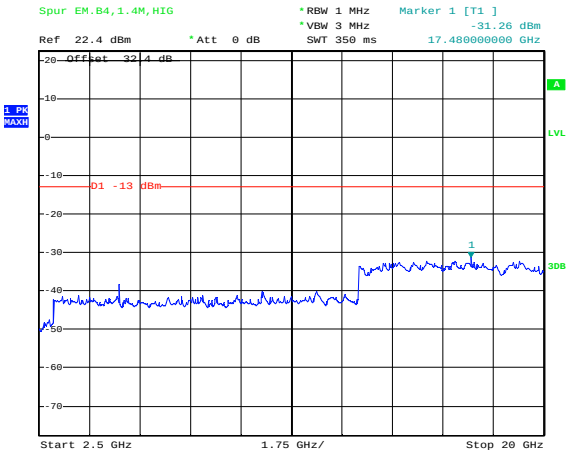
LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-17e: Band 4, Spurious Conducted Emissions, High channel, 1.4MHz BW (RB= 6)



Date: 20.JUN.2012 02:37:41

Figure 1-18e: Band 4, Spurious Conducted Emissions, High channel, 1.4MHz BW (RB= 6)



Date: 20.JUN.2012 02:38:19

LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-19e: Occupied Bandwidth, Band 4 Low Channel, 20MHz BW, RB=100

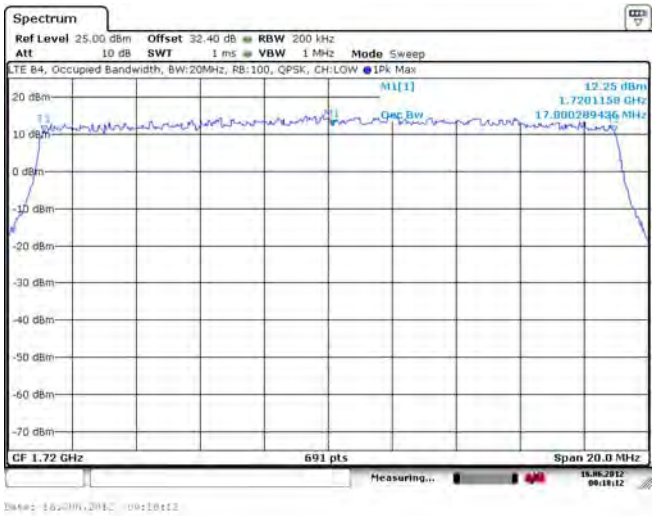


Figure 1-20e: Occupied Bandwidth, Band 4 Middle Channel, 20MHz BW, RB=100

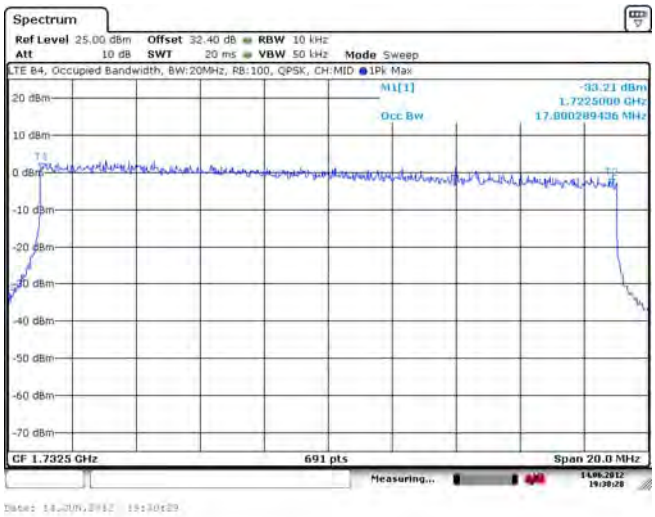
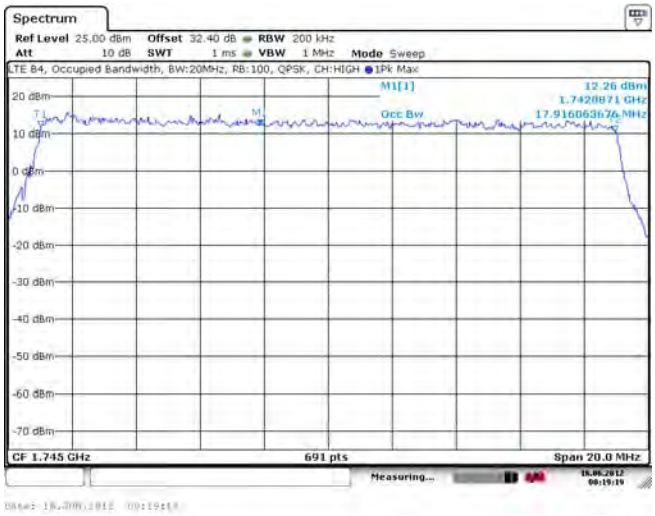


Figure 1-21e: Occupied Bandwidth, Band 4 High Channel, 20MHz BW, RB=100



LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-22e: Occupied Bandwidth, Band 4 Low Channel, 10MHz BW, RB=50

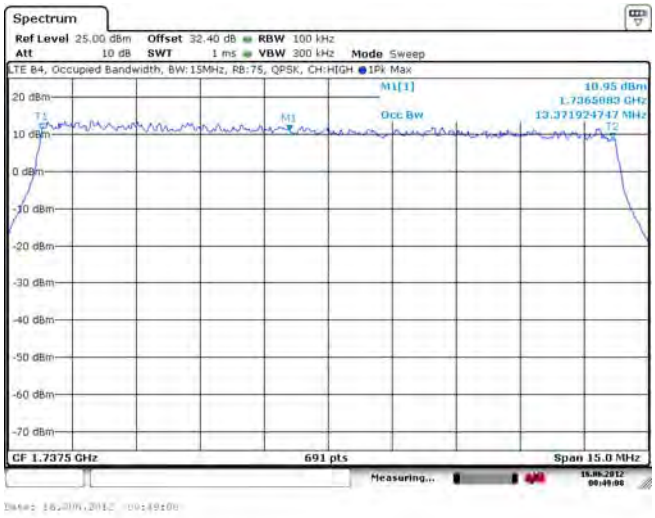


Figure 1-23e: Occupied Bandwidth, Band Middle Channel, 10MHz BW, RB=50

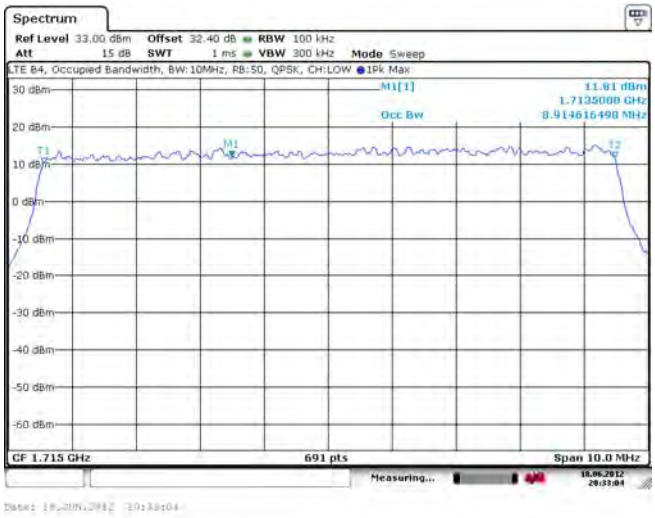
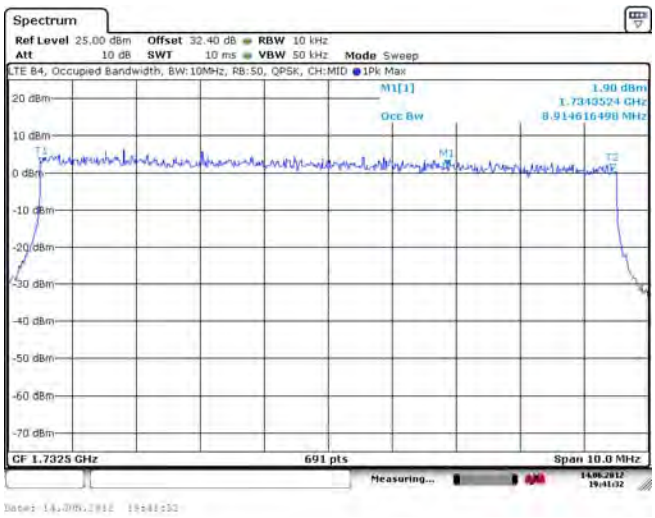


Figure 1-24e: Occupied Bandwidth, Band 4 High Channel, 10MHz BW, RB=50



LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-25e: Occupied Bandwidth, Band 4 Low Channel, 1.4MHz BW, RB=6

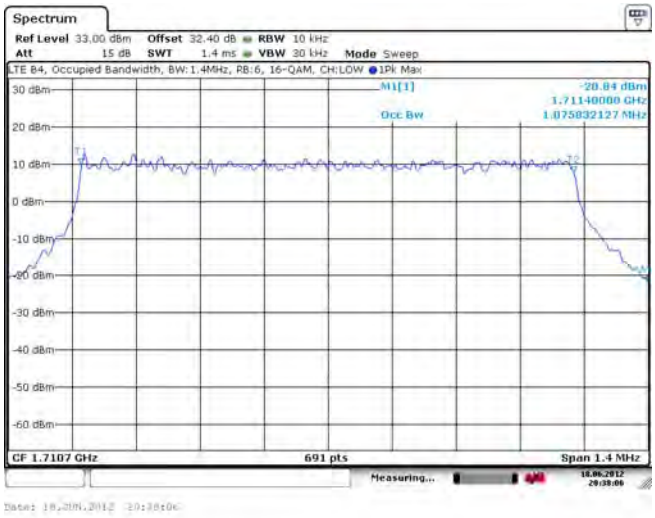


Figure 1-26e: Occupied Bandwidth, Band 4 Middle Channel, 1.4MHz BW, RB=6

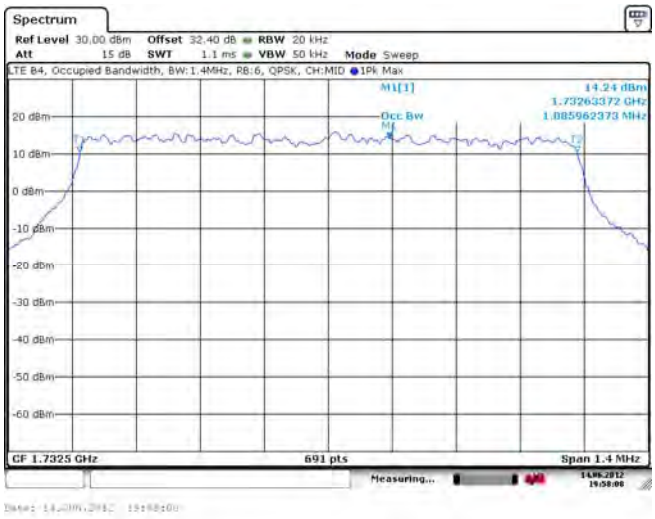
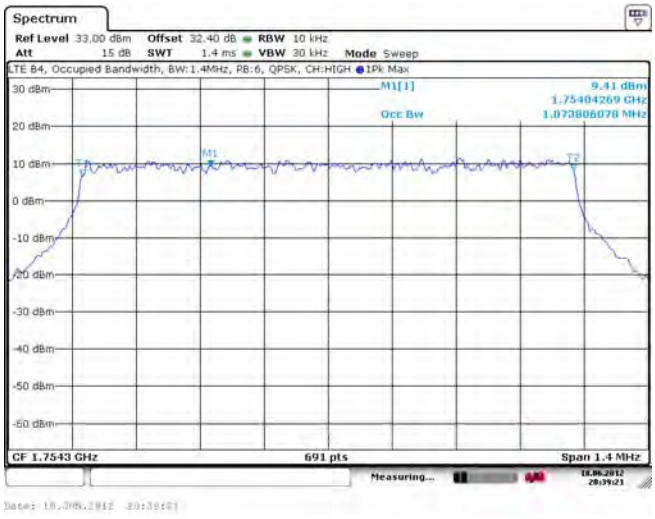


Figure 1-27e: Occupied Bandwidth, Band 4 High Channel, 1.4MHz BW, RB=6



LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-28e: -26 dBc Bandwidth, Band 4 Low Channel, 20MHz BW, RB=100

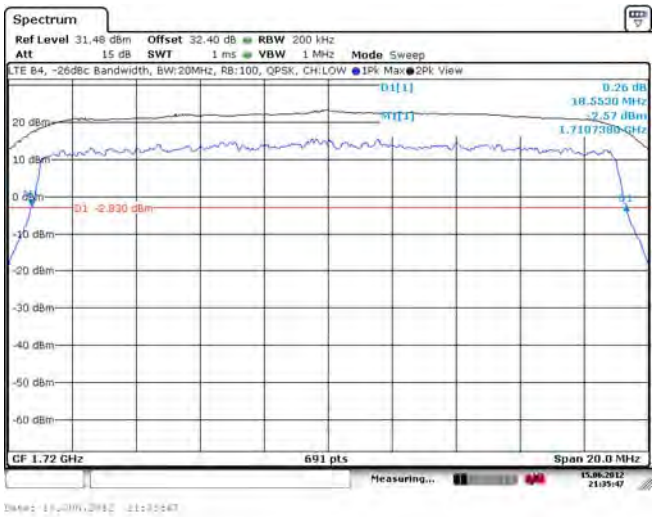


Figure 1-29e: -26 dBc Bandwidth, Band 4 Middle Channel, 20MHz BW, RB=100

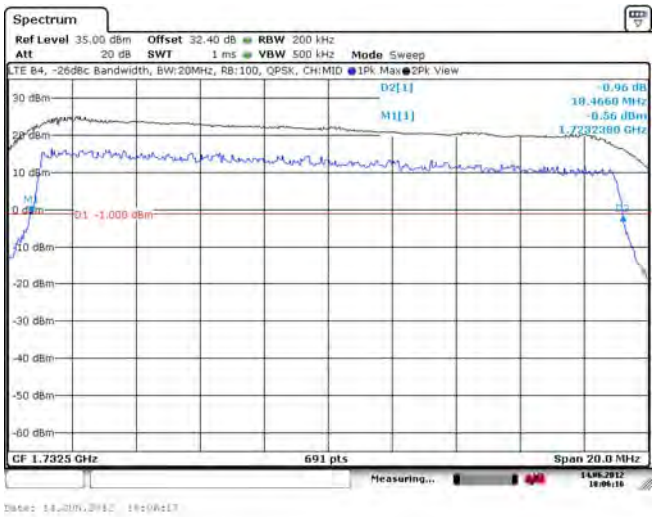


Figure 1-30e: -26 dBc Bandwidth, Band 4 High Channel, 20MHz BW, RB=100

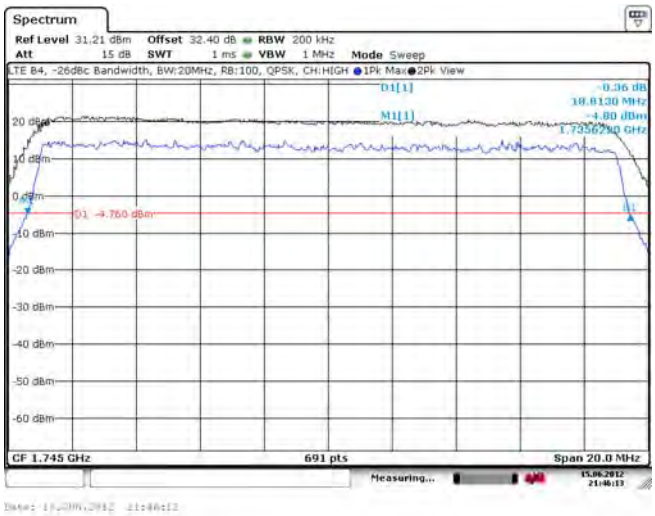
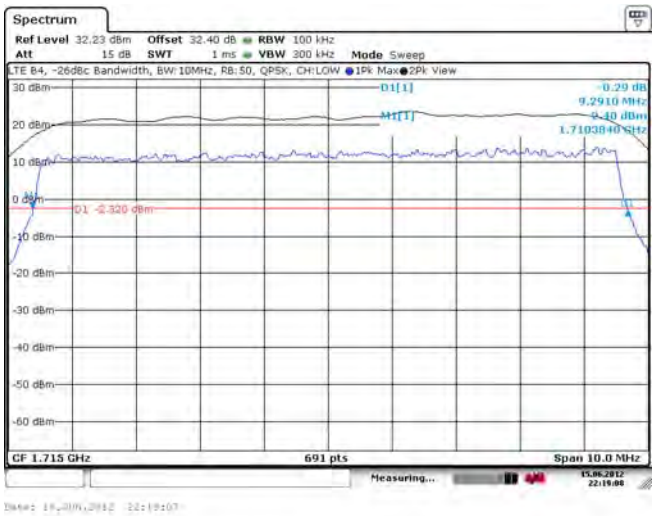


Figure 1-31e: -26 dBc Bandwidth, Band 4 Low Channel, 10MHz BW, RB=50



LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-32e: -26 dBc Bandwidth, Band 4 Middle Channel, 10MHz BW, RB=50

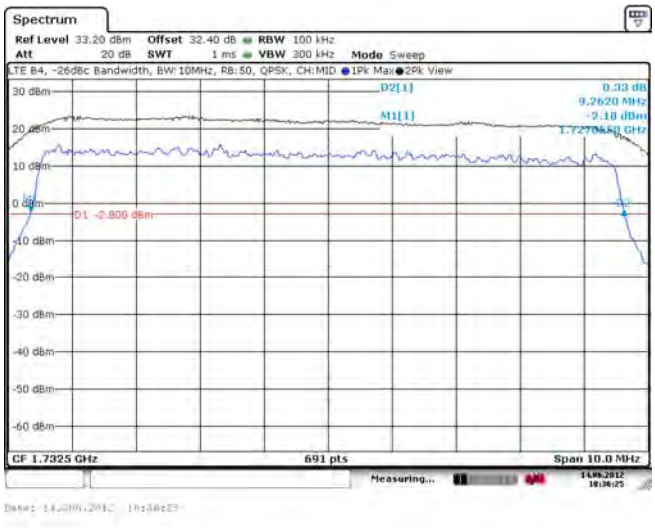


Figure 1-33e: -26 dBc Bandwidth, Band 4 High Channel, 10MHz BW, RB=50

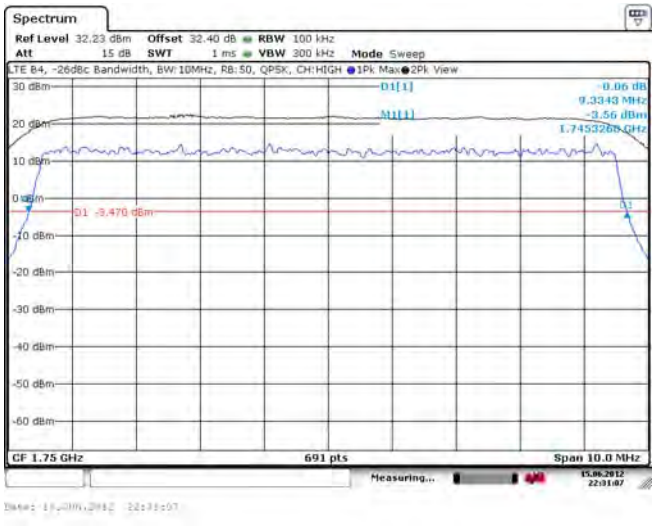


Figure 1-34e: -26 dBc Bandwidth, Band 4 Low Channel, 1.4MHz BW, RB=6

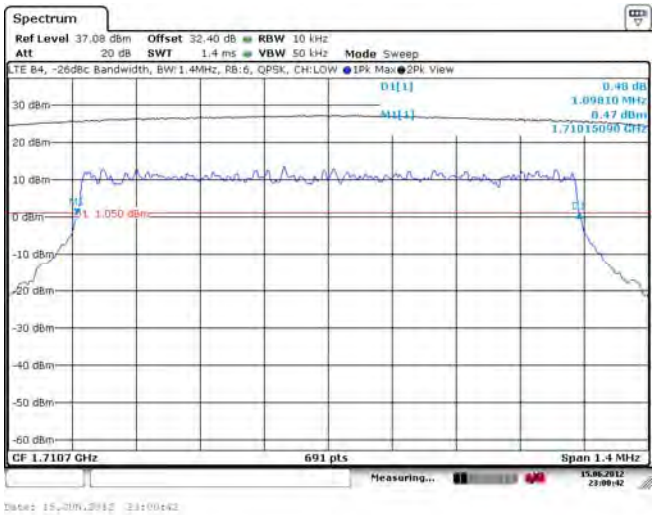
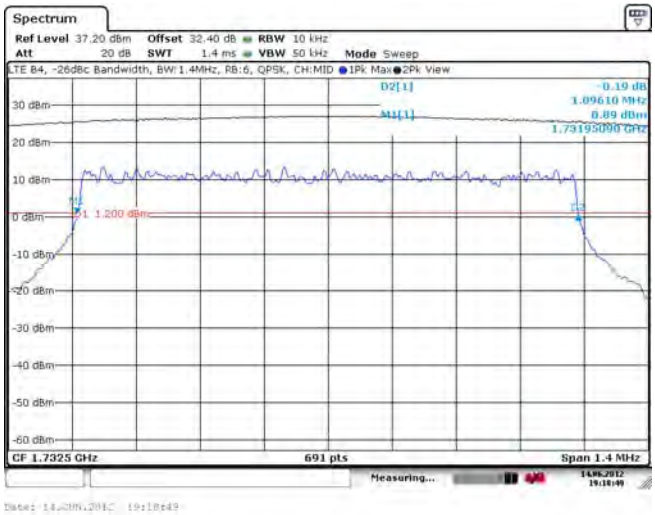


Figure 1-35e: -26 dBc Bandwidth, Band 4 Middle Channel, 1.4MHz BW, RB=6



LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-36e: -26 dBc Bandwidth, Band 4 High Channel, 1.4MHz BW, RB=6

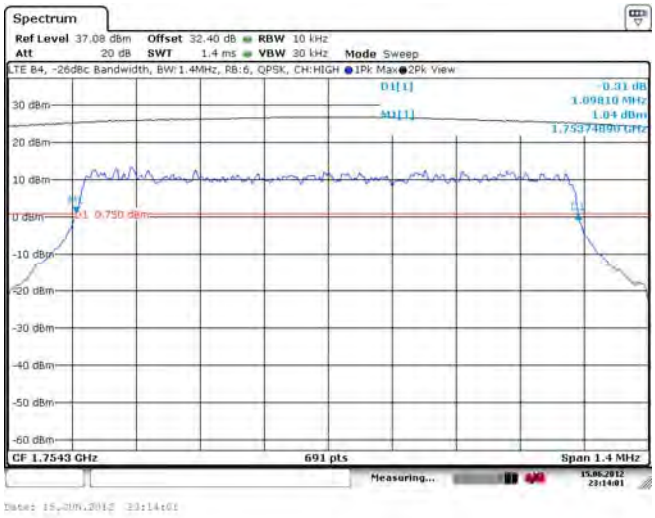


Figure 1-37e: Band 4 Low Channel Mask, 20MHz BW, RB=100

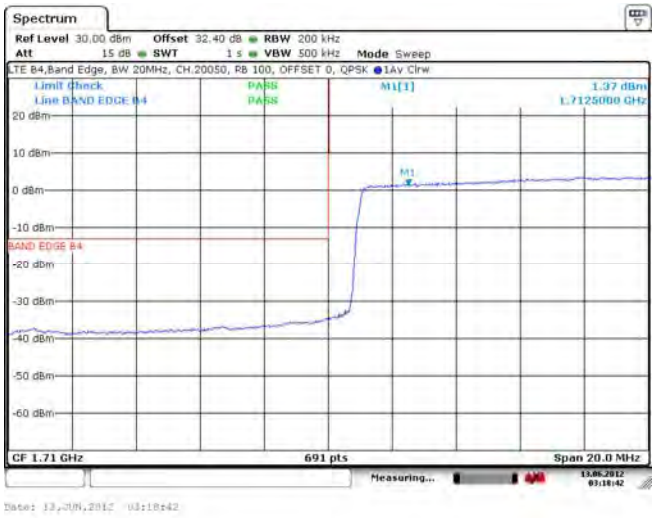
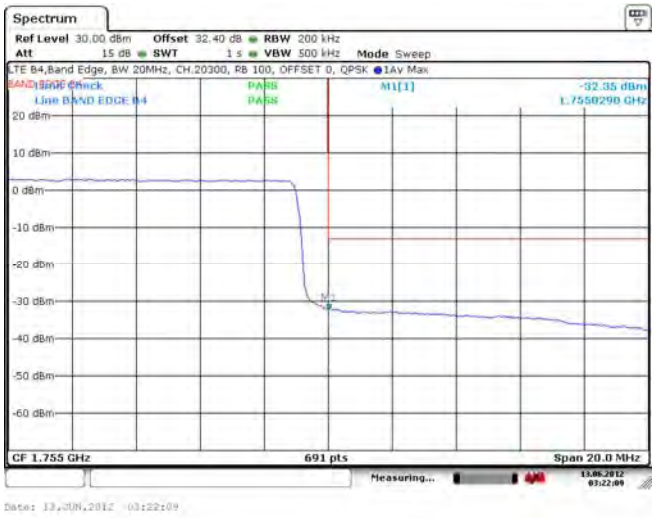


Figure 1-38e: Band 4 High Channel Mask, 20MHz BW, RB=100



LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-39: Band 4 Low Channel Mask, 10MHz BW, RB=50

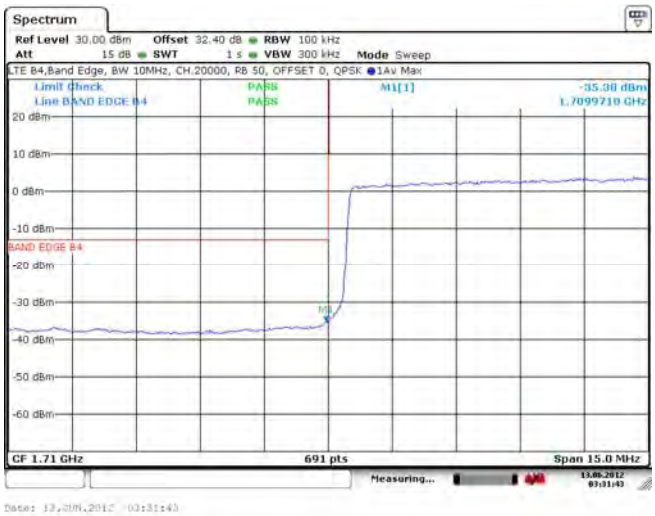


Figure 1-40e: Band 4 High Channel Mask, 10MHz BW, RB=50

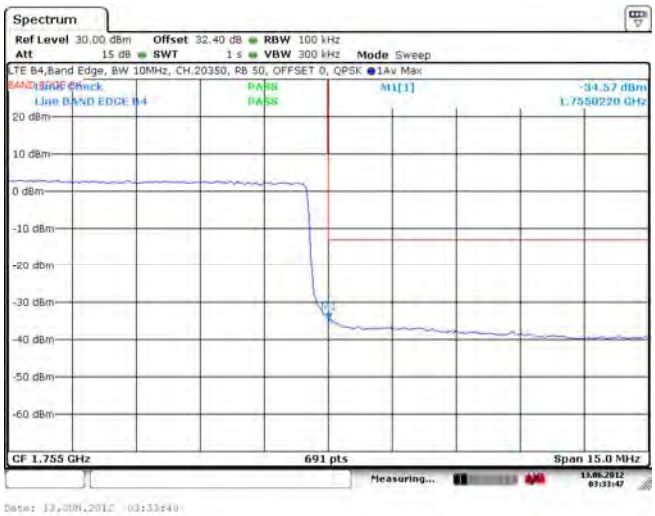


Figure 1-41e: Band 4 Low Channel Mask, 1.4MHz BW, RB=6

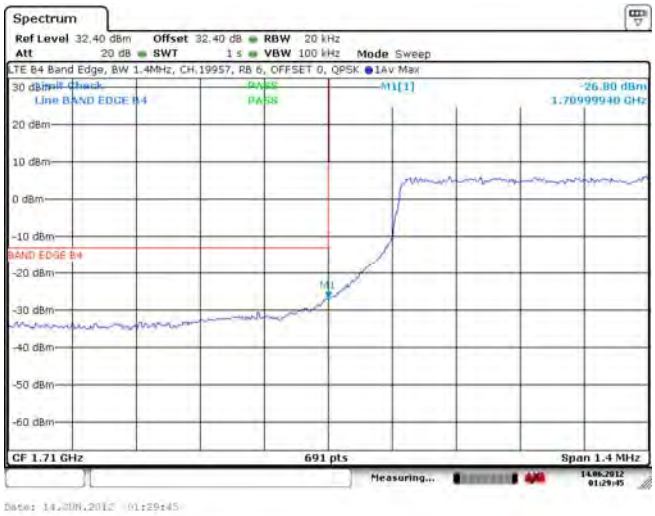
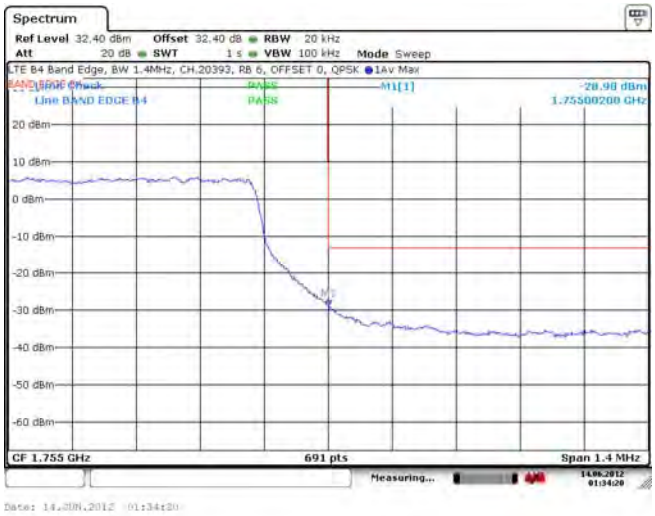


Figure 1-42e: Band 4 High Channel Mask, 1.4MHz BW, RB=6



LTE Band 4 Conducted RF Emission Test Data cont'd

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

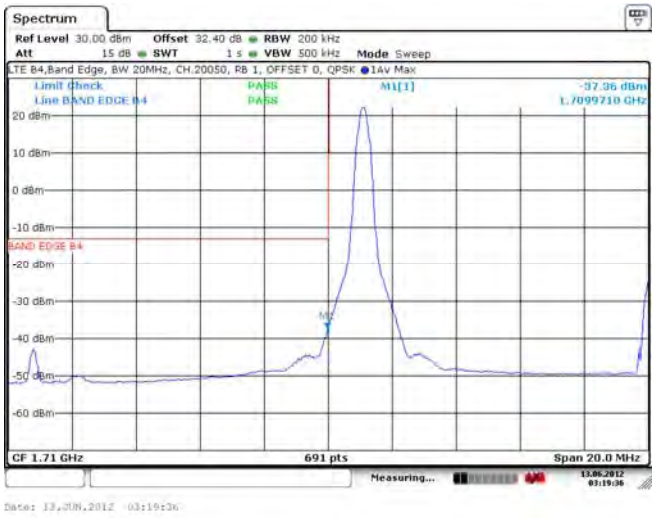


Figure 1-44e: Band 4 High Channel Mask, 20MHz BW, RB=1

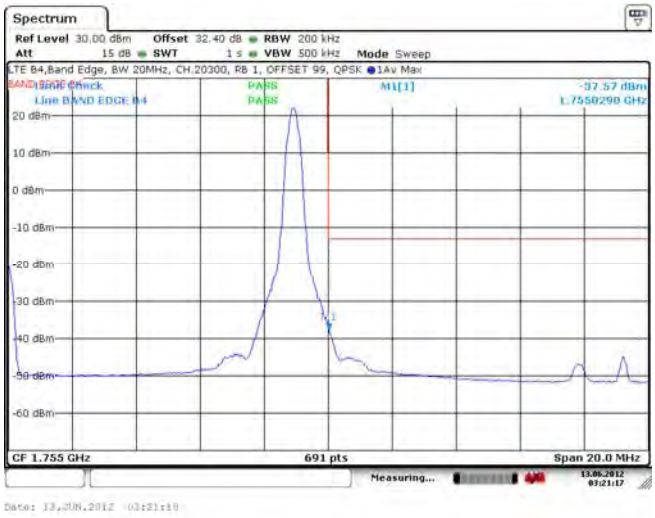


Figure 1-45e: Band 4 Low Channel PAR, 20MHz BW, RB=50

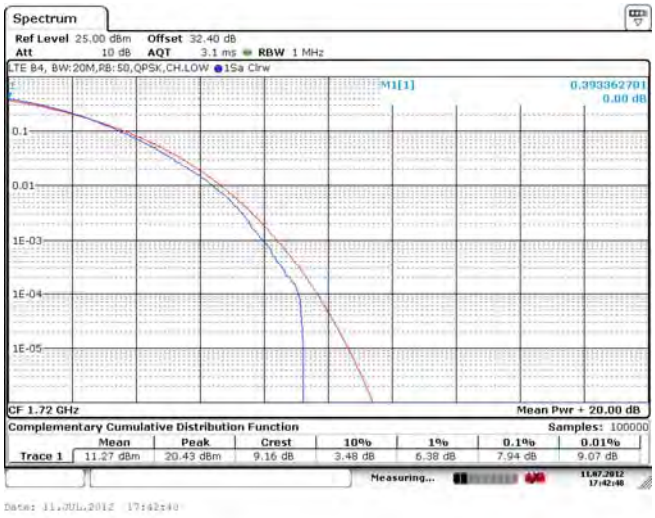
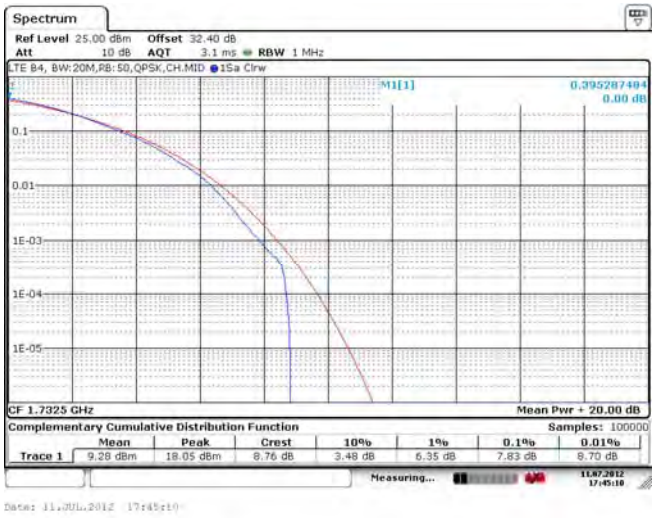
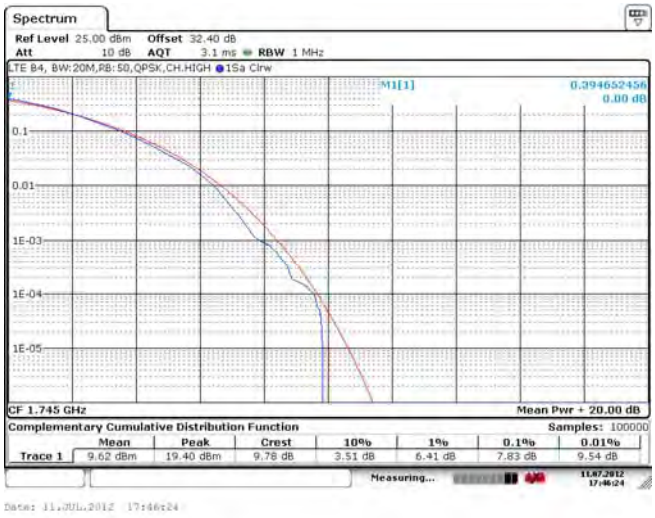


Figure 1-46e: Band 4 Middle Channel Mask, 20MHz BW, RB=50



LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 1-47e: Band 4 High Channel PAR, 20MHz BW, RB=50



APPENDIX 5B – LTE Band 4 CONDUCTED RF OUTPUT POWER TEST DATA

LTE Band 4 Conducted RF Output Power Test Data

The conducted RF output power was measured using the CMW500 base station simulator. Low, middle and high channels were measured at maximum radio output power at different service options and modes.

Date of Test: June 21, 2012

The environmental conditions were: Temperature: 23.5 °C
Humidity: 36.2 %

The measurements were performed by Daoud Attayi.

LTE Band 4 RF Conducted Output Power

Band	LTE Band 4					
Frequency (MHz)	**Channel**	**BW**	**Modulation**	**RB Size**	**RB Offset**	**Maximum Avg. Power (dBm)**
1710	19950	20 MHz	QPSK	1	0	22.70
			QPSK	1	99	23.00
			QPSK	50	0	22.10
			QPSK	100	0	22.00
			16QAM	1	0	22.05
			16QAM	1	99	22.18
			16QAM	75	0	21.23
			16QAM	100	0	20.88
1720	20050	20 MHz	QPSK	1	0	22.65
			QPSK	1	99	22.91
			QPSK	50	0	22.34
			QPSK	100	0	21.75
			16QAM	1	0	22.13
			16QAM	1	99	22.19
			16QAM	75	0	21.32
			16QAM	100	0	21.03
1732.5	20175	20 MHz	QPSK	1	0	23.35
			QPSK	1	99	23.33
			QPSK	50	0	22.27
			QPSK	100	0	22.60
			16QAM	1	0	22.61
			16QAM	1	99	22.20
			16QAM	75	0	21.31
			16QAM	100	0	21.24
1745.0	20300	20 MHz	QPSK	1	0	22.76
			QPSK	1	99	21.40
			QPSK	50	0	22.00
			QPSK	100	0	21.85
			16QAM	1	0	22.36
			16QAM	1	99	20.96
			16QAM	75	0	21.20
			16QAM	100	0	21.10
1745.9	20399	20 MHz	QPSK	1	0	21.92
			QPSK	1	99	20.94
			QPSK	50	0	21.92
			QPSK	100	0	21.56

LTE Band 4 Conducted RF Output Power(cont'd)

			16QAM	1	0	21.10
			16QAM	1	99	20.23
			16QAM	75	0	20.50
			16QAM	100	0	20.64
1732.5	20175	15 MHz	QPSK	1	0	22.79
			QPSK	1	74	22.64
			QPSK	36	0	22.35
			QPSK	75	0	22.45
			16QAM	1	0	22.22
			16QAM	1	74	22.01
			16QAM	16	0	22.41
			16QAM	75	0	21.18
1732.5	20175	10 MHz	QPSK	1	0	22.96
			QPSK	1	49	22.84
			QPSK	25	0	22.23
			QPSK	50	0	22.34
			16QAM	1	0	21.80
			16QAM	1	49	21.80
			16QAM	16	0	21.24
			16QAM	50	0	21.25
1732.5	20175	5 MHz	QPSK	1	0	22.86
			QPSK	1	24	22.80
			QPSK	25	0	22.04
			16QAM	1	0	22.85
			16QAM	1	24	22.83
			16QAM	25	0	21.16
1732.5	20175	3 MHz	QPSK	1	0	22.89
			QPSK	1	14	22.87
			QPSK	15	0	21.92
			16QAM	1	0	21.67
			16QAM	1	14	21.50
			16QAM	15	0	20.91
1732.5	20175	1.4 MHz	QPSK	1	0	22.74
			QPSK	1	5	22.75
			QPSK	6	0	21.77
			16QAM	1	0	22.02
			16QAM	1	5	22.12
			16QAM	6	0	21.00

LTE band 4 conducted power measurements
(Rev 1)

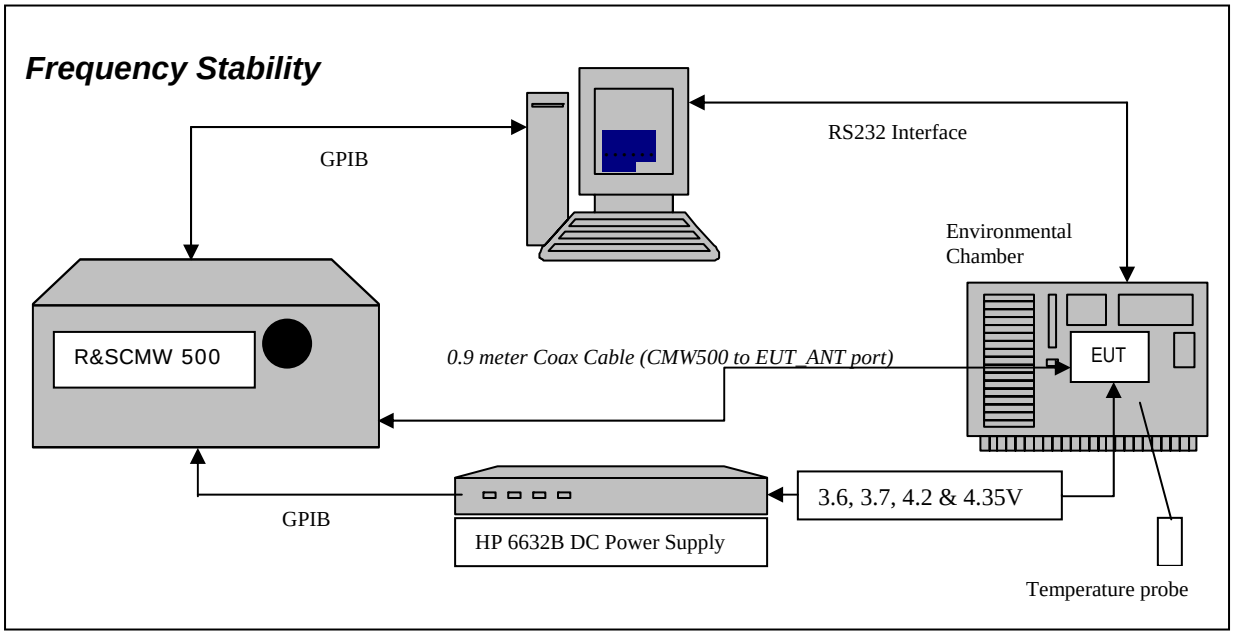
LTE Band 4 Conducted RF Output Power(cont'd)

Band	LTE Band 4					
Frequency (MHz)	**Channel**	**BW**	**Modulation**	**RB Size**	**RB Offset**	**Maximum Avg. Power (dBm)**
1720	20050	20 MHz	QPSK	1	0	
			QPSK	1	99	23.6
			QPSK	50	0	
			QPSK	100	0	
			16QAM	1	0	22.2
			16QAM	1	99	
			16QAM	75	0	
			16QAM	100	0	
1732.5	20175	20 MHz	QPSK	1	0	
			QPSK	1	99	23.7
			QPSK	50	0	
			QPSK	100	0	
			16QAM	1	0	22.6
			16QAM	1	99	
			16QAM	75	0	
			16QAM	100	0	
1745.0	20300	20 MHz	QPSK	1	0	
			QPSK	1	99	23.3
			QPSK	50	0	
			QPSK	100	0	
			16QAM	1	0	22.7
			16QAM	1	99	
			16QAM	75	0	
			16QAM	100	0	

LTE band 4 conducted power measurements
(Rev 2)

APPENDIX 5C – LTE Band 4 FREQUENCY STABILITY TEST DATA

LTE Band 4 Frequency Stability Test Data



The following measurements were performed by Kevin Guo.

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.

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 3.7 volts, 4.2 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, 3.7 volts, 4.2 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) resource blocks. 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.

Procedure:

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

31. Switch on the HP 6632B power supply; CMW 500 Communications test Set, and Environmental Chamber.
32. Start test program
33. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
34. Set power supply voltage to 3.6 volts.
35. Set up CMW 500 Radio Communication Tester.
36. Command the CMW 500 to switch to the low channel.
37. Enable the voltage to the EUT, and connect a link to the CMW 500 test set.
38. EUT is commanded to Transmit 100 Bursts.
39. 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.
40. The CMW 500 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
41. Repeat steps 5 to 10 changing the supply voltage to 3.7 Volts
42. Increase temperature by 10°C and soak for 1/2 hour.
43. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
44. Repeat steps 5 to 10 changing the supply voltage to 4.2 volts
45. 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, 3.7, 4.2 and 4.35 volts

The maximum frequency error in the LTE band 4 measured was **0.0143 PPM**.

Date of test: July 03, 2012

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	8	0.0044
20175	1732.5	3.6	20	-5	-0.0030
20300	1745.0	3.6	20	5	0.0030

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	3.7	20	8	0.0044
20175	1732.5	3.7	20	-6	-0.0037
20300	1745.0	3.7	20	6	0.0036

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	4.2	20	7	0.0040
20175	1732.5	4.2	20	-6	-0.0033
20300	1745.0	4.2	20	-7	-0.0040

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	4.35	20	9	0.0052
20175	1732.5	4.35	20	7	0.0040
20300	1745.0	4.35	20	-6	-0.0036

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	8	0.0047
20050	1720.0	3.6	-20	6	0.0033
20050	1720.0	3.6	-10	7	0.0042
20050	1720.0	3.6	0	8	0.0046
20050	1720.0	3.6	10	7	0.0039
20050	1720.0	3.6	20	8	0.0044
20050	1720.0	3.6	30	7	0.0043
20050	1720.0	3.6	40	8	0.0049
20050	1720.0	3.6	50	10	0.0056
20050	1720.0	3.6	60	9	0.0051

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	3.7	-30	5	0.0029
20050	1720.0	3.7	-20	7	0.0040
20050	1720.0	3.7	-10	6	0.0035
20050	1720.0	3.7	0	6	0.0036
20050	1720.0	3.7	10	8	0.0049
20050	1720.0	3.7	20	8	0.0044
20050	1720.0	3.7	30	22	0.0129
20050	1720.0	3.7	40	7	0.0042
20050	1720.0	3.7	50	5	0.0031
20050	1720.0	3.7	60	7	0.0043

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	4.2	-30	6	0.0038
20050	1720.0	4.2	-20	8	0.0049
20050	1720.0	4.2	-10	5	0.0032
20050	1720.0	4.2	0	7	0.0042
20050	1720.0	4.2	10	7	0.0038
20050	1720.0	4.2	20	7	0.0040
20050	1720.0	4.2	30	6	0.0033
20050	1720.0	4.2	40	8	0.0044
20050	1720.0	4.2	50	-8	-0.0046
20050	1720.0	4.2	60	8	0.0046

LTE band 4 Results: channel 20050 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20050	1720.0	4.35	-30	9	0.0052
20050	1720.0	4.35	-20	-5	-0.0028
20050	1720.0	4.35	-10	-9	-0.0052
20050	1720.0	4.35	0	-5	-0.0031
20050	1720.0	4.35	10	7	0.0038
20050	1720.0	4.35	20	7	0.0040
20050	1720.0	4.35	30	20	0.0114
20050	1720.0	4.35	40	-7	-0.0041
20050	1720.0	4.35	50	-8	-0.0046
20050	1720.0	4.35	60	-24	-0.0136

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	5	0.0030
20175	1732.5	3.6	-20	6	0.0032
20175	1732.5	3.6	-10	-6	-0.0034
20175	1732.5	3.6	0	-4	-0.0021
20175	1732.5	3.6	10	7	0.0039
20175	1732.5	3.6	20	-5	-0.0030
20175	1732.5	3.6	30	-6	-0.0037
20175	1732.5	3.6	40	-8	-0.0046
20175	1732.5	3.6	50	6	0.0032
20175	1732.5	3.6	60	-7	-0.0038

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20175	1732.5	3.7	-30	-7	-0.0038
20175	1732.5	3.7	-20	-4	-0.0023
20175	1732.5	3.7	-10	-5	-0.0028
20175	1732.5	3.7	0	6	0.0036
20175	1732.5	3.7	10	-5	-0.0032
20175	1732.5	3.7	20	-6	-0.0037
20175	1732.5	3.7	30	-5	-0.0028
20175	1732.5	3.7	40	-7	-0.0040
20175	1732.5	3.7	50	7	0.0042
20175	1732.5	3.7	60	-5	-0.0029

LTE band 4 Results: channel 20175 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20175	1732.5	4.2	-30	-6	-0.0033
20175	1732.5	4.2	-20	-5	-0.0029
20175	1732.5	4.2	-10	6	0.0034
20175	1732.5	4.2	0	6	0.0036
20175	1732.5	4.2	10	-13	-0.0074
20175	1732.5	4.2	20	-6	-0.0033
20175	1732.5	4.2	30	5	0.0031
20175	1732.5	4.2	40	-9	-0.0055
20175	1732.5	4.2	50	5	0.0031
20175	1732.5	4.2	60	-6	-0.0036

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20175	1732.5	4.35	-30	8	0.0044
20175	1732.5	4.35	-20	5	0.0031
20175	1732.5	4.35	-10	7	0.0039
20175	1732.5	4.35	0	-6	-0.0036
20175	1732.5	4.35	10	13	0.0073
20175	1732.5	4.35	20	-6	-0.0036
20175	1732.5	4.35	30	-16	-0.0092
20175	1732.5	4.35	40	6	0.0035
20175	1732.5	4.35	50	-6	-0.0036
20175	1732.5	4.35	60	-16	-0.0094

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	-7	-0.0037
20300	1745.0	3.6	-20	-8	-0.0043
20300	1745.0	3.6	-10	-7	-0.0041
20300	1745.0	3.6	0	-5	-0.0031
20300	1745.0	3.6	10	-6	-0.0033
20300	1745.0	3.6	20	5	0.0030
20300	1745.0	3.6	30	25	**0.0143**
20300	1745.0	3.6	40	-9	-0.0052
20300	1745.0	3.6	50	7	0.0039
20300	1745.0	3.6	60	-7	-0.0039

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20300	1745.0	3.7	-30	-10	-0.0054
20300	1745.0	3.7	-20	6	0.0035
20300	1745.0	3.7	-10	-7	-0.0037
20300	1745.0	3.7	0	-6	-0.0036
20300	1745.0	3.7	10	7	0.0040
20300	1745.0	3.7	20	6	0.0036
20300	1745.0	3.7	30	-8	-0.0045
20300	1745.0	3.7	40	8	0.0046
20300	1745.0	3.7	50	-6	-0.0035
20300	1745.0	3.7	60	-5	-0.0031

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20300	1745.0	4.2	-30	6	0.0034
20300	1745.0	4.2	-20	4	0.0021
20300	1745.0	4.2	-10	5	0.0026
20300	1745.0	4.2	0	-5	-0.0030
20300	1745.0	4.2	10	-6	-0.0034
20300	1745.0	4.2	20	-7	-0.0040
20300	1745.0	4.2	30	-8	-0.0044
20300	1745.0	4.2	40	6	0.0034
20300	1745.0	4.2	50	8	0.0047
20300	1745.0	4.2	60	-7	-0.0042

LTE band 4 Results: channel 20300 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20300	1745.0	4.35	-30	15	0.0090
20300	1745.0	4.35	-20	8	0.0045
20300	1745.0	4.35	-10	6	0.0034
20300	1745.0	4.35	0	7	0.0043
20300	1745.0	4.35	10	8	0.0045
20300	1745.0	4.35	20	9	0.0052
20300	1745.0	4.35	30	19	0.0109
20300	1745.0	4.35	40	8	0.0047
20300	1745.0	4.35	50	7	0.0039
20300	1745.0	4.35	60	8	0.0045

APPENDIX 5D – LTE Band 4 RADIATED EMISSIONS TEST DATA

Radiated Power Test Data Results

Date of Test: October 18, 2012
The following measurements were performed by Savtej Sandhu.
The environmental tests conditions were: Temperature: 25.6 °C
Relative Humidity: 32.4 %
The BlackBerry® smartphone was standalone horizontally, LCD facing up and top 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 4, 20MHz 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	20050	1720.00	4	Horn	V	-25.85	-20.65	V-V	-13.70	26.50	0.45	30.00	-3.50
F0	20050	1720.00	4	Horn	H	-20.65		H-H	-12.94				
F0	20175	1732.50	4	Horn	V	-26.38	-20.59	V-V	-13.60	26.83	0.48	30.00	-3.17
F0	20175	1732.50	4	Horn	H	-20.59		H-H	-12.78				
F0	20299	1744.90	4	Horn	V	-26.49	-20.45	V-V	-12.94	**27.12**	**0.52**	30.00	-2.88
F0	20299	1744.90	4	Horn	H	-20.45		H-H	-12.24				

LTE band 4, 1.4MHz BW, RB=6, 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	19957	1710.70	4	Horn	V	-27.61	-21.67	V-V	-14.67	25.39	0.35	30.00	-4.61
F0	19957	1710.70	4	Horn	H	-21.67		H-H	-14.05				
F0	20175	1732.50	4	Horn	V	-27.72	-21.50	V-V	-14.47	25.95	0.39	30.00	-4.05
F0	20175	1732.50	4	Horn	H	-21.50		H-H	-13.66				
F0	20392	1754.20	4	Horn	V	-27.85	-22.39	V-V	-14.66	25.42	0.35	30.00	-4.58
F0	20392	1754.20	4	Horn	H	-22.39		H-H	-13.94				

Radiated Power Test Data Results (cont'd)

LTE band 4, 3MHz BW, RB=15, 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	19965	1711.50	4	Horn	V	-27.73	-21.70	V-V	-14.71	25.36	0.34	30.00	-4.64
F0	19965	1711.50	4	Horn	H	-21.70		H-H	-14.08				
F0	20175	1732.50	4	Horn	V	-27.70	-21.88	V-V	-14.90	25.51	0.36	30.00	-4.49
F0	20175	1732.50	4	Horn	H	-21.88		H-H	-14.10				
F0	20384	1753.40	4	Horn	V	-27.53	-22.08	V-V	-14.43	25.70	0.37	30.00	-4.30
F0	20384	1753.40	4	Horn	H	-22.08		H-H	-13.66				

LTE band 4, 5MHz BW, RB=25, 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	19975	1712.50	4	Horn	V	-27.02	-21.61	V-V	-14.68	25.43	0.35	30.00	-4.57
F0	19975	1712.50	4	Horn	H	-21.61		H-H	-14.01				
F0	20175	1732.50	4	Horn	V	-27.33	-21.21	V-V	-14.21	26.18	0.41	30.00	-3.82
F0	20175	1732.50	4	Horn	H	-21.21		H-H	-13.43				
F0	20374	1752.40	4	Horn	V	-27.34	-21.83	V-V	-14.22	25.88	0.39	30.00	-4.12
F0	20374	1752.40	4	Horn	H	-21.83		H-H	-13.48				

Radiated Power Test Data Results (cont'd)

LTE band 4, 10MHz BW, RB=50, 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	20000	1715.00	4	Horn	V	-27.14	-21.63	V-V	-14.73	25.39	0.35	30.00	-4.61
F0	20000	1715.00	4	Horn	H	-21.63		H-H	-14.05				
F0	20175	1732.50	4	Horn	V	-27.30	-21.48	V-V	-14.45	25.96	0.39	30.00	-4.04
F0	20175	1732.50	4	Horn	H	-21.48		H-H	-13.65				
F0	20349	1749.90	4	Horn	V	-27.19	-22.33	V-V	-14.75	25.31	0.34	30.00	-4.69
F0	20349	1749.90	4	Horn	H	-22.33		H-H	-14.05				

LTE band 4, 15MHz BW, RB=75, 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	20025	1717.50	4	Horn	V	-26.81	-21.28	V-V	-14.47	25.74	0.37	30.00	-4.26
F0	20025	1717.50	4	Horn	H	-21.28		H-H	-13.70				
F0	20175	1732.50	4	Horn	V	-27.16	-21.12	V-V	-14.13	26.27	0.42	30.00	-3.73
F0	20175	1732.50	4	Horn	H	-21.12		H-H	-13.34				
F0	20324	1747.40	4	Horn	V	-27.17	-21.98	V-V	-14.93	25.69	0.37	30.00	-4.31
F0	20324	1747.40	4	Horn	H	-21.98		H-H	-13.67				

Radiated Power Test Data Results (con'd)

LTE band 4, 20MHz BW, RB=100, 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) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	20050	1720.00	4	Horn	V	-26.62	-21.15	V-V	-14.28	25.96	0.39	30.00	-4.04
F0	20050	1720.00	4	Horn	H	-21.15		H-H	-13.48				
F0	20175	1732.50	4	Horn	V	-26.97	-21.07	V-V	-14.04	26.35	0.43	30.00	-3.65
F0	20175	1732.50	4	Horn	H	-21.07		H-H	-13.26				
F0	20299	1744.90	4	Horn	V	-27.22	-21.72	V-V	-14.21	25.86	0.39	30.00	-4.14
F0	20299	1744.90	4	Horn	H	-21.72		H-H	-13.50				

Radiated Emissions Test Data Results cont'd

Date of Test: June 20 - June 21 and October 10, 2012

The following measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25.6 ºC
Relative Humidity: 36.9 %

The BlackBerry® smartphone was standalone horizontally, LCD facing up 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 LTE band 4 with 1.4MHz BW (channel 19957, 20175 and 20392 with RB = 6), 3MHz BW (channel 19965, 20175 and 20384 with RB = 15), 5MHz BW (channel 19975, 20175 and 20374 with RB = 25) and 10MHz BW (channel 20000, 20175, 20349 with RB = 50) and 20MHz BW (channel 20050, 20175 and 20299 with RB =100 and RB = 1), with QPSK modulation.

All emissions had test margins greater than 25.0 dB.

Date of Test: June 14 – July 09 and September 26, 2012

The following measurements were performed by Shuo Wang
The environmental test conditions were: Temperature: 25.4 ºC
Relative Humidity: 41.7 %

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 20 GHz.

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

Measurements were performed in LTE band 4 with 1.4MHz BW (channel 19957, 20175 and 20392 with RB = 6), 3MHz BW (channel 19965, 20175 and 20384 with RB = 15), 5MHz BW (channel 19975, 20175 and 20374 with RB = 25) and 10MHz BW (channel 20000, 20175, 20349 with RB = 50) and 20MHz BW (channel 20050, 20175 and 20299 with RB =100 and RB = 1), with QPSK modulation.

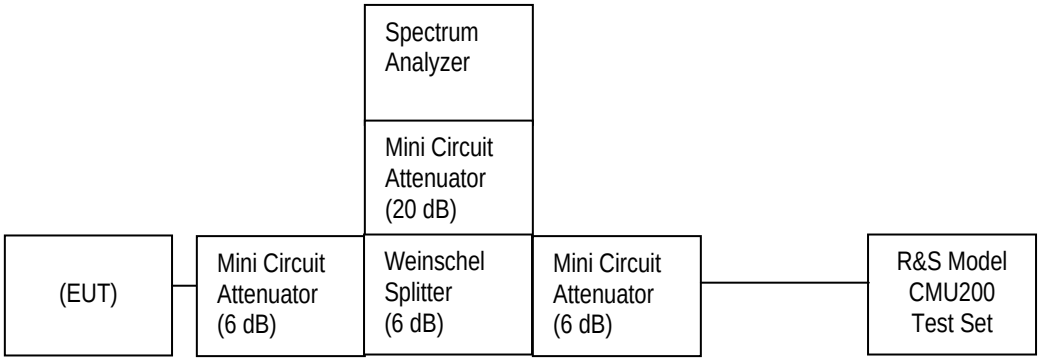
All emissions had test margins greater than 25.0 dB.

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

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



Date of Test: June 03, 2012

The environmental test conditions were: Temperature: 25.7ºC
Relative Humidity: 35.9 %

The following measurements were performed by Kevin Guo.

LTE Band 17 Conducted RF Emission Test Data cont'd

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 10 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 resource blocks 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 resource block 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 9.407MHz. 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 LTE Band 17 selected Frequencies in 10MHz BW (RB = 50)

LTE Band 17 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
709.0	**9.233**	**8.915**
710.0	**9.334**	**8.929**
711.0	**9.407**	**8.929**

Peak to Average Ratio (PAR)

For each 5MHz and 10MHz with different number of resource blocks 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 9.04 dB on the high channel in 10MHz bandwidth with 25 resource blocks.

Measurement Plots for LTE Band 17

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

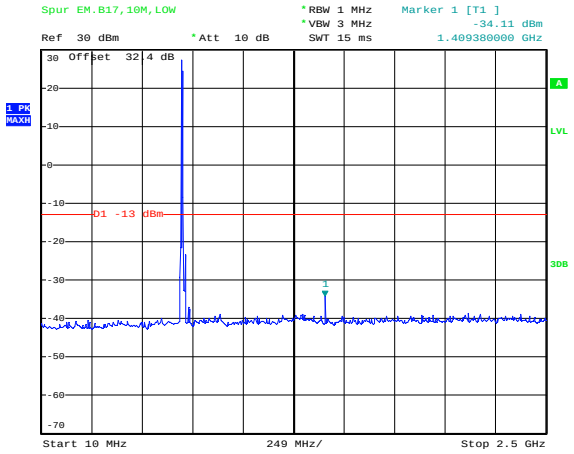
See Figures 1-19f to 1-24f for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.

See Figures 1-25f to 1-32f for the plots of the Channel mask.

See Figures 1-33f to 1-35f for the plots of the Peak to Average Ratio.

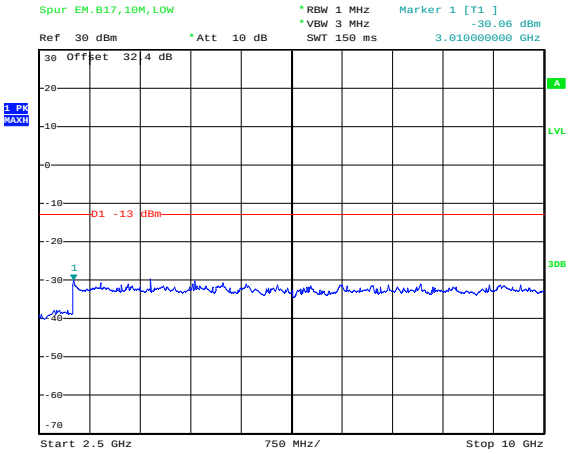
LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 1-1f: Band 17, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)



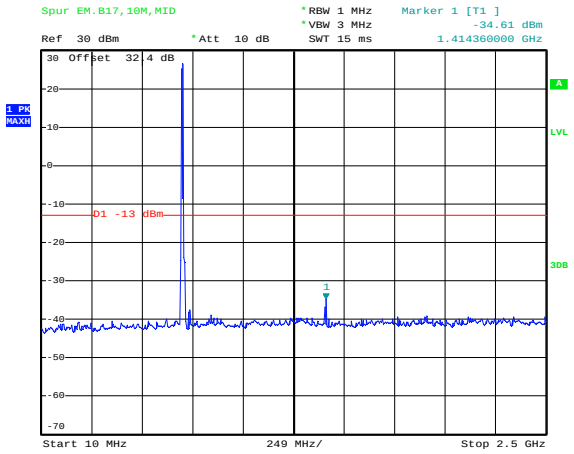
Date: 20.JUN.2012 07:30:52

Figure 1-2f: Band 17, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)



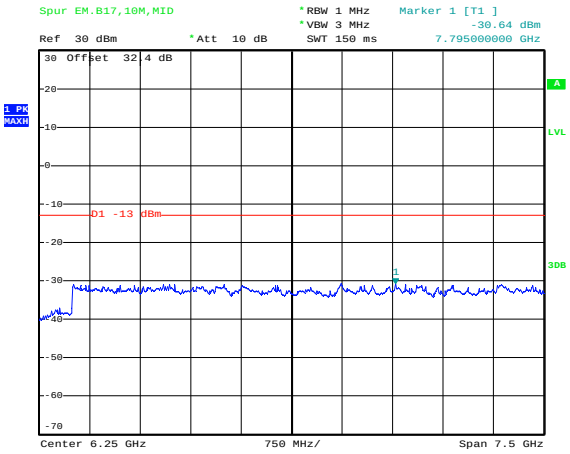
Date: 20.JUN.2012 07:33:33

Figure 1-3f: Band 17, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 50)



Date: 20.JUN.2012 07:29:42

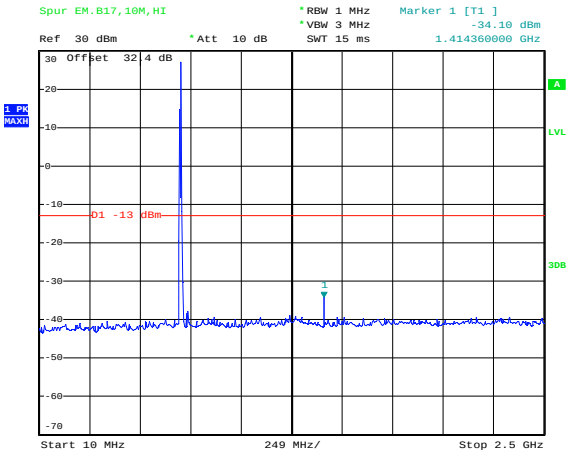
Figure 1-4f: Band 17, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 50)



Date: 20.JUN.2012 07:28:55

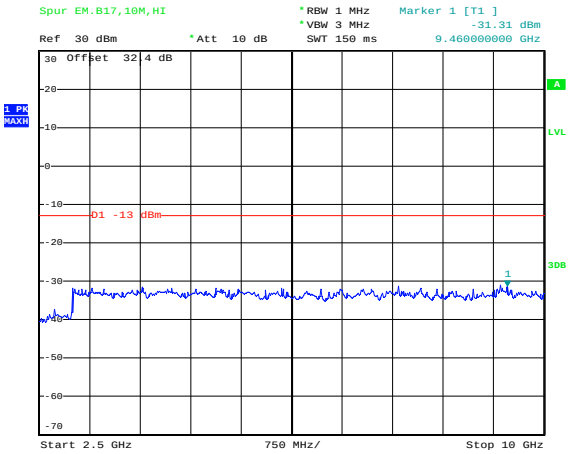
LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 1-5f: Band 17, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)



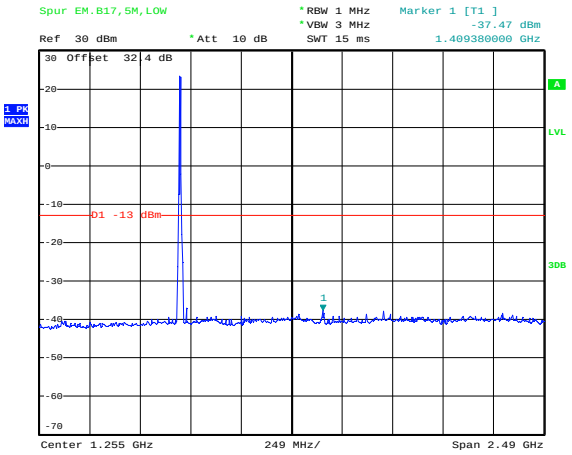
Date: 20.JUN.2012 07:35:52

Figure 1-6f: Band 17, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)



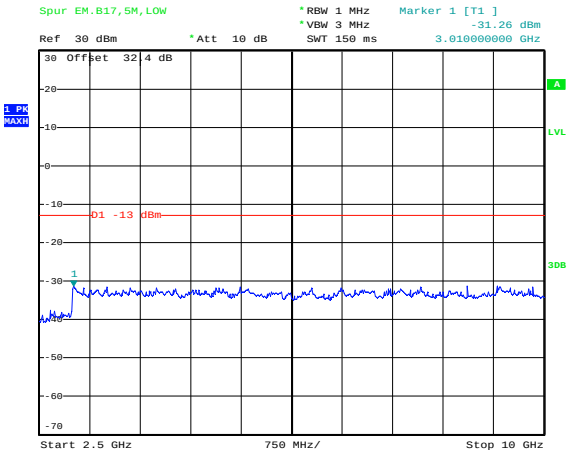
Date: 20.JUN.2012 07:35:17

Figure 1-7f: Band 17, Spurious Conducted Emissions, Low channel, 5MHz BW (RB= 25)



Date: 20.JUN.2012 07:40:36

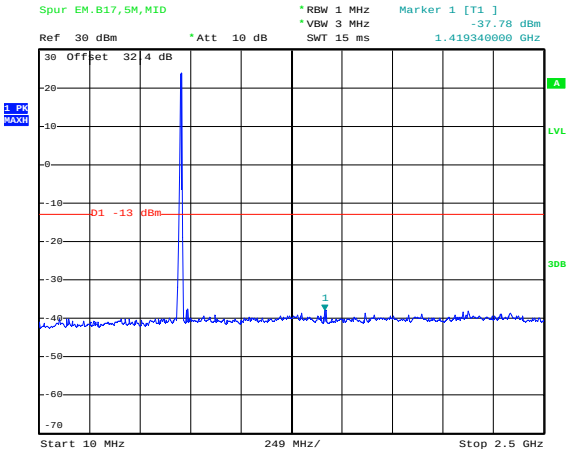
Figure 1-8f: Band 17, Spurious Conducted Emissions, Low channel, 5MHz BW (RB= 25)



Date: 20.JUN.2012 07:41:07

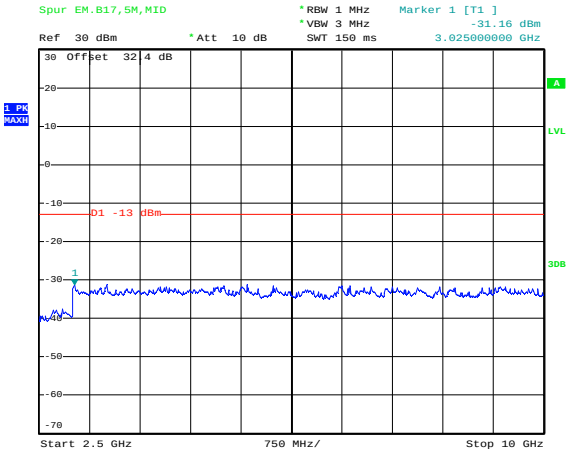
LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 1-9f: Band 17, Spurious Conducted Emissions, Middle Channel, 5MHz BW (RB= 25)



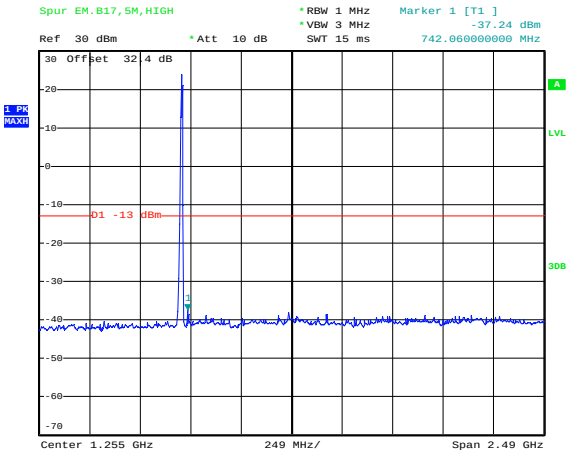
Date: 20.JUN.2012 07:43:36

Figure 1-10f: Band 17, Spurious Conducted Emissions, High Channel, 5MHz BW (RB= 25)



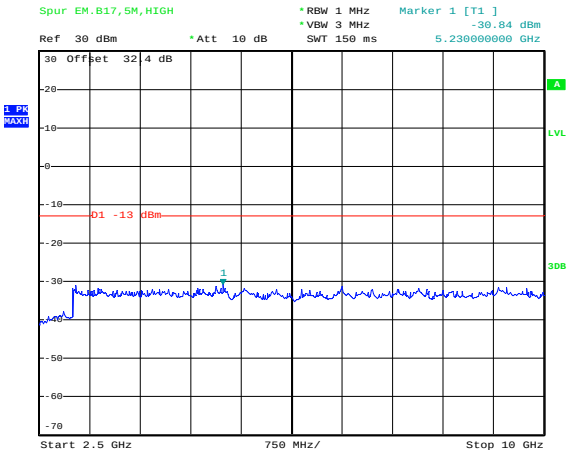
Date: 20.JUN.2012 07:44:10

Figure 1-11f: Band 17, Spurious Conducted Emissions, High channel, 5MHz BW (RB= 25)



Date: 20.JUN.2012 07:45:20

Figure 1-12f: Band 17, Spurious Conducted Emissions, High channel, 5MHz BW (RB= 25)



Date: 20.JUN.2012 07:45:45

LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 1-13f: Occupied Bandwidth, Band 17 Low Channel, 10MHz BW, RB=50

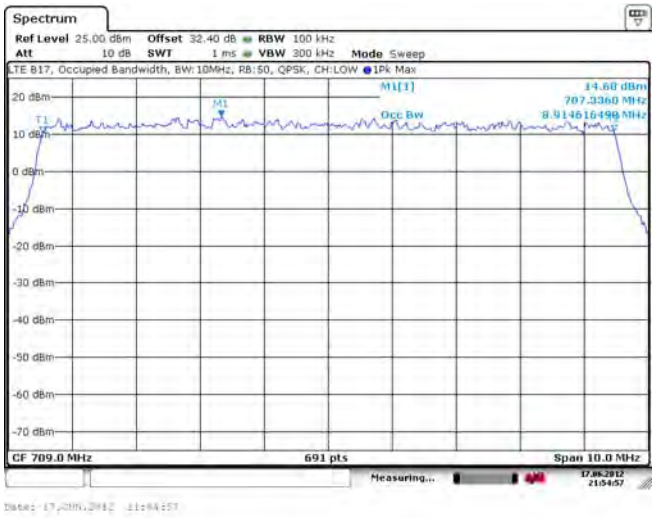


Figure 1-14f: Occupied Bandwidth, Band 17 Middle Channel, 10MHz BW, RB=50

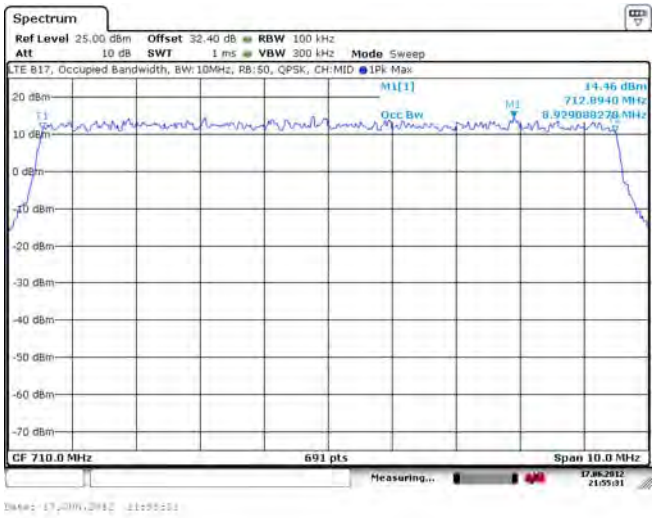
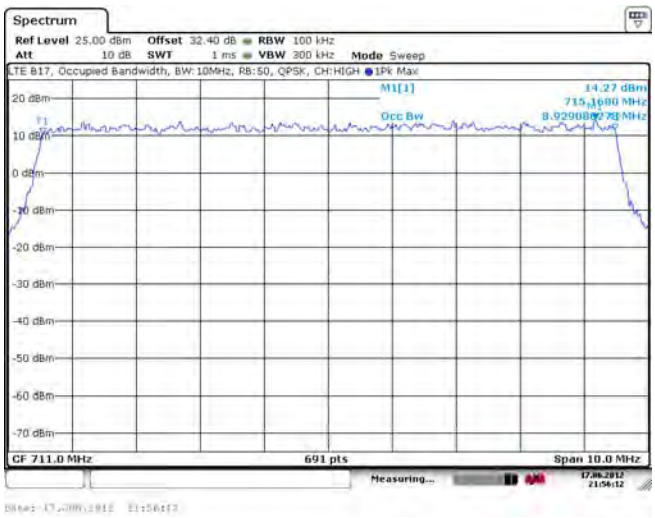


Figure 1-15f: Occupied Bandwidth, Band 17 High Channel, 10MHz BW, RB=50



LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 1-16f: Occupied Bandwidth, Band 5 Low Channel, 5MHz BW, RB=25

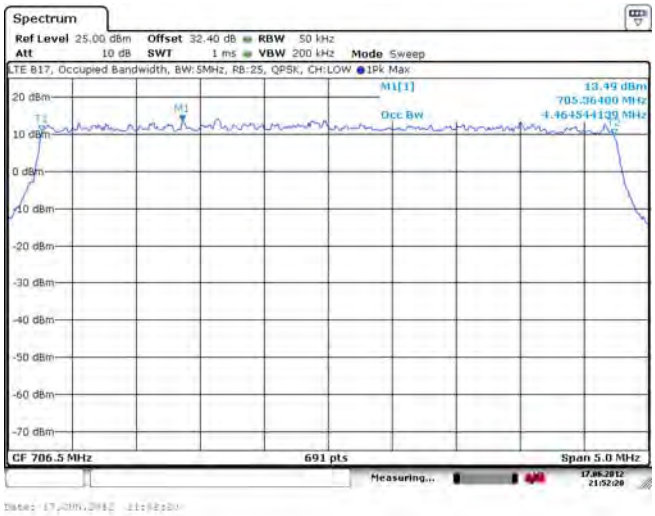


Figure 1-17f: Occupied Bandwidth, Band 5 Middle Channel, 5MHz BW, RB=25

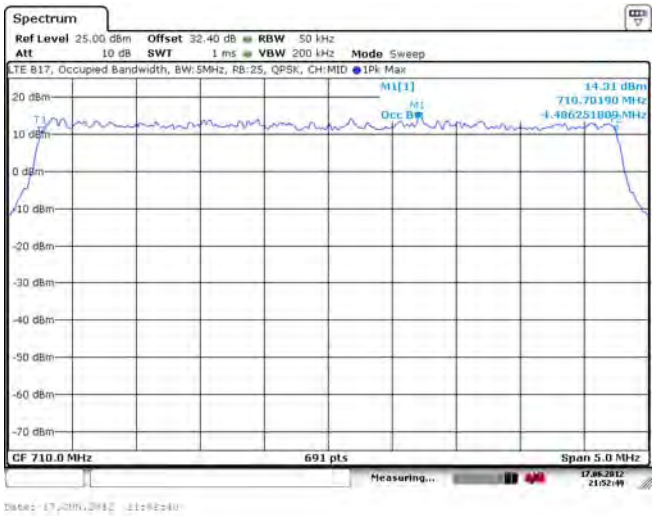
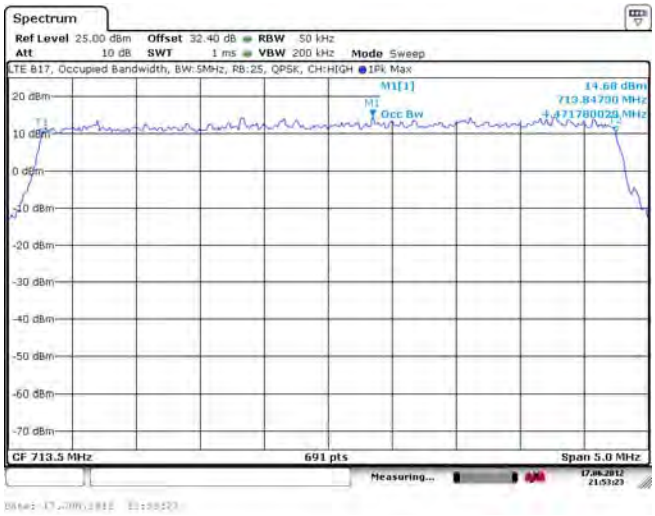


Figure 1-18f: Occupied Bandwidth, Band 5 High Channel, 5MHz BW, RB=25



LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 1-19f: -26 dBc Bandwidth, Band 17 Low Channel, 10MHz BW, RB=50

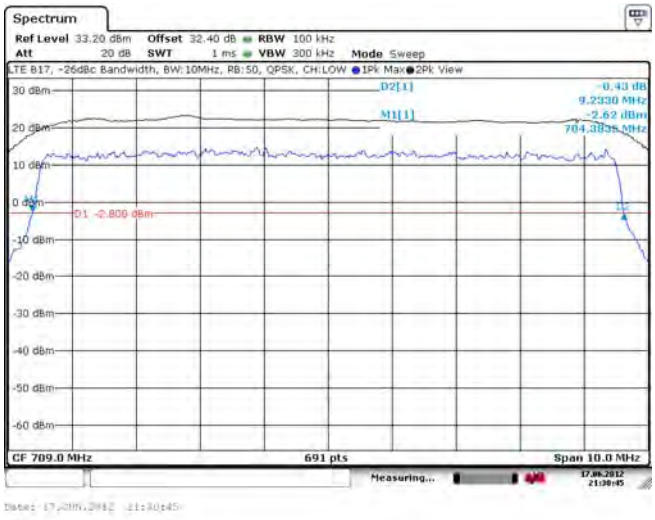


Figure 1-20f: -26 dBc Bandwidth, Band 17 Middle Channel, 10MHz BW, RB=50

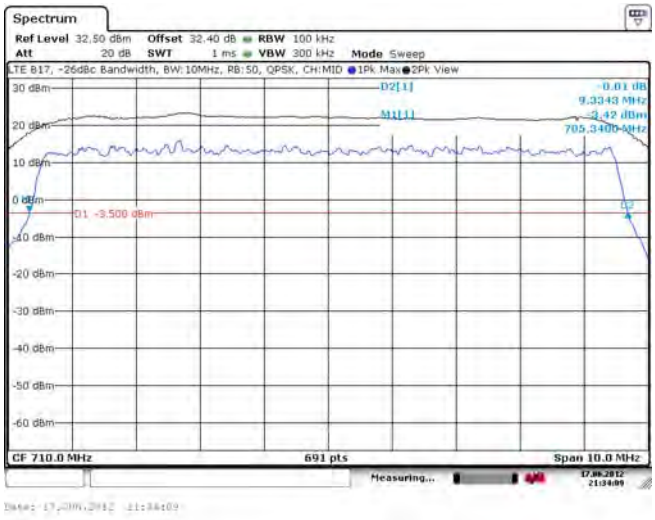


Figure 1-21f: -26 dBc Bandwidth, Band 17 High Channel, 10MHz BW, RB=50

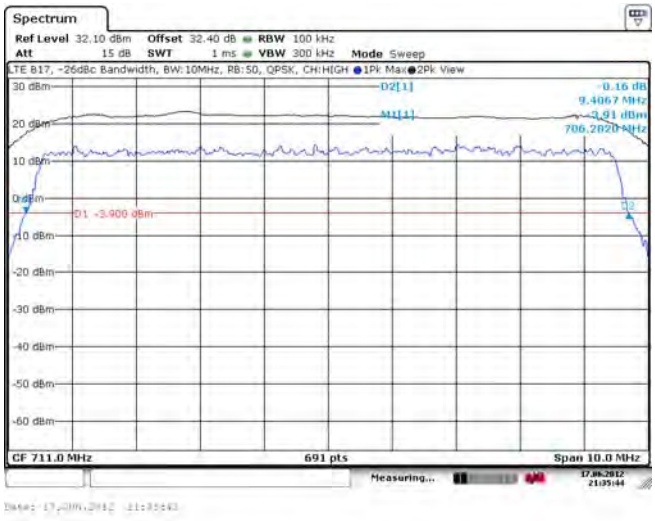
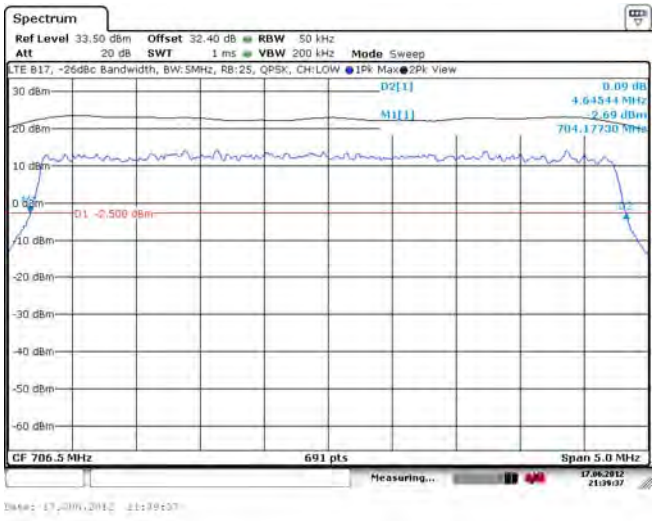


Figure 1-22f: -26 dBc Bandwidth, Band 17 Low Channel, 5MHz BW, RB=25



LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 1-23f: -26 dBc Bandwidth, Band 17 Middle Channel, 5MHz BW, RB=25

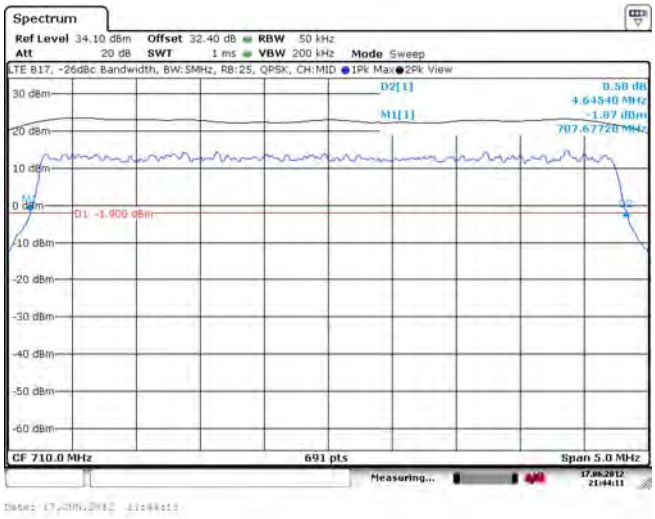


Figure 1-24f: -26 dBc Bandwidth, Band 17 High Channel, 5MHz BW, RB=25

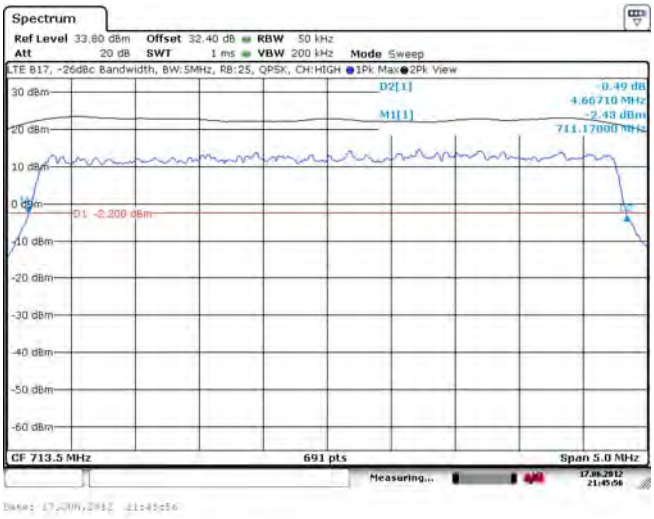


Figure 1-25f: Band 17 Low Channel Mask, 10MHz BW, RB=1

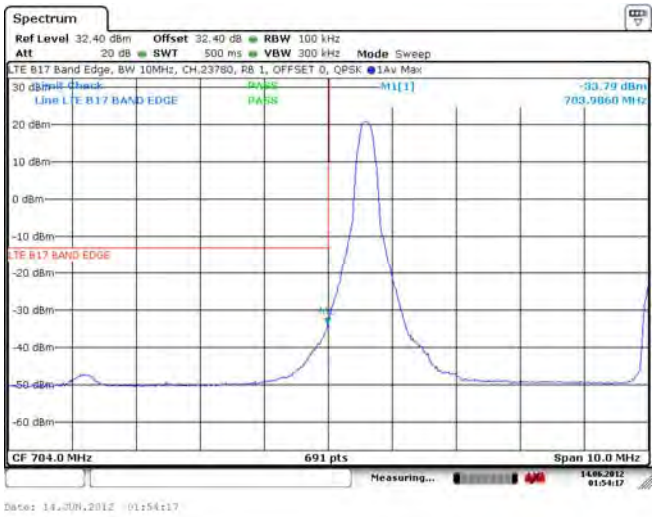
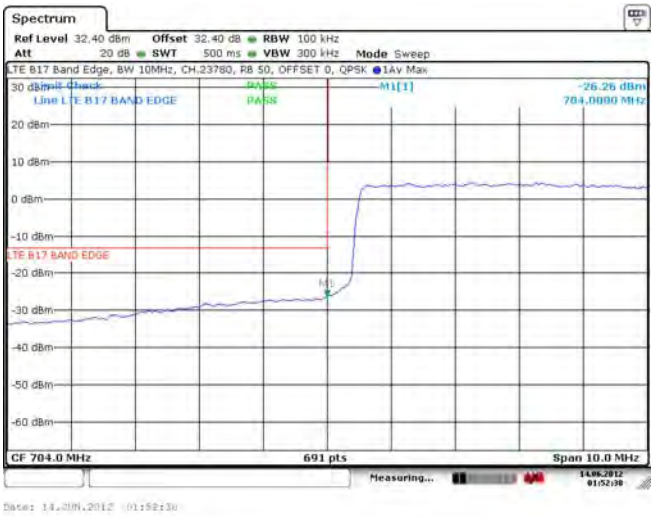


Figure 1-26f: Band 17 Low Channel Mask, 10MHz BW, RB=50



LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 1-27f: Band 17 High Channel Mask, 10MHz BW, RB=1

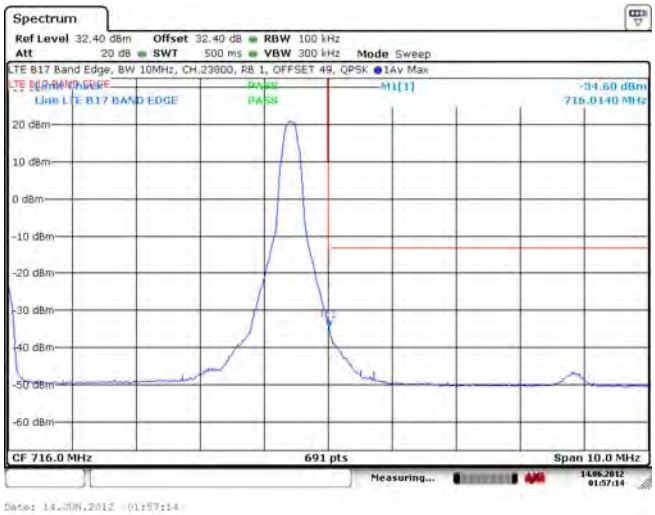


Figure 1-28f: Band 17 High Channel Mask,10MHz BW, RB=50

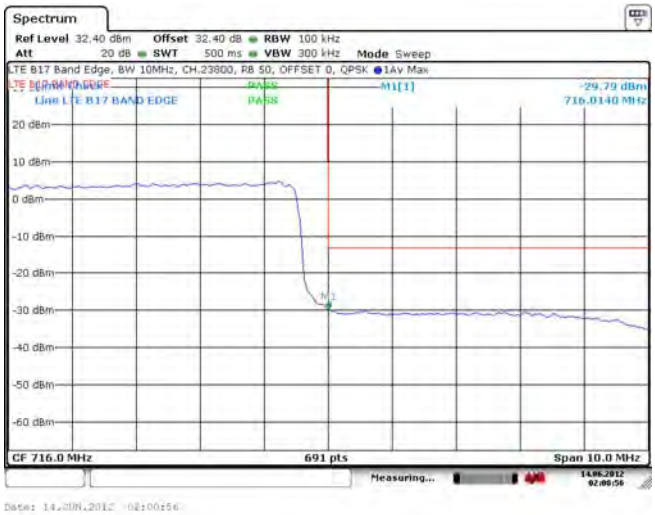


Figure 1-29f: Band 17 Low Channel Mask, 5MHz BW, RB=1

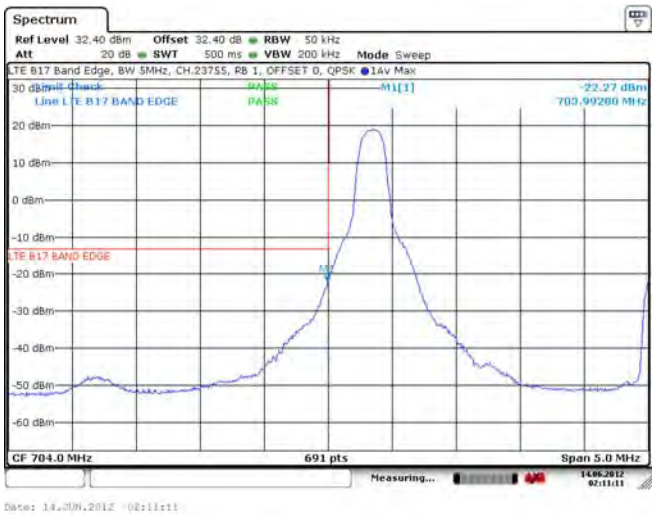
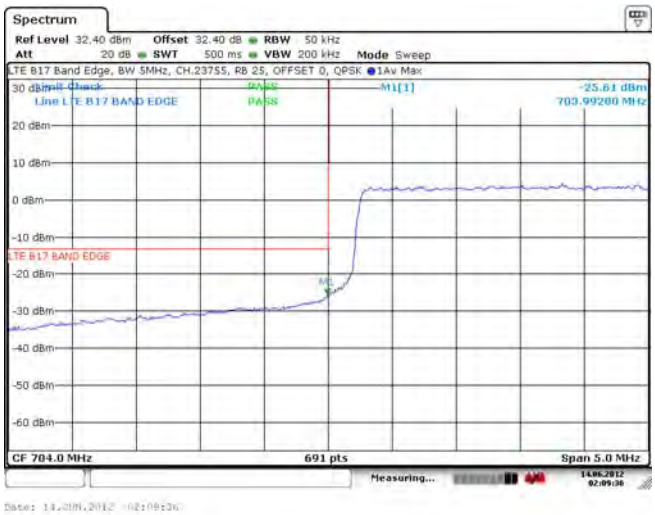


Figure 1-30f: Band 17 Low Channel Mask, 5MHz BW, RB=25



LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 1-31f: Band 17 High Channel Mask, 5MHz BW, RB=1

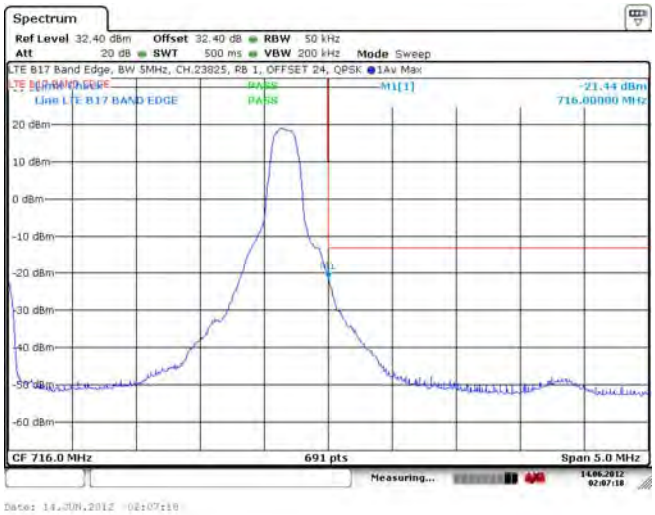


Figure 1-32f: Band 17 High Channel Mask, 5MHz BW, RB=25

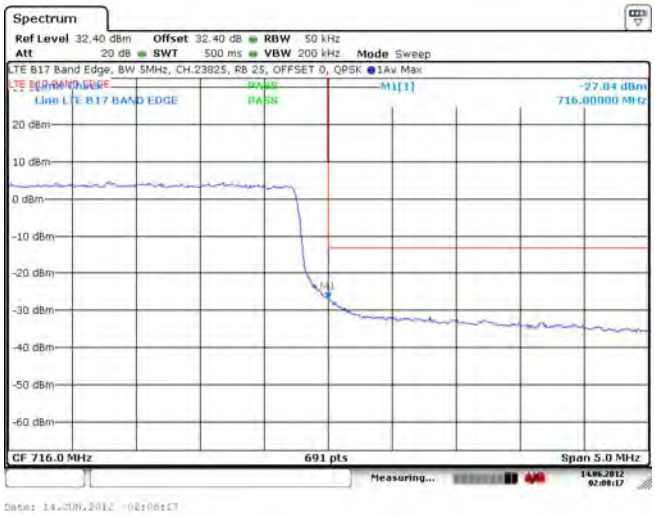


Figure 1-33f: Band 17 Low Channel PAR, 10MHz BW, RB=25

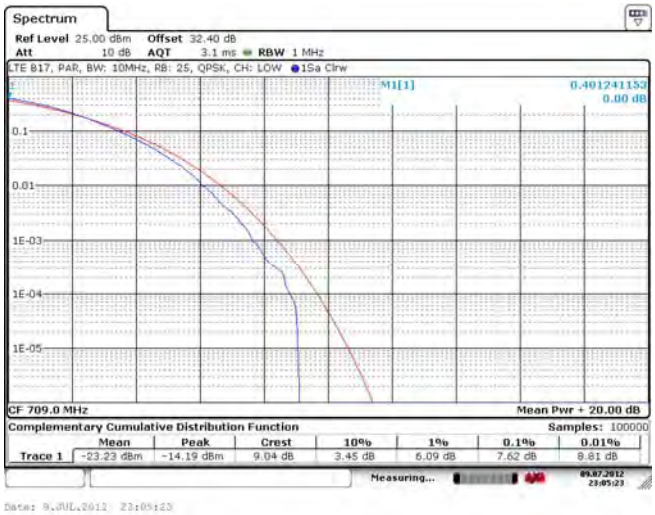
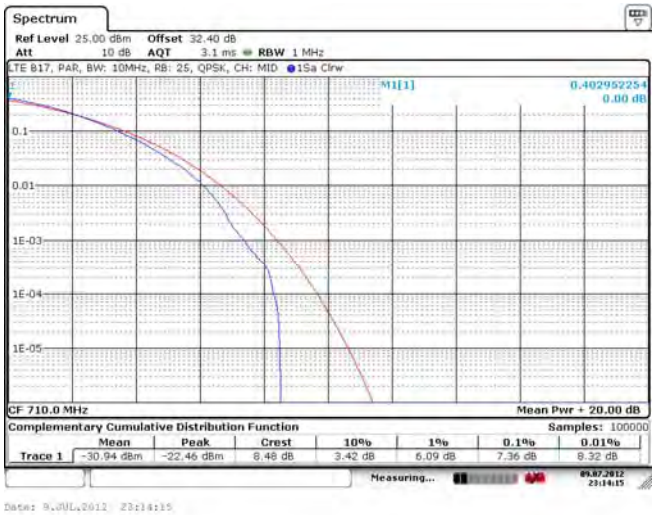
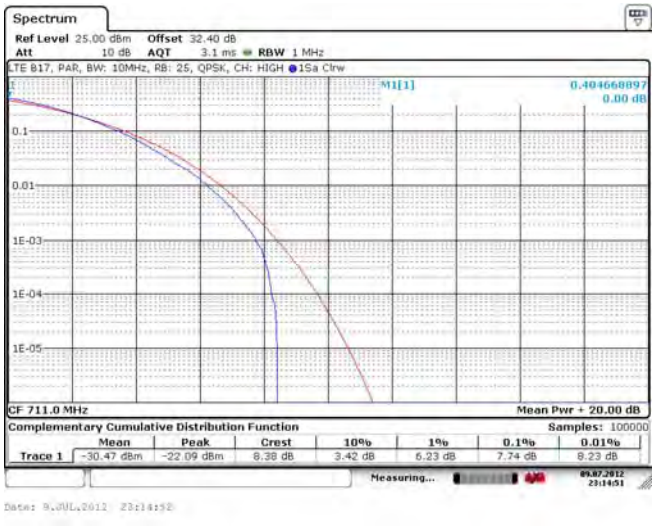


Figure 1-34f: Band 17 Middle Channel PAR, 10MHz BW, RB=25



LTE Band 17 Conducted RF Emission Test Data cont'd

Figure 1-35f: Band 17 High Channel PAR, 10MHz BW, RB=25



APPENDIX 6B – LTE Band 17 CONDUCTED RF OUTPUT POWER TEST DATA

LTE Band 17 Conducted RF Output Power Test Data

The conducted RF output power was measured using the CMW500 base station simulator. Low, middle and high channels were measured at maximum radio output power at different service options and modes.

Date of Test: June 20, 2012

The environmental conditions were: Temperature: 23.0 °C
Humidity: 37.6 %

The measurements were performed by Daoud Attayi.

LTE Band 17 RF Conducted Power

Band	LTE Band 17					
Frequency (MHz)	**Channel**	**BW**	**Modulation**	**RB Size**	**RB Offset**	**Maximum Avg. Power (dBm)**
704	23730	10 MHz	QPSK	1	0	23.10
			QPSK	1	49	23.10
			QPSK	25	0	22.20
			QPSK	50	0	22.20
			16QAM	1	0	22.10
			16QAM	1	49	22.10
			16QAM	30	0	21.50
			16QAM	30	20	21.40
709.0	23780	10 MHz	QPSK	1	0	23.00
			QPSK	1	49	23.15
			QPSK	25	0	22.60
			QPSK	50	0	22.57
			16QAM	1	0	22.30
			16QAM	1	49	22.44
			16QAM	30	0	21.31
			16QAM	30	20	21.55
710	23790	10 MHz	QPSK	1	0	23.00
			QPSK	1	49	23.00
			QPSK	25	0	22.40
			QPSK	50	0	22.40
			16QAM	1	0	21.45
			16QAM	1	49	21.46
			16QAM	30	0	21.47
			16QAM	30	20	21.45
711	23800	10 MHz	QPSK	1	0	22.95
			QPSK	1	49	22.89
			QPSK	25	0	22.35
			QPSK	50	0	22.49
			16QAM	1	0	22.15
			16QAM	1	49	22.14
			16QAM	30	0	21.76
			16QAM	30	20	21.56

LTE Band 17 RF Conducted Power (cont'd)

715.9	23849	10 MHz	QPSK	1	0	21.40
			QPSK	1	49	21.40
			QPSK	25	0	21.40
			QPSK	50	0	21.30
			16QAM	1	0	20.64
			16QAM	1	49	20.64
			16QAM	30	0	20.65
			16QAM	30	20	20.67
710	23790	5 MHz	QPSK	1	0	23.30
			QPSK	1	24	23.30
			QPSK	12	6	23.29
			QPSK	25	0	23.34
			16QAM	1	0	21.80
			16QAM	1	24	21.77
			16QAM	12	0	21.73
			16QAM	25	0	21.65

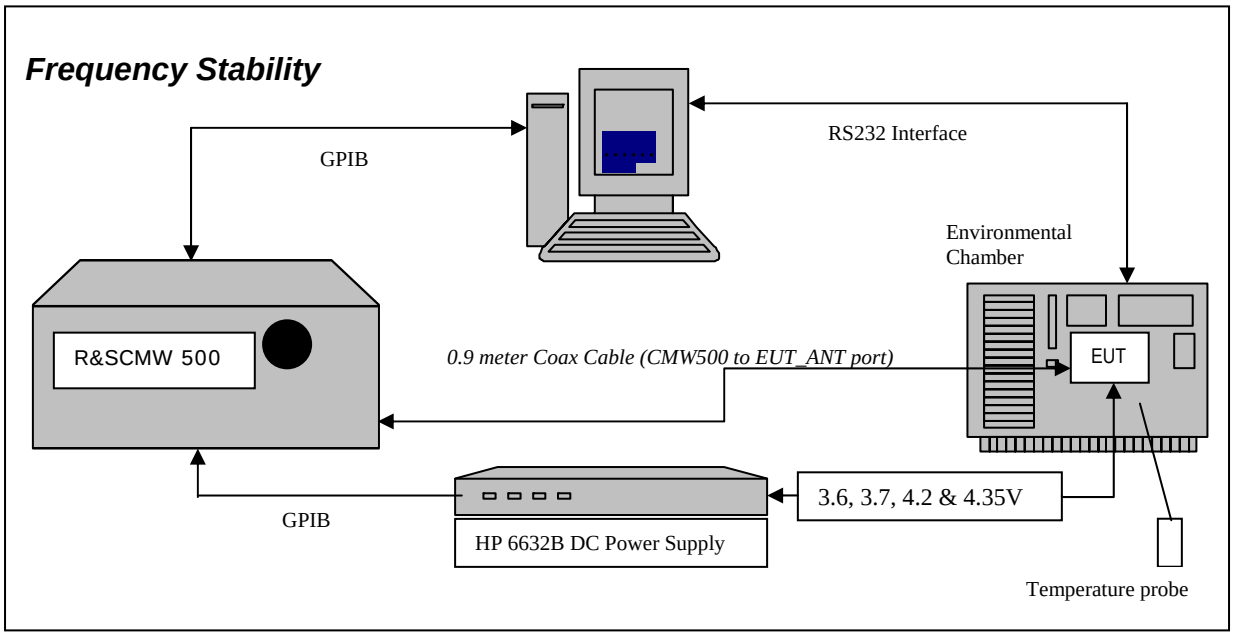
LTE band 17 conducted power measurements
Rev 1

Band	**LTE Band 17**					
Frequency (MHz)	**Channel**	**BW**	**Modulation**	**RB Size**	**RB Offset**	**Maximum Avg. Power (dBm)**
709.0	23780	10 MHz	QPSK	1	0	
			QPSK	1	49	24.8
			QPSK	25	0	
			QPSK	50	0	
			16QAM	1	0	
			16QAM	1	49	23.7
			16QAM	30	0	
			16QAM	30	20	
710	23790	10 MHz	QPSK	1	0	
			QPSK	1	49	24.9
			QPSK	25	0	
			QPSK	50	0	
			16QAM	1	0	
			16QAM	1	49	23.6
			16QAM	30	0	
			16QAM	30	20	
711	23800	10 MHz	QPSK	1	0	
			QPSK	1	49	24.5
			QPSK	25	0	
			QPSK	50	0	
			16QAM	1	0	
			16QAM	1	49	23.7
			16QAM	30	0	
			16QAM	30	20	

LTE band 17 conducted power measurements
Rev 2

APPENDIX 6C – LTE Band 17 FREQUENCY STABILITY TEST DATA

LTE Band 17 Frequency Stability Test Data



The following measurements were performed by Kevin Guo.

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.

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 3.7 volts, 4.2 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, 3.7 volts, 4.2 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) resource blocks. 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.

Procedure:

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

46. Switch on the HP 6632B power supply; CMW 500 Communications test Set, and Environmental Chamber.
47. Start test program
48. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
49. Set power supply voltage to 3.6 volts.
50. Set up CMW 500 Radio Communication Tester.
51. Command the CMW 500 to switch to the low channel.
52. Enable the voltage to the EUT, and connect a link to the CMW 500 test set.
53. EUT is commanded to Transmit 100 Bursts.
54. 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.
55. The CMW 500 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
56. Repeat steps 5 to 10 changing the supply voltage to 3.7 Volts
57. Increase temperature by 10°C and soak for 1/2 hour.
58. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
59. Repeat steps 5 to 10 changing the supply voltage to 4.2 volts
60. 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, 3.7, 4.2 and 4.35 volts

The maximum frequency error in the LTE band 17 measured was -**0.0254 PPM**.

Date of test: July 13, 2012

LTE Band 17 results: channels 20780, 20790 and 20800 @ 20°C maximum transmitted power

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20780	709.0	3.6	20	9	0.0127
20790	710.0	3.6	20	-7	-0.0099
20800	711.0	3.6	20	2	0.0035

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20780	709.0	3.7	20	4	0.0053
20790	710.0	3.7	20	-7	-0.0101
20800	711.0	3.7	20	-7	-0.0097

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20780	709.0	4.2	20	9	0.0122
20790	710.0	4.2	20	7	0.0096
20800	711.0	4.2	20	-12	-0.0169

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20780	709.0	4.35	20	3	0.0046
20790	710.0	4.35	20	4	0.0053
20800	711.0	4.35	20	7	0.0096

LTE band 17 Results: channel 20780 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20780	709.0	3.6	-30	-3	-0.0037
20780	709.0	3.6	-20	-3	-0.0039
20780	709.0	3.6	-10	3	0.0035
20780	709.0	3.6	0	-18	**-0.0254**
20780	709.0	3.6	10	11	0.0155
20780	709.0	3.6	20	9	0.0127
20780	709.0	3.6	30	-4	-0.0052
20780	709.0	3.6	40	-10	-0.0137
20780	709.0	3.6	50	6	0.0080
20780	709.0	3.6	60	7	0.0094

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20780	709.0	3.7	-30	-3	-0.0049
20780	709.0	3.7	-20	3	0.0044
20780	709.0	3.7	-10	-2	-0.0029
20780	709.0	3.7	0	6	0.0083
20780	709.0	3.7	10	-8	-0.0111
20780	709.0	3.7	20	4	0.0053
20780	709.0	3.7	30	7	0.0096
20780	709.0	3.7	40	-8	-0.0109
20780	709.0	3.7	50	4	0.0059
20780	709.0	3.7	60	-4	-0.0052

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20780	709.0	4.2	-30	-3	-0.0037
20780	709.0	4.2	-20	3	0.0045
20780	709.0	4.2	-10	2	0.0028
20780	709.0	4.2	0	-5	-0.0068
20780	709.0	4.2	10	9	0.0125
20780	709.0	4.2	20	9	0.0122
20780	709.0	4.2	30	-4	-0.0062
20780	709.0	4.2	40	8	0.0110
20780	709.0	4.2	50	-4	-0.0049
20780	709.0	4.2	60	5	0.0072

LTE band 17 Results: channel 20780 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20780	709.0	4.35	-30	8	0.0108
20780	709.0	4.35	-20	-9	-0.0125
20780	709.0	4.35	-10	-5	-0.0070
20780	709.0	4.35	0	5	0.0065
20780	709.0	4.35	10	-3	-0.0039
20780	709.0	4.35	20	3	0.0046
20780	709.0	4.35	30	3	0.0045
20780	709.0	4.35	40	7	0.0104
20780	709.0	4.35	50	-4	-0.0053
20780	709.0	4.35	60	-4	-0.0054

LTE band 5 Results: channel 20790 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20790	710.0	3.6	-30	3	0.0048
20790	710.0	3.6	-20	3	0.0045
20790	710.0	3.6	-10	4	0.0056
20790	710.0	3.6	0	11	0.0155
20790	710.0	3.6	10	-2	-0.0028
20790	710.0	3.6	20	-7	-0.0099
20790	710.0	3.6	30	8	0.0110
20790	710.0	3.6	40	6	0.0090
20790	710.0	3.6	50	4	0.0052
20790	710.0	3.6	60	9	0.0120

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20790	710.0	3.7	-30	9	0.0128
20790	710.0	3.7	-20	5	0.0075
20790	710.0	3.7	-10	4	0.0053
20790	710.0	3.7	0	-8	-0.0110
20790	710.0	3.7	10	6	0.0087
20790	710.0	3.7	20	-7	-0.0101
20790	710.0	3.7	30	-3	-0.0048
20790	710.0	3.7	40	-2	-0.0028
20790	710.0	3.7	50	-3	-0.0039
20790	710.0	3.7	60	8	0.0110

LTE band 17 Results: channel 20790 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20790	710.0	4.2	-30	3	0.0043
20790	710.0	4.2	-20	3	0.0048
20790	710.0	4.2	-10	4	0.0059
20790	710.0	4.2	0	9	0.0129
20790	710.0	4.2	10	-7	-0.0094
20790	710.0	4.2	20	7	0.0096
20790	710.0	4.2	30	8	0.0106
20790	710.0	4.2	40	-4	-0.0052
20790	710.0	4.2	50	-7	-0.0099
20790	710.0	4.2	60	-4	-0.0055

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20790	710.0	4.35	-30	4	0.0056
20790	710.0	4.35	-20	-5	-0.0065
20790	710.0	4.35	-10	3	0.0045
20790	710.0	4.35	0	3	0.0040
20790	710.0	4.35	10	10	0.0147
20790	710.0	4.35	20	4	0.0053
20790	710.0	4.35	30	8	0.0108
20790	710.0	4.35	40	5	0.0068
20790	710.0	4.35	50	4	0.0054
20790	710.0	4.35	60	9	0.0123

LTE band 17 Results: channel 20800 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20800	711.0	3.6	-30	-4	-0.0051
20800	711.0	3.6	-20	-3	-0.0043
20800	711.0	3.6	-10	-3	-0.0045
20800	711.0	3.6	0	-7	-0.0101
20800	711.0	3.6	10	6	0.0090
20800	711.0	3.6	20	2	0.0035
20800	711.0	3.6	30	-2	-0.0025
20800	711.0	3.6	40	6	0.0082
20800	711.0	3.6	50	2	0.0027
20800	711.0	3.6	60	-7	-0.0094

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20800	711.0	3.7	-30	-4	-0.0050
20800	711.0	3.7	-20	-4	-0.0050
20800	711.0	3.7	-10	-3	-0.0048
20800	711.0	3.7	0	4	0.0053
20800	711.0	3.7	10	-9	-0.0127
20800	711.0	3.7	20	-7	-0.0097
20800	711.0	3.7	30	-3	-0.0039
20800	711.0	3.7	40	6	0.0084
20800	711.0	3.7	50	-7	-0.0091
20800	711.0	3.7	60	7	0.0096

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20800	711.0	4.2	-30	-3	-0.0037
20800	711.0	4.2	-20	-5	-0.0070
20800	711.0	4.2	-10	-4	-0.0051
20800	711.0	4.2	0	6	0.0090
20800	711.0	4.2	10	8	0.0107
20800	711.0	4.2	20	-12	-0.0169
20800	711.0	4.2	30	-8	-0.0114
20800	711.0	4.2	40	-6	-0.0082
20800	711.0	4.2	50	1	0.0014
20800	711.0	4.2	60	-6	-0.0083

LTE band 17 Results: channel 20800 @ maximum transmitted power (cont'd)

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20800	711.0	4.35	-30	-5	-0.0077
20800	711.0	4.35	-20	-6	-0.0080
20800	711.0	4.35	-10	-3	-0.0047
20800	711.0	4.35	0	-3	-0.0045
20800	711.0	4.35	10	-3	-0.0046
20800	711.0	4.35	20	7	0.0096
20800	711.0	4.35	30	-4	-0.0054
20800	711.0	4.35	40	-13	-0.0180
20800	711.0	4.35	50	4	0.0055
20800	711.0	4.35	60	-3	-0.0045

APPENDIX 6D – LTE Band 17 RADIATED EMISSIONS TEST DATA

Radiated Power Test Data Results

Date of Test: October 17, 2012
The following measurements were performed by Feras Obeid.
The environmental tests conditions were: Temperature: 25.6 °C
Relative Humidity: 32.4 %

The BlackBerry® smartphone was standalone, with USB jack pointing 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 17, 10MHz BW, RB=1, QPSK modulation

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBm)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole) (dBm)	Corrected Reading (relative to Dipole) (W)	Limit (dBm)	Diff. To Limit (dB)
F0	23780	709.00	17	Dipole	V	-37.45	-29.63	V-V	6.95	**25.68**	**0.37**	35.0	-9.32
F0	23780	709.00	17	Dipole	H	-29.63		H-H	5.18				
F0	23790	710.00	17	Dipole	V	-37.68	-29.80	V-V	6.78	25.51	0.36	35.0	-9.49
F0	23790	710.00	17	Dipole	H	-29.80		H-H	5.18				
F0	23799	710.90	17	Dipole	V	-37.94	-29.93	V-V	6.56	25.29	0.34	35.0	-9.71
F0	23799	710.90	17	Dipole	H	-29.93		H-H	4.88				

LTE band 17, 5MHz BW, RB=25, QPSK modulation

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBm)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole) (dBm)	Corrected Reading (relative to Dipole) (W)	Limit (dBm)	Diff. To Limit (dB)
F0	23755	706.50	17	Dipole	V	-37.86	-30.86	V-V	6.46	25.19	0.33	35.0	-9.81
F0	23755	706.50	17	Dipole	H	-30.86		H-H	0.39				
F0	23790	710.00	17	Dipole	V	-38.52	-30.88	V-V	5.79	24.52	0.28	35.0	-10.48
F0	23790	710.00	17	Dipole	H	-30.88		H-H	2.17				
F0	23824	713.40	17	Dipole	V	-38.07	-29.95	V-V	6.30	25.03	0.32	35.0	-9.97
F0	23824	713.40	17	Dipole	H	-29.95		H-H	2.95				

Radiated Power Test Data Results (con'd)

LTE band 17, 10MHz BW, RB=50, QPSK modulation

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBm)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole) (dBm)	Corrected Reading (relative to Dipole) (W)	Limit (dBm)	Diff. To Limit (dB)
F0	23780	709.00	17	Dipole	V	-37.95	-30.39	V-V	6.39	25.12	0.33	35.0	-9.88
F0	23780	709.00	17	Dipole	H	-30.39		H-H	2.79				
F0	23790	710.00	17	Dipole	V	-37.98	-30.33	V-V	6.34	25.07	0.32	35.0	-9.93
F0	23790	710.00	17	Dipole	H	-30.33		H-H	2.70				
F0	23799	710.90	17	Dipole	V	-37.99	-30.15	V-V	6.44	25.17	0.33	35.0	-9.83
F0	23799	710.90	17	Dipole	H	-30.15		H-H	2.93				

Radiated Emissions Test Data Results cont'd

Date of Test: June 21 and October 9, 2012

The following measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 26.3 ºC
Relative Humidity: 37.6 %

The BlackBerry® smartphone was standalone, with USB jack pointing down and 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 5MHz BW (channel 23755, 23790 and 23824 with RB = 25 and RB = 1) and 10MHz BW (channel 23780, 23790, 23800 with RB = 50 and RB = 1), with QPSK modulation.

All emissions had test margins greater than 25.0 dB.

Date of Test: June 14 – June 27 and October 11, 2012

The following measurements were performed by Shuo Wang
The environmental test conditions were: Temperature: 25.6 ºC
Relative Humidity: 42.6 %

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, with USB jack pointing up and LCD facing the RX antenna when the turntable is at 0 degree position

Measurements were performed in LTE band 17 with 5MHz BW (channel 23755, 23790 and 23824 with RB = 25 and RB = 1) and 10MHz BW (channel 23780, 23790, 23800 with RB = 50 and RB = 1), with QPSK modulation.

All emissions had test margins greater than 25.0 dB.