EMI Test Report

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

REPORT NO.: RTS-6057-1406-17

PRODUCT MODEL NO.:	RGY181LW
TYPE NAME:	BlackBerry® smartphone
FCC ID:	L6ARGY180LW
IC:	2503A-RGY180LW
EMISSION DESIGNATOR (GSM):	247KGXW
EMISSION DESIGNATOR (EDGE):	245KG7W
EMISSION DESIGNATOR (WCDMA):	4M17F9W
EMISSION DESIGNATOR (LTE QPSK):	See details in Appendix
EMISSION DESIGNATOR (LTE 16QAM):	See details in Appendix

DATE: June 16, 2014

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

592

Statement of Performance:

The BlackBerry® smartphone, model RGY181LW, part number CER-59665-001 Rev 2-x05-00 and accessories when configured and operated per BlackBerry's operation instructions performs within the requirements of the test standards.

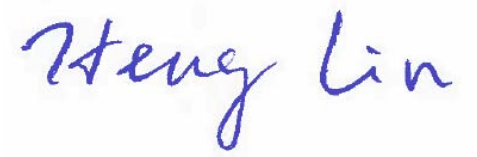
Declaration:

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

Documented by:

Kevin Guo
Compliance Specialist I (Regulatory)

Reviewed by:



Heng Lin
Compliance Specialist II (Regulatory)

Reviewed and Approved by:

Masud S. Attayi, P.Eng.
Manager, Regulatory Compliance

Table of Contents

A. Scope

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

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

B. Associated Documents

1)MultiSourceDeclaration_R135_10.3.0.302_10.3.0.203
2)MultiSourceDeclaration_R135_10.3.0.302_10.3.0.416
3)MultiSourceDeclaration_R135_10.3.0.302_10.3.0.530
4)MultiSourceDeclaration_R135_10.3.0.302_10.3.0.590
5)MultiSourceDeclaration_R135_10.3.0.302_10.3.0.596_reg_only
6)MultiSourceDeclaration_R135_10.3.0.302_10.3.0.626
7)RGY181LW_CER-59665-001 – Rev1 - x04-00
8)RGY181LW _CER-59665-001 – Rev2 - x05-02
9)RGY181LW _CER-59665-001 – Rev2 - x05-04

C. Product Identification

Manufactured by BlackBerry Limited whose headquarters is located at:

2200 University Ave. E
Waterloo, Ontario
Canada, N2K 0A7
Phone: 519 888 7465
Fax: 519 888 7884

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

BlackBerry RTS EMC test facilities

305 Phillip Street	440 Phillip Street
Waterloo, Ontario	Waterloo, Ontario,
Canada, N2L 3W8	Canada , N2L 5R9
Phone: 519 888 7465	Phone: 519 888 7465
Fax: 519 888 6906	Fax: 519 888 6906

The testing was performed from April 16 to June 2, 2014.

BlackBerry® smartphone Samples Tested

Sample	Model	CER NUMBER	PIN	Software Information
1	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3F	OS Version: 10.3.0.203 Bundle: 203
2	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3F	OS Version: 10.3.0.416 Bundle: 416
3	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3F	OS Version: 10.3.0.530 Bundle: 530
4	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3E	OS Version: 10.3.0.203 Bundle: 203
5	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3E	OS Version: 10.3.0.416 Bundle: 416
6	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3E	OS Version: 10.3.0.530 Bundle: 530
7	RGY181LW	CER-59665-001Rev2-x05-02	2FFF470B	OS Version: 10.3.0.590 Bundle: 590
8	RGY181LW	CER-59665-001Rev2-x05-02	2FFF470B	OS Version: 10.3.0.596 Bundle: 596
9	RGY181LW	CER-59665-001Rev2-x05-04	2FFF4752	OS Version: 10.3.0.626 Bundle: 626

RF Conducted Emissions testing was performed on samples 1, 2.
Radiated Emissions testing was performed on samples 3, 4, 5, 6, 7, 8, 9.

Only the characteristics that may have been impacted by the changes from RGY181LW Rev1 to RGY181LW Rev2 were re-tested.
For more details, refer to RGY181LW_HW_Declaration_CER-59665-001_Rev2 - x05-02 and RGY181LW_HW_Declaration_CER-59665-001_Rev2 - x05-04

To view the differences between OS: 10.3.0.302 and OS: 10.3.0.626 see documents

MultiSourceDeclaration_RGY181LW_10.3.0.203,
MultiSourceDeclaration_RGY181LW_10.3.0.302,
MultiSourceDeclaration_RGY181LW_10.3.0.416,
MultiSourceDeclaration_RGY181LW_10.3.0.530,
MultiSourceDeclaration_R135_10.3.0.302_10.3.0.596_reg_only,
MultiSourceDeclaration_RGY181LW_10.3.0.626

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

Part 24.232(b)(c)	RSS-133, 6.4	LTE Band 2 EIRP	Pass	3C
Part 24.238	RSS-133, 6.5	LTE Band 2 Radiated Spurious/Harmonic Emissions	Pass	3C
Part 2.1051 Part 22.917	RSS-132, 4.5	LTE Band 5 Conducted Spurious Emissions	Pass	4A
Part 2.1049 Part 22.917	RSS-GEN, 4.6	LTE Band 5 Occupied Bandwidth and Channel Mask	Pass	4A
Part 2.1055(a)(d) Part 22.917	RSS-132, 4.3	LTE Band 5 Frequency Stability vs. Temperature and Voltage	Pass	4B
Part 22.913(a)(2)	RSS-132, 4.4	LTE Band 5 ERP	Pass	4C
Part 22.917	RSS-132, 4.5	LTE Band 5 Radiated Spurious/Harmonic Emissions	Pass	4C
Part 2.1051 Part 27.53(h)	RSS-139, 6.5	LTE Band 4 Conducted Spurious Emissions	Pass	5A
Part 2.1049 Part 27.53(h)(1)	RSS-GEN, 4.6	LTE Band 4 Occupied Bandwidth and Channel Mask	Pass	5A
Part 27.50 (d)(5)	RSS-139, 6.4	LTE Band 4 Peak to Average Ratio measurements	Pass	5A
Part 2.1055 Part 27.54	RSS-139, 6.3	LTE Band 4 Frequency Stability vs. Temperature and Voltage	Pass	5B
Part 2.1053 Part 27.50(d)(4)	RSS-139, 6.4	LTE Band 4 EIRP	Pass	5C
Part 2.1053 Part 27.53(h)	RSS-139, 6.5	LTE Band 4 Radiated Spurious/Harmonic Emissions	Pass	5C
Part 2.1051 Part 27.53(g)	RSS-130, 4.6	LTE Band 13 Conducted Spurious Emissions	Pass	6A
Part 2.1049 Part 27.53(g)	RSS-GEN, 4.6	LTE Band 13 Occupied Bandwidth and Channel Mask	Pass	6A
Part 2.1055 Part 27.54	RSS-130, 4.3	LTE Band 13 Frequency Stability vs. Temperature and Voltage	Pass	6B
Part 2.1053 Part 27.50(c)(9)	RSS-130, 4.4	LTE Band 13 ERP	Pass	6C
Part 2.1053 Part 27.53(g)	RSS-130, 4.6	LTE Band 13 Radiated Spurious/Harmonic Emissions	Pass	6C

Part 2.1051 Part 27.53(g)	RSS-130, 4.6	LTE Band 17 Conducted Spurious Emissions	Pass	7A
Part 2.1049 Part 27.53(g)	RSS-GEN, 4.6	LTE Band 17 Occupied Bandwidth and Channel Mask	Pass	7A
Part 2.1055 Part 27.54	RSS-130, 4.3	LTE Band 17 Frequency Stability vs. Temperature and Voltage	Pass	7B
Part 2.1053 Part 27.50(c)(9)	RSS-130, 4.4	LTE Band 17 ERP	Pass	7C
Part 2.1053 Part 27.53(g)	RSS-130, 4.6	LTE Band 17 Radiated Spurious/Harmonic Emissions	Pass	7C

F.Summary of Results

1) Conducted Emission Measurements

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

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

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

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the PCS1900 as per 47 CFR 2.202, CFR 24.238 and RSS-GEN, 4.6. The EUT was measured in GSM and EDGE mode on the low, middle and high channels. The worst case occupied bandwidth was 245.0 kHz on low channel in CALL mode, and 245 kHz on the low and high channel in EDGE mode.
See APPENDIX 1A for test data.

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

The BlackBerry® smartphone met the requirements of the Frequency Stability in the PCS1900 as per 47 CFR 2.1055, CFR 24.235 and RSS-GEN, 4.7. The EUT was measured in PCS1900 mode on the low, middle and high channels.
See APPENDIX1B for test data.

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

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

The EUT met the requirements of the Tx Conducted Spurious Emissions in the WCDMA Band IV 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. The frequency range investigated was from 30 MHz to 20 GHz.
See APPENDIX 2A for test data

- The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the WCDMA band V as per 47 CFR 2.202, CFR 22.917 and RSS-GEN, 4.6. . The EUT was measured in Voice and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.175 MHz on the mid channel in Loopback mode, and 4.183 MHz on the high 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 II as per 47 CFR 2.202, CFR 24.238 and RSS-GEN, 4.6. The EUT was measured in Voice and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.167 MHz on all channels in Loopback mode, and 4.183 MHz on the high 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 IV as per 47 CFR 2.1051, CFR 27.53 and RSS-139, 6.5. The EUT was measured in Voice and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.170 MHz on the low channels in Loopback mode, and 4.175 MHz on the high channel in HSUPA mode.
See APPENDIX 2A for test data.

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

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

The EUT met the requirements of the Frequency Stability in the WCDMA Band IV as per 47 CFR 2.1055, CFR 27.54 and RSS-139, 6.3. The EUT was measured in WCDMA Band IV mode on the low, middle and high channels.
See APPENDIX 2B for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 2 as per 47 CFR 2.1051, CFR 24.238, CFR 24.50(d), RSS-133, 6.5 and RSS-GEN, 4.9. The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 2 with both QPSK and 16-QAM modulations. Different Resource Block allocations were investigated; a minimum one RB case was also tested. The frequency range investigated was from 30 MHz to 20 GHz.
See APPENDIX 3A for test data.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the LTE Band 2 as per 47 CFR 2.202, CFR 24.238 and RSS-GEN, 4.6. The EUT was measured on the low, middle and high channels in all bandwidth and both modulations. The worst case occupied bandwidth was 17.90 MHz on the middle channel in 20MHz BW, 100 RB 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 all bandwidths for LTE Band 2 with QPSK and 16-QAM modulations. Different RB allocations were also investigated, a minimum one RB case was also tested. The worst case Peak to Average Ratio was 9.1 dB on mid channel in 20MHz bandwidth with 100 RB.
See APPENDIX 3A for test data

The BlackBerry® smartphone met the requirements of the Frequency Stability in the LTE Band 2 as per 47 CFR 2.1055, CFR 24.235 and RSS-133, 6.3. The EUT was measured in LTE Band 2 mode on the low, middle and high channels in 20MHz BW with 100 RB and QPSK modulation.
See APPENDIX 3B for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 5 as per 47 CFR 2.1051, CFR 22.917, CFR 22.901(d), RSS-132, 5.5 and RSS-GEN, 4.9. The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Different RB allocations were investigated, a minimum one RB case was also tested. The frequency range investigated was from 30 MHz to 10 GHz.
See APPENDIX 4A for test data.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the LTE Band 5 as per 47 CFR 2.202, CFR 22.917 and RSS-GEN, 4.6. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, 5MHz and 10MHz bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Different RB allocations were investigated, a minimum one RB case was also tested. The worst case occupied bandwidth was 8.95 MHz on the mid and high channels in 10MHz BW, 50 RB and QPSK modulation.
See APPENDIX 4A 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-132, 5.3. The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Different RB allocations were investigated, a minimum one RB case was also tested.
See APPENDIX 4B for test data.

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

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the LTE Band 4 as per 47 CFR 2.1049, CFR 27.53 and RSS-GEN, 4.6. The EUT was measured on the low, middle and high channels in all bandwidths and both modulations. The worst case occupied bandwidth was 17.94 MHz on the high channel in 20MHz BW, 100 RBs and 16QAM modulation.
See Appendix 5A for test data

The BlackBerry® smartphone met the requirements of the Tx Peak to Average Ratio in the LTE Band 4 as per 47 CFR 27.50 (5)(d) and RSS-139, 6.4. The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 4 with QPSK and 16-QAM modulations. Different RB allocations were also investigated, a minimum one RB case was also tested. The worst case Peak to Average Ratio was 11.32 dB on middle channel in 10MHz bandwidth with 50 RBs.
See APPENDIX 5A for test data

The BlackBerry® smartphone met the requirements of the Frequency Stability in the LTE Band 4 as per 47 CFR 2.1055, CFR 27.54 and RSS-139, 6.3. The EUT was measured in LTE Band 4 mode on the low, middle and high channels in 20MHz BW with 100 RBs and QPSK modulation.
See APPENDIX 5B for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 13 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 13 with QPSK and 16-QAM modulations. Different RB allocations were investigated, a minimum one RB case was also tested. The frequency range investigated was from 30 MHz to 20 GHz.
See Appendix 6A for test data

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the LTE Band 13 as per 47 CFR 2.1049, CFR 27.53. The EUT was measured on the low, middle and high channels. The worst case occupied bandwidth was 8.973 MHz on the low channel in 10MHz BW, 50 RBs 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 13 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 13 with QPSK and 16-QAM modulations. Different RB allocations were also investigated, a minimum one RB case was also tested. The worst case Peak to Average Ratio was 9.51 dB on middle channel in 10MHz bandwidth with 100 RBs.
See APPENDIX 6A for test data

The BlackBerry® smartphone met the requirements of the Frequency Stability in the LTE Band 13 as per 47 CFR 2.1055, CFR 27.54. The EUT was measured in LTE Band 13 mode on the low, middle and high channels in 20MHz BW with 100 RB and QPSK modulation.
See APPENDIX 6B for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 17 as per 47 CFR 2.1051, CFR 27.53. The EUT was measured on the low, middle and high channels in 5MHz and 10MHz, bandwidths for LTE Band 17 with QPSK and 16-QAM modulations. Different RB allocations were investigated, a minimum one RB case was also tested. The frequency range investigated was from 30 MHz to 20 GHz.
See Appendix 7A 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 8.973MHz on the low channel in 10MHz BW, 50 RBs and 16-QAM modulation.
See Appendix 7A for test data

The BlackBerry® smartphone met the requirements of the Tx Peak to Average Ratio in the LTE Band 17 as per 47 CFR 27.50 (5)(d). The EUT was measured on the low, middle and high channels in 5MHz and 10MHz bandwidths for LTE Band 17 with QPSK and 16-QAM modulations. Different RB allocations were also investigated, a minimum one RB case was also tested. The worst case Peak to Average Ratio was 10.48 dB on middle channel in 10MHz bandwidth with 100 RBs.
See APPENDIX 7A for test data

The BlackBerry® smartphone met the requirements of the Frequency Stability in the LTE Band 17 as per 47 CFR 2.1055, CFR 27.54. The EUT was measured in LTE Band 17 mode on the low, middle and high channels in 20MHz BW with 100 RBs and QPSK modulation.
See APPENDIX 7B for test data.

2) Radiated Emission Measurements

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

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

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

a) The radiated spurious emissions/harmonics and ERP/EIRP were measured for GSM 850 and PCS 1900. The results are within the limits.

- The highest ERP in the 850 band Call mode measured was 28.82 dBm (0.76 W) at 848.80 MHz (channel 251)

- The highest ERP in the 850 band EDGE mode measured was 26.23 dBm (0.42 W) at 824.20 MHz (channel 128).

- The highest EIRP in the PCS band Call mode measured was 28.69 dBm (0.74 W) at 1880.00 MHz (channel 661).

- The highest EIRP in the PCS band EDGE mode measured was 27.37 dBm (0.55 W) at 1880.00 MHz (channel 661).

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 15.7 dB below the limit at 1672.84 MHz in Call mode in band GSM850.
- The worst margin was 22.7 dB below the limit at 2509.45 MHz in EDGE mode in band GSM850.
- All margins in the PCS1900 for harmonic emissions were at least 25 dB below the limit for all test frequencies in CALL mode.
- All margins in the PCS1900 for harmonic emissions were at least 25 dB below the limit for all test frequencies in EDGE mode.

See Appendix 1C for test data.

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

- The highest ERP in the WCDMA band V, Call Service mode was 22.55 dBm (0.18 W) at 826.40 MHz (channel 4132).
- The highest ERP in the WCDMA band V, HSUPA mode was 21.38 dBm (0.14 W) at 826.40 MHz (channel 4132).
- The highest EIRP in the WCDMA band II, Call Service mode measured was 25.53 dBm (0.36 W) at 1852.4 MHz (channel 9262).
- The highest EIRP in the WCDMA band II, HSUPA mode measured was 23.64 dBm (0.23 W) at 1852.4 MHz (channel 9262).
- The highest EIRP in the WCDMA band IV, Call Service mode measured was 26.60 dBm (0.46 W) at 1712.4 MHz (channel 1312).
- The highest EIRP in the WCDMA band IV, HSUPA mode measured was 25.51 dBm (0.36 W) at 1712.4 MHz (channel 1312).

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

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

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

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

See Appendix 2C for test data.

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

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

- The highest EIRP in the LTE Band 2 measured was 25.49 dBm (0.35 W) at 1860.00 MHz (channel 18700) in 20 MHz BW, 1 RB and QPSK modulation and
- The highest EIRP in the LTE Band 2 measured was 24.39 dBm (0.27 W) at 1860.00 MHz (channel 18700) in 20 MHz BW, 1 RB and 16-QAM modulation.

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

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

See Appendix 3C for test data.

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

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

- The highest EIRP in the LTE Band 5 measured was 21.18 dBm (0.13 W) at 834.00 MHz (channel 20500) in 10 MHz BW, 1 RB and QPSK modulation.

- The highest EIRP in the LTE Band 5 measured was 20.11 dBm (0.10 W) at 834.00 MHz (channel 20500) in 10 MHz BW, 1 RB and 16-QAM modulation.

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

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

See Appendix 4C for test data.

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

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

- The highest EIRP in the LTE Band 4 measured was 26.54 dBm (0.45 W) at 1720.00 MHz (channel 20050) in 20MHz BW, 1 RB and QPSK modulation.
- The highest EIRP in the LTE Band 4 measured was 25.63 dBm (0.37 W) at 1720.00 MHz (channel 20050) in 20MHz BW, 1 RB and 16-QAM modulation.

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

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

See Appendix 5C for test data.

f) The radiated spurious emissions/harmonics and ERP were measured for LTE Band 13.

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. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

- The highest EIRP in the LTE band 13 measured was 20.32 dBm (0.11 W) at 784.40 MHz (channel 23254) in 5MHz BW, 25 RB and QPSK modulation.
- The highest EIRP in the LTE band 13 measured was 19.46 dBm (0.09 W) at 784.40 MHz (channel 23254) in 5MHz BW, 25 RB and 16-QAM modulation.

The radiated carrier harmonics were measured up to the 10th harmonic. The EUT was measured on the low, middle and high channels in the worst bandwidth 10MHz bandwidth for LTE Band 13 with QPSK and 16-QAM modulations as per conducted

power. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

- All margins in the LTE Band 13 for harmonic emissions were at least 25 dB below the limit for all test frequencies.

See Appendix 6C for test data.

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

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

- The highest EIRP in the LTE band 17 measured was 16.06 dBm (0.04 W) at 709.00 MHz (channel 23780) in 10MHz BW, 1 RB and QPSK modulation.
- The highest EIRP in the LTE band 17 measured was 15.38 dBm (0.03 W) at 709.00 MHz (channel 23780) in 10MHz BW, 1 RB and 16-QAM 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 the worst bandwidth 10 MHz bandwidth for LTE Band 17 with QPSK and 16-QAM modulations as per conducted power. Worst RB case was tested. Both the horizontal and vertical polarizations were measured.

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

See Appendix 7C 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) + 802.11ac
- WCDMA Band II + Bluetooth(3DH5)+ 802.11n(2.4GHz).
- WCDMA Band IV + Bluetooth(DH5) + 802.11b
- WCDMA Band V + Bluetooth(DH5) + 802.11a
- LTE B2 + Bluetooth(2DH5) + 802.11b
- LTE B4 + Bluetooth(3DH5) + 802.11g
- LTE B5 + Bluetooth(DH5) + 802.11n(2.4GHz)
- LTE B13 + Bluetooth(3DH5) + 802.11n(2.4GHz)
- LTE B17 + Bluetooth(DH5) + 802.11a

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

Sample Calculation:

Corrected Signal level (CSL) is calculated as follows:
CSL (dBm) = Measured Level (dBµV) – Antenna Gain (dBi) + Free Space loss (dB) – 107(dB) + Cable Loss (dB) - Preamp (dB) + Filter Loss (dB) -2.15(dB)

Measurement Uncertainty ±4.3 dB

G. Compliance Test Equipment Used

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

Compliance Test Equipment Used cont'd

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

H. Test Software used

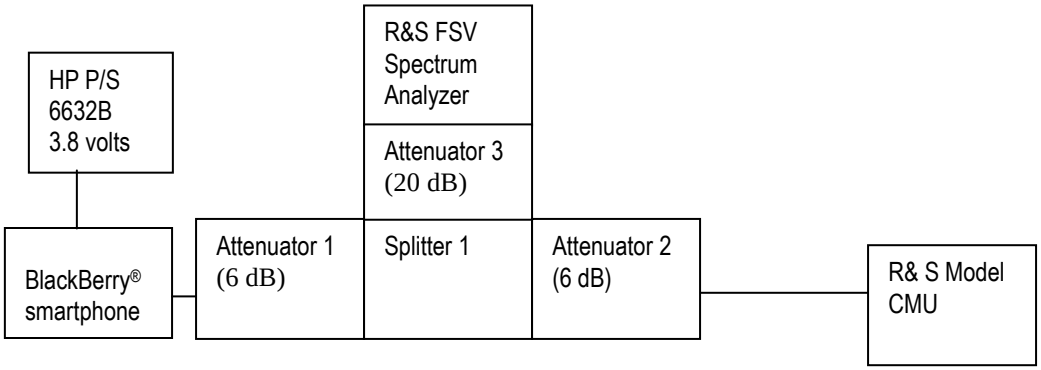
SOFTWARE	COMPANY	VERSION	USE
EMC32	Rohde & Schwarz	8.53.0	Radiated Emissions
TDK Standard Emission Test	TDK RF Solutions	8.53.1.62	Radiated Emissions

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

GSM Conducted RF Emission Test Data

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

Test Setup Diagram



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

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

The environmental test conditions were:

Temperature: 25.1 ºC
Relative Humidity: 41.3 %

The following measurements were performed by Chuan.

GSM Conducted RF Emission Test Data cont'd

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

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each carrier frequency of low, middle and high, the modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth.
The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.
The worst case –26dBc bandwidth for the GSM850 band was measured to be 275kHz, and for the PCS1900 band was measured to be 272kHz as shown below. Results were derived in a 3.0 kHz resolution bandwidth.
On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

Test Data for GSM850 band and PCS1900 band in Call mode

GSM850 band Frequency (MHz)	-26dBc Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
824.2	274	**246**
837.6	269	243
848.8	275	243

PCS1900 band Frequency (MHz)	-26dBc Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
1850.2	264	**245**
1880.0	270	243
1909.8	272	243

Measurement Plots for 850 and 1900 bands in Call mode

See Figures 1-1a to 1-12a for the plots of the conducted spurious emissions.
See Figures 1-13a to 1-24a for the plots of 26dBc/99% Occupied Bandwidth.
See Figures 1-25a to 1-28a for the plots of the Channel mask.
See figures 1-51a to 1-53a for the plots of Peak to Average Ratio.

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	243
848.8	**245**

PCS1900 band Frequency (MHz)	99% Occupied Bandwidth (kHz)
1850.2	**245**
1880.0	241
1909.8	**245**

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

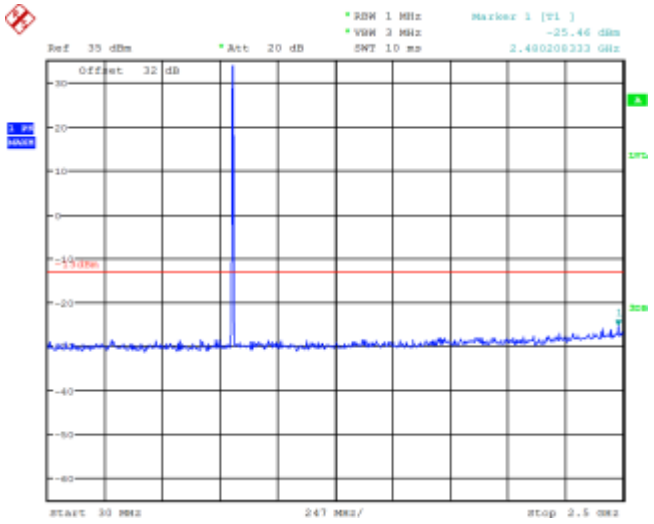


Figure 1-1a: GSM850 band, Spurious Conducted Emissions, Low channel

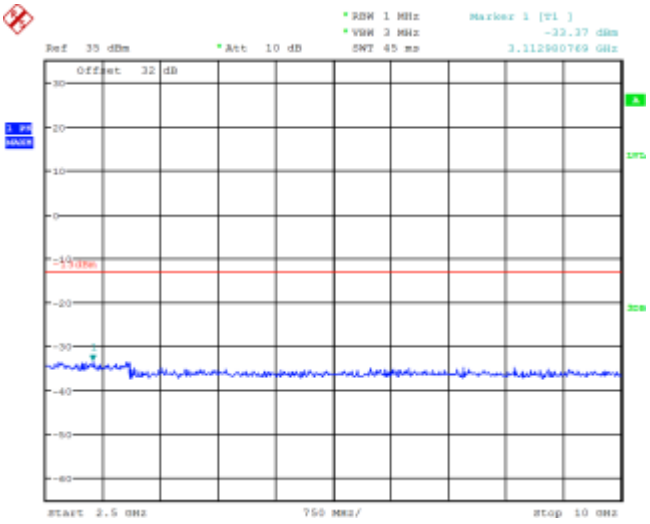


Figure 1-2a: GSM850 band, Spurious Conducted Emissions, Middle Channel

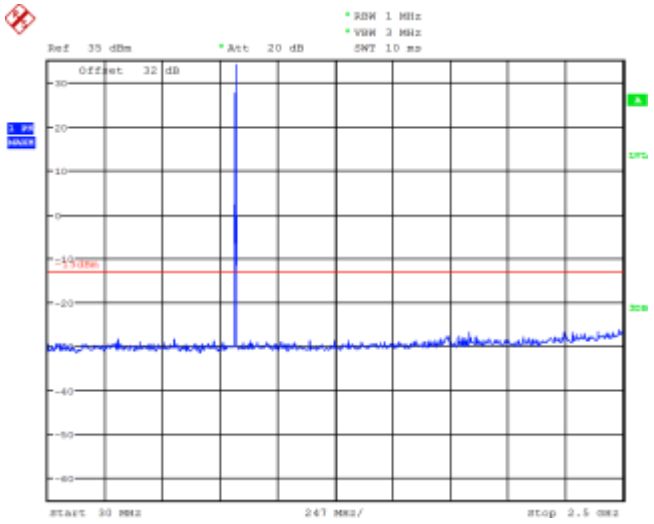
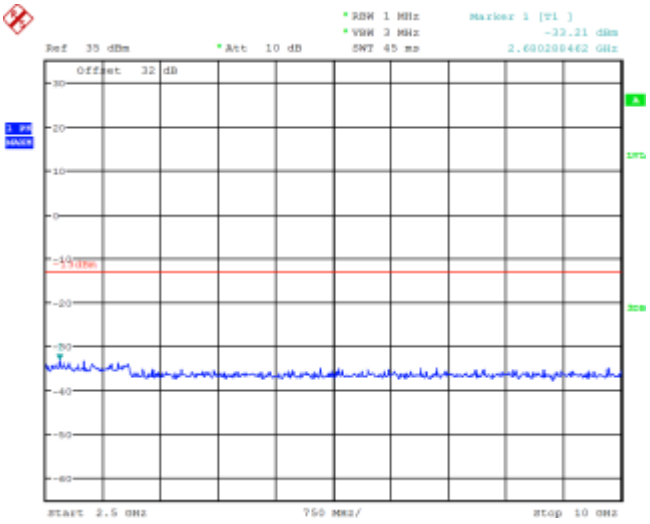


Figure 1-3a: GSM850 band, Spurious Conducted Emissions, Middle Channel



GSM Conducted RF Emission Test Data cont'd

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

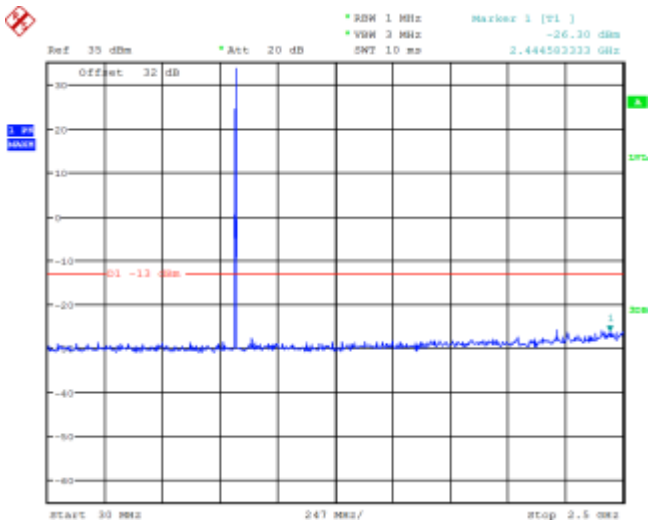


Figure 1-5a: GSM850 band, Spurious Conducted Emissions, High Channel

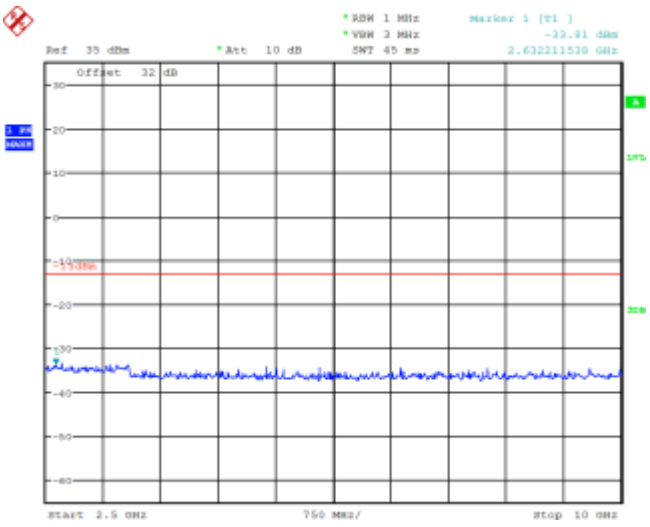


Figure 1-7a: PCS1900 band, Spurious Conducted Emissions, Low Channel

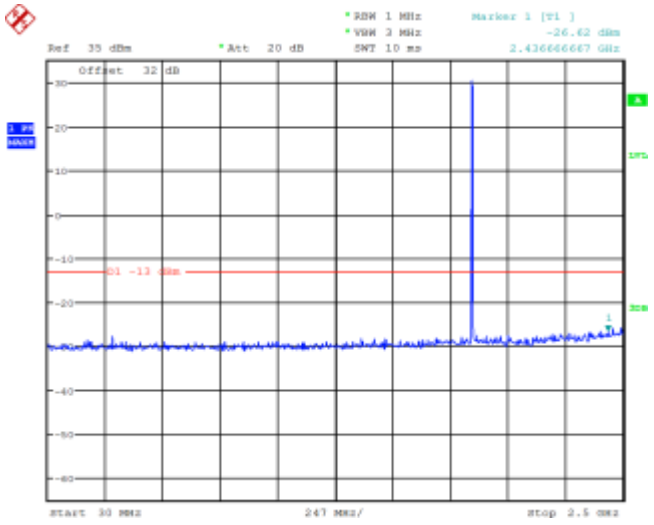
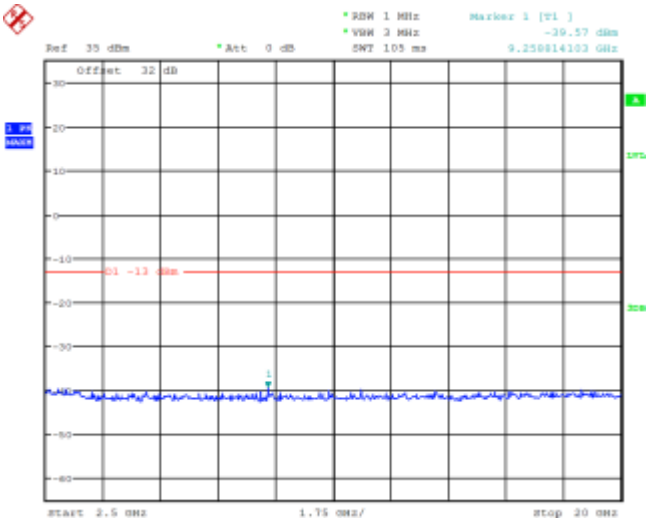


Figure 1-8a: PCS1900 band, Spurious Conducted Emissions, Low Channel



GSM Conducted RF Emission Test Data cont'd

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

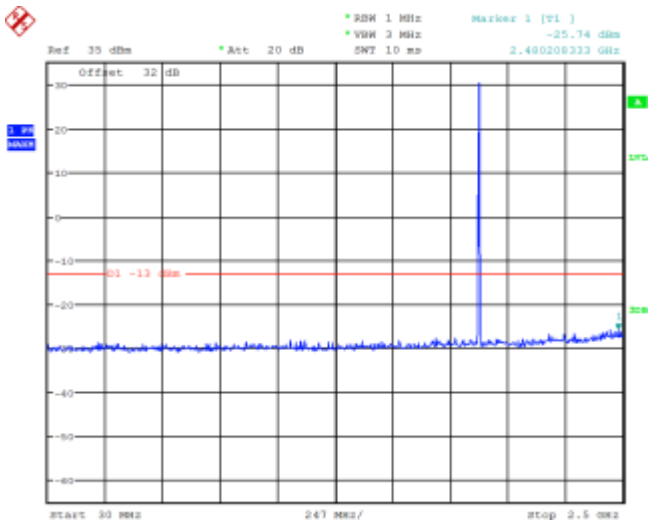


Figure 1-10a: PCS1900 band, Spurious Conducted Emissions, Middle Channel

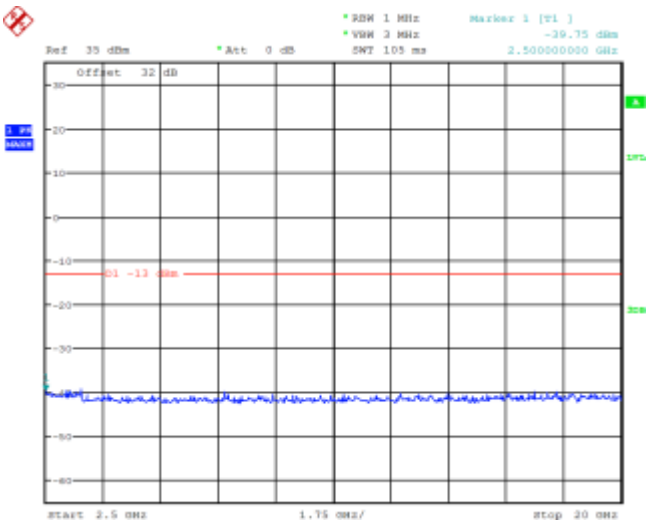


Figure 1-11a: PCS1900 band, Spurious Conducted Emissions, High Channel

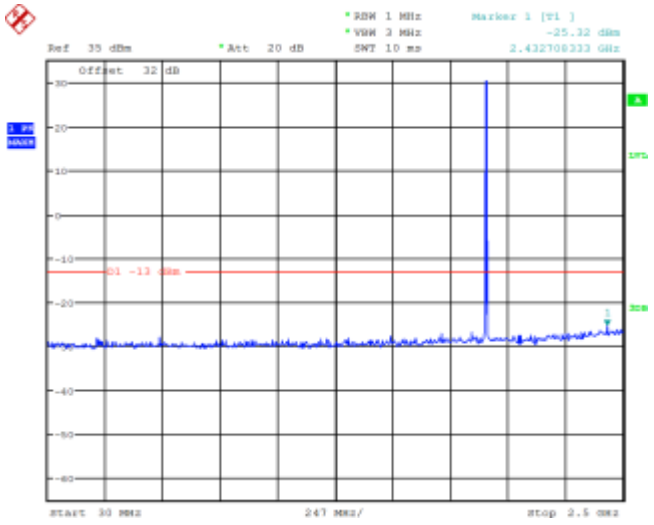
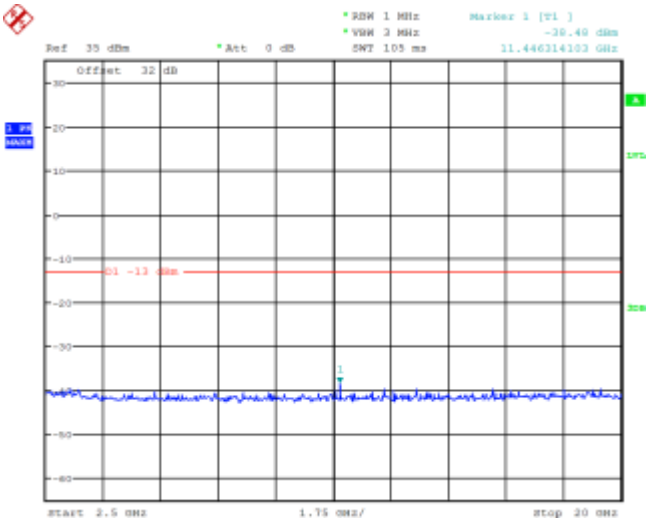


Figure 1-12a: PCS1900 band, Spurious Conducted Emissions, High Channel



GSM Conducted RF Emission Test Data cont'd

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

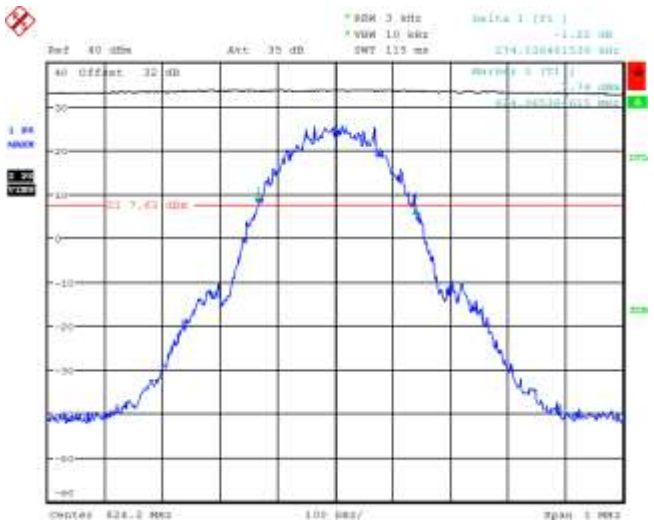


Figure 1-14a: Occupied Bandwidth, GSM850 band Low Channel in GSM mode

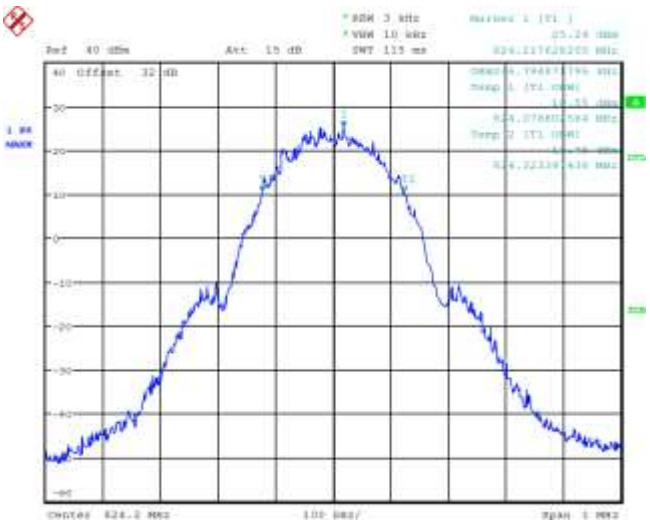


Figure 1-15a: -26dBc bandwidth, GSM850 band Middle Channel in GSM mode

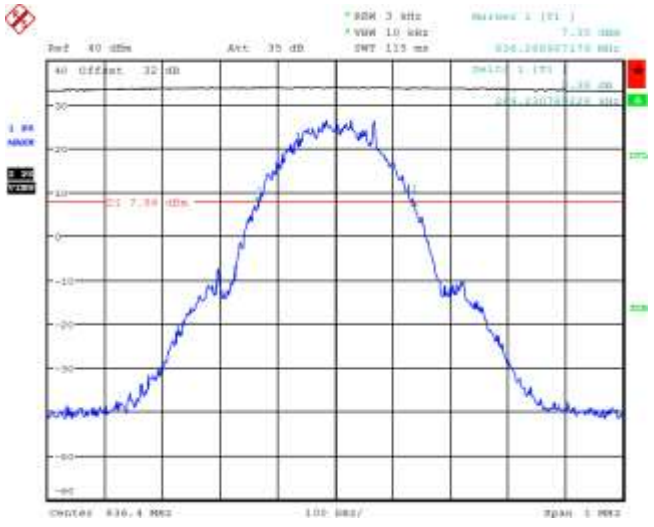
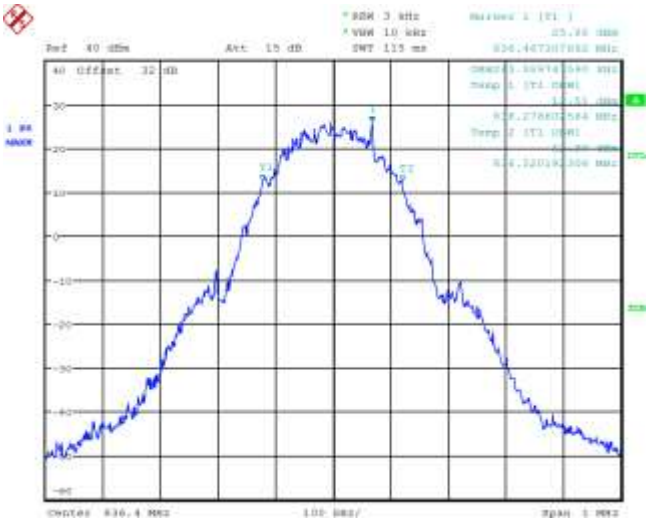


Figure 1-16a: Occupied Bandwidth, GSM850 band Middle Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

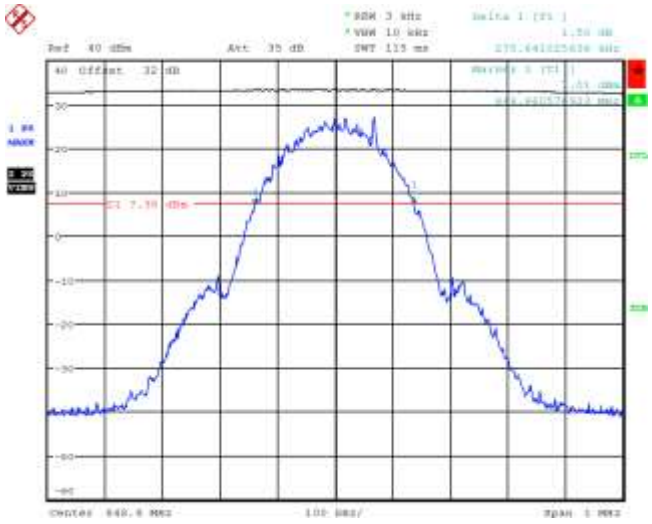


Figure 1-18a: Occupied Bandwidth, GSM850 band High Channel in GSM mode

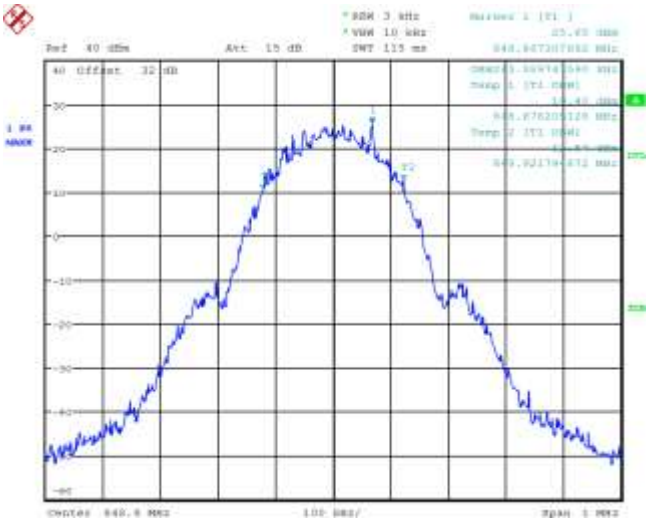


Figure 1-19a: -26dBc bandwidth, PCS1900 Low Channel in GSM mode

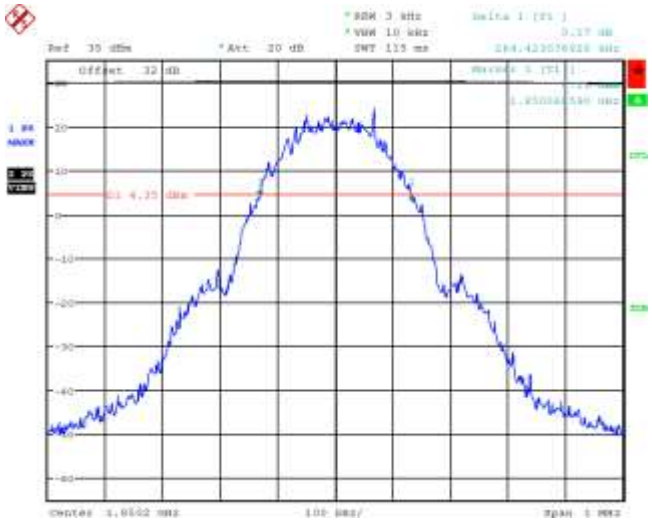
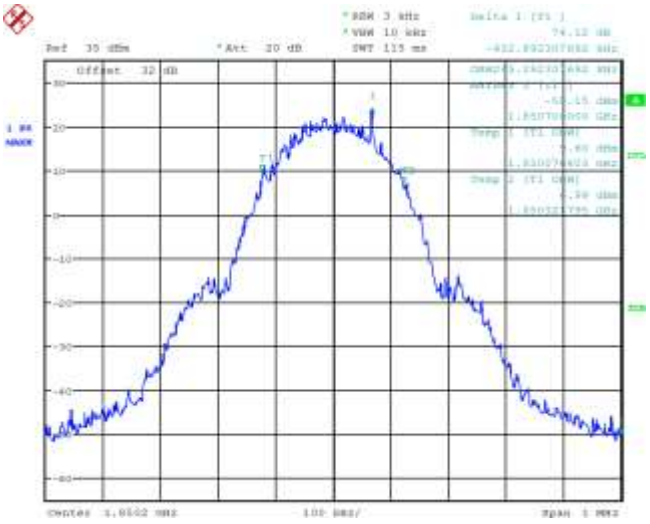


Figure 1-20a: Occupied Bandwidth, PCS1900 Low Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

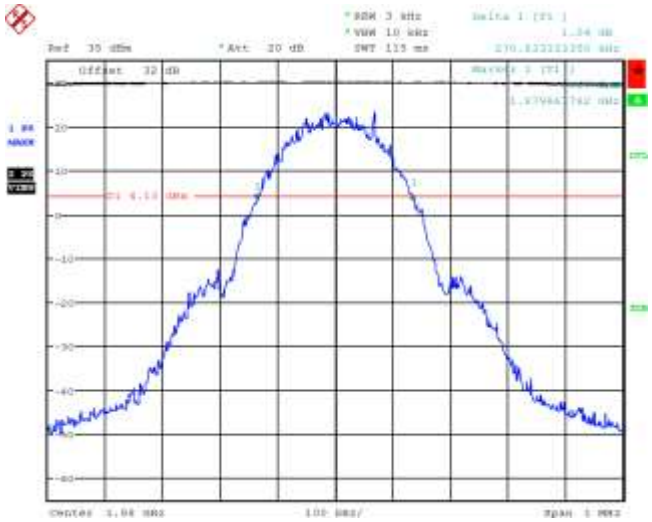


Figure 1-22a: Occupied Bandwidth, PCS1900 Middle Channel in GSM mode

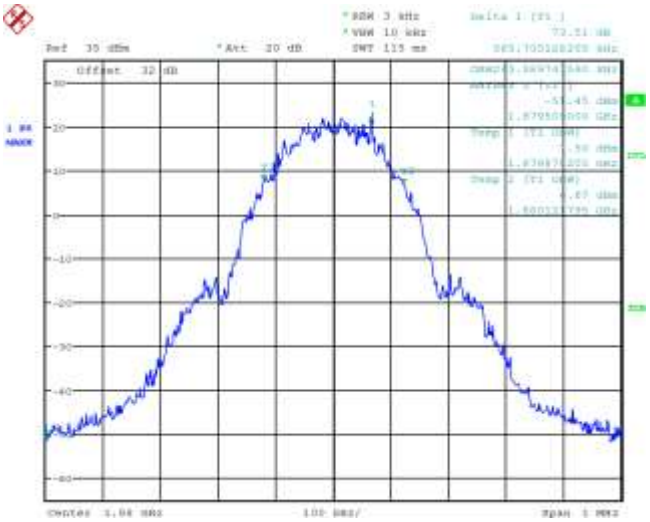


Figure 1-23a: -26dBc bandwidth, PCS1900 High Channel in GSM mode

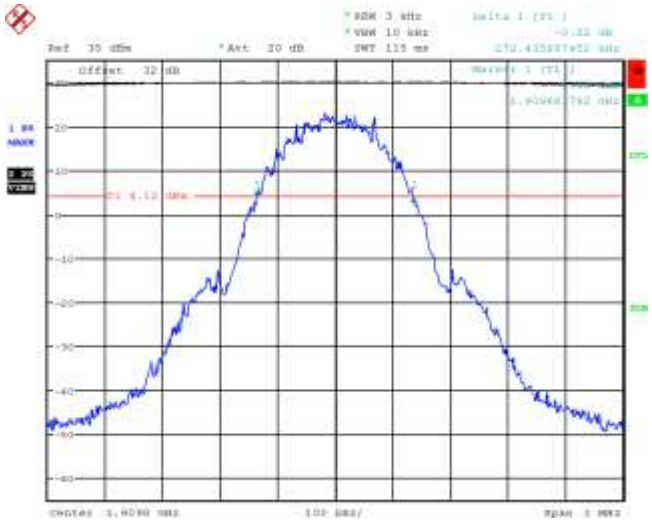
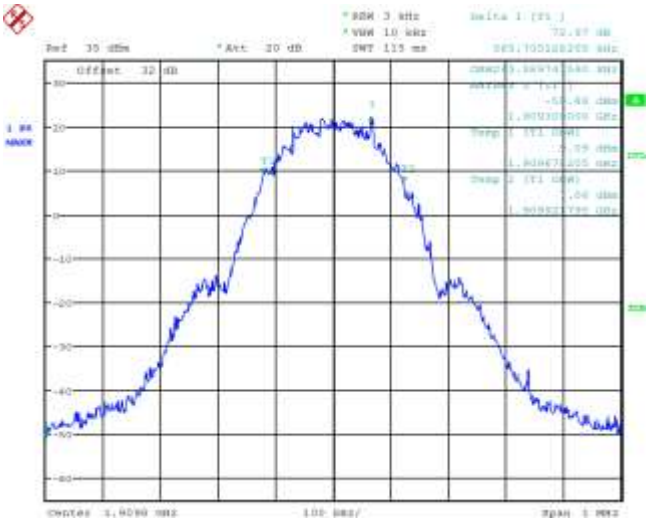


Figure 1-24a: Occupied Bandwidth, PCS1900 High Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

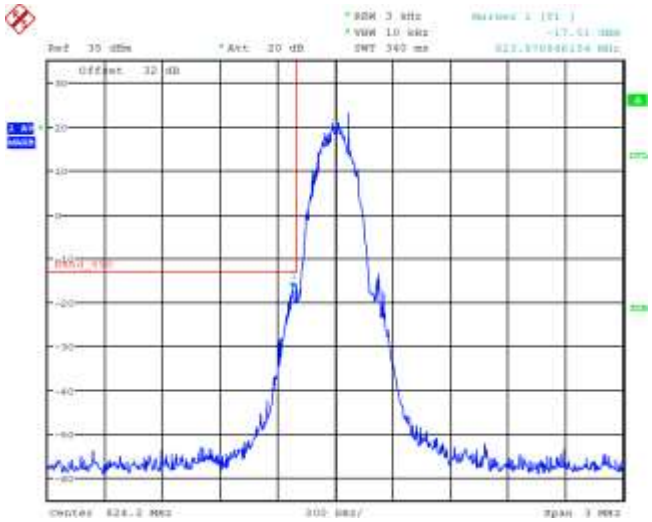


Figure 1-26a: GSM850 band High Channel Mask in GSM mode

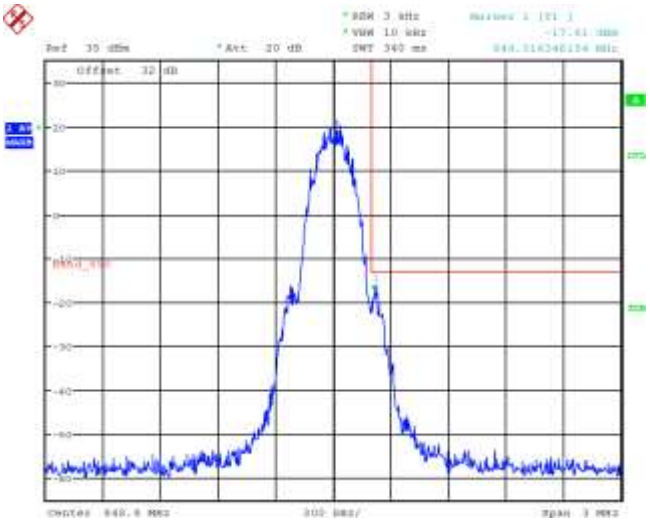


Figure 1-27a: PCS1900, Low Channel Mask in GSM mode

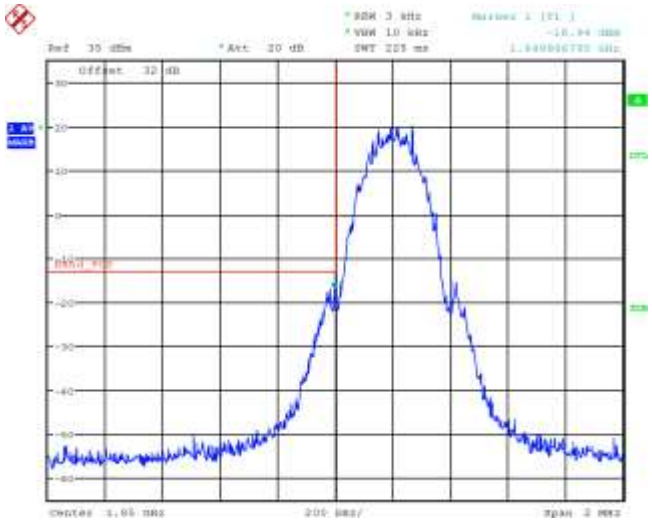
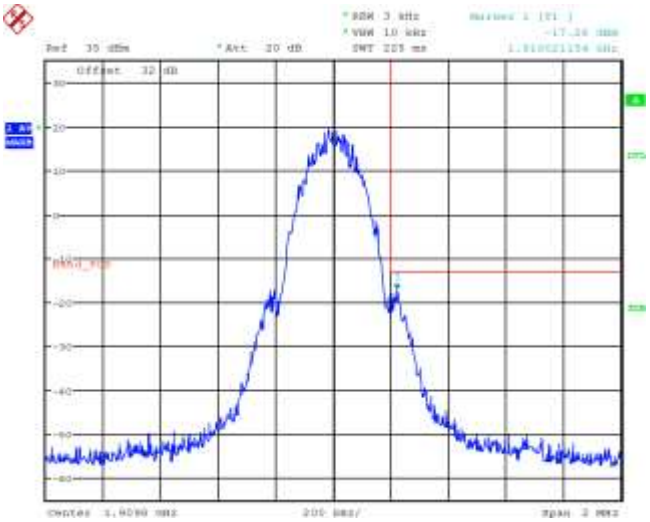


Figure 1-28a: PCS1900, High Channel Mask in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

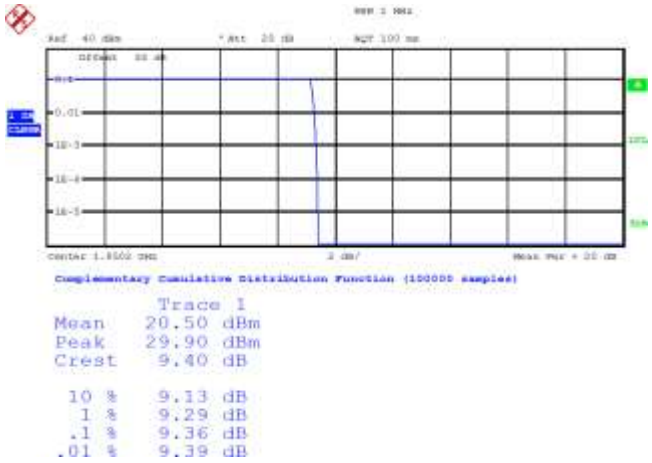


Figure 1-52a: PCS1900 Band, PAR Mid Channel

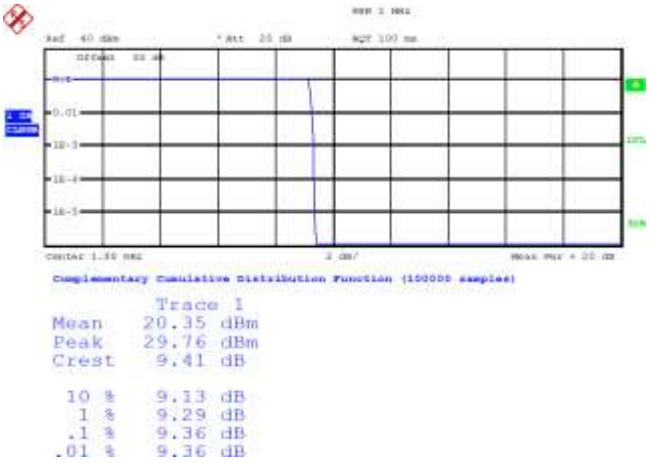
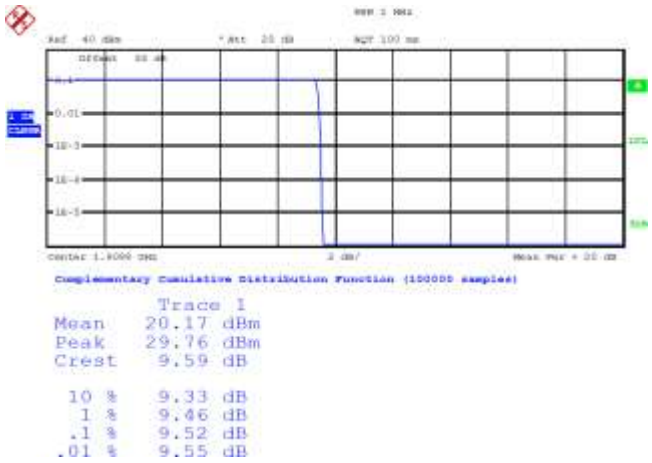


Figure 1-53a: PCS1900 Band, PAR High Channel



GSM Conducted RF Emission Test Data cont'd

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

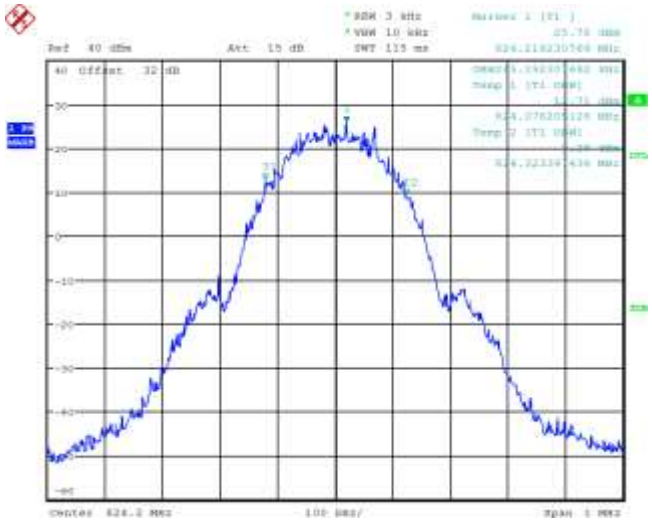


Figure 1-30a: Occupied Bandwidth, GSM850 Band, Middle Channel in EDGE mode

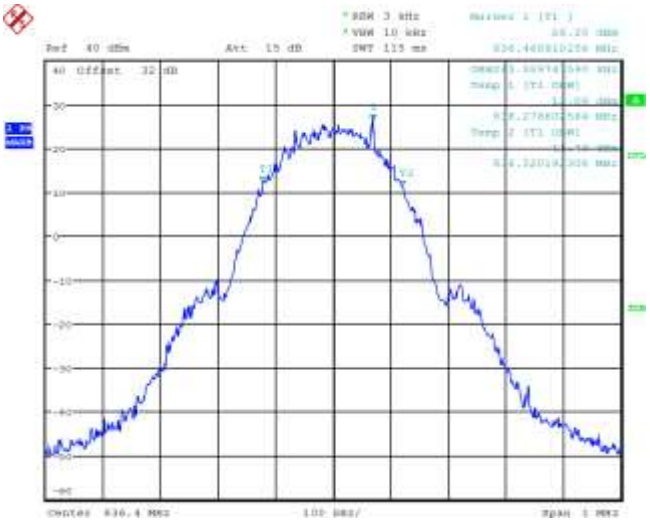


Figure 1-31a: Occupied Bandwidth, GSM850 band, High Channel in EDGE mode

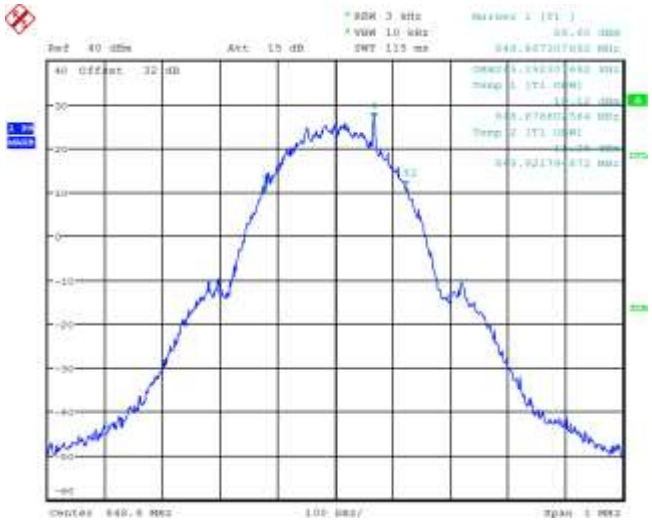
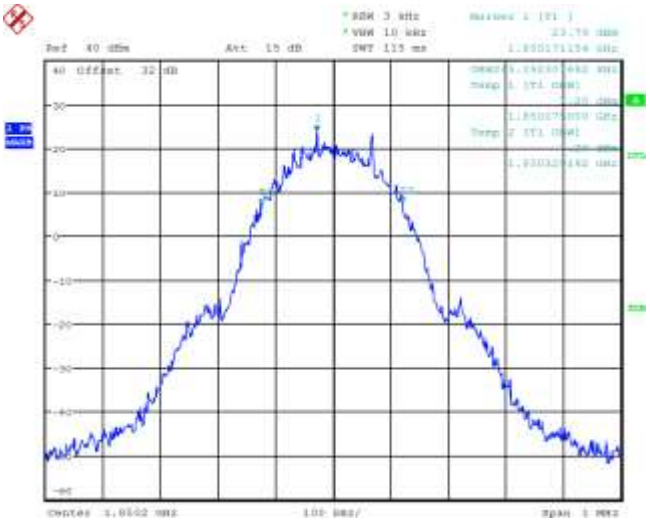


Figure 1-32a: Occupied Bandwidth, PCS1900 Band, Low Channel in EDGE mode



GSM Conducted RF Emission Test Data cont'd

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

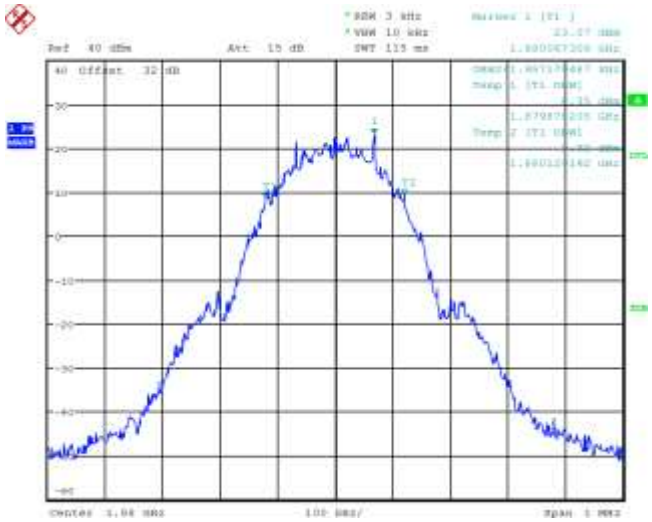


Figure 1-34a: Occupied Bandwidth, PCS1900 Band, High Channel in EDGE mode

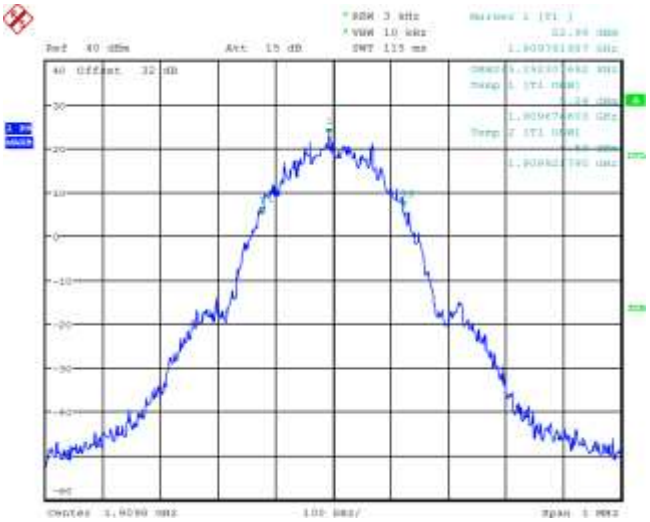


Figure 1-35a: GSM850 Band, Low Channel Mask in EDGE mode

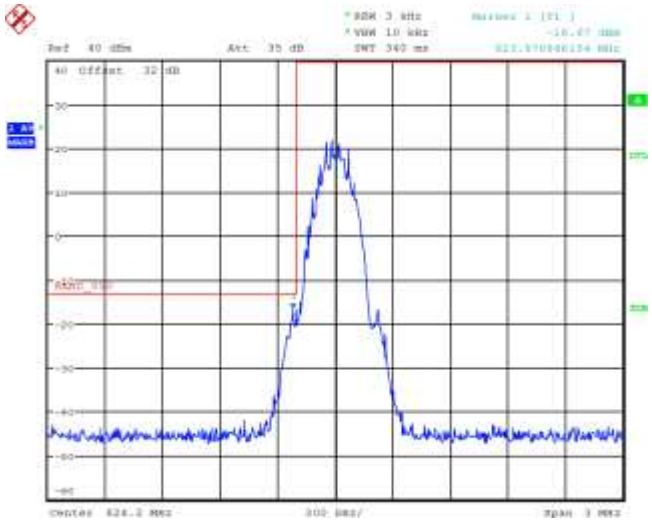
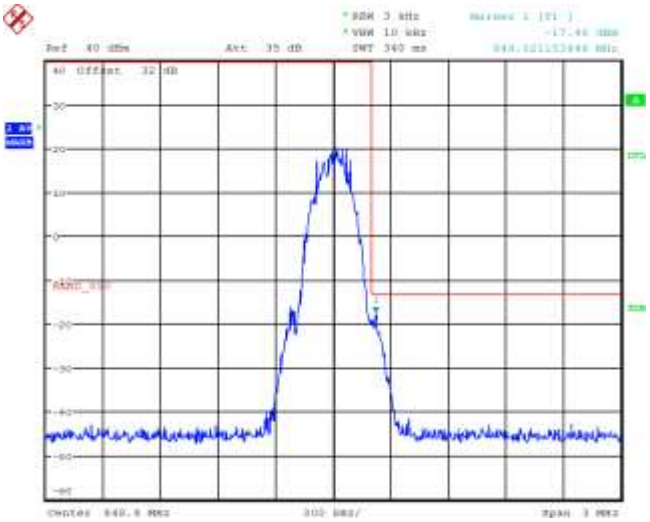


Figure 1-36a: GSM850 Band, High Channel Mask in EDGE mode



GSM Conducted RF Emission Test Data cont'd

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

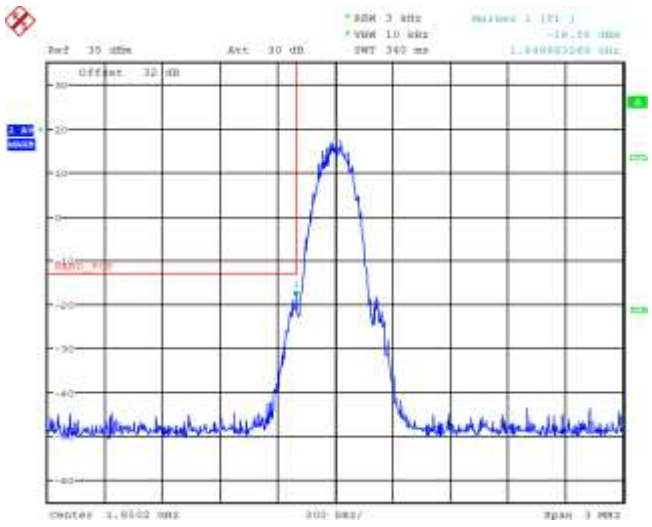
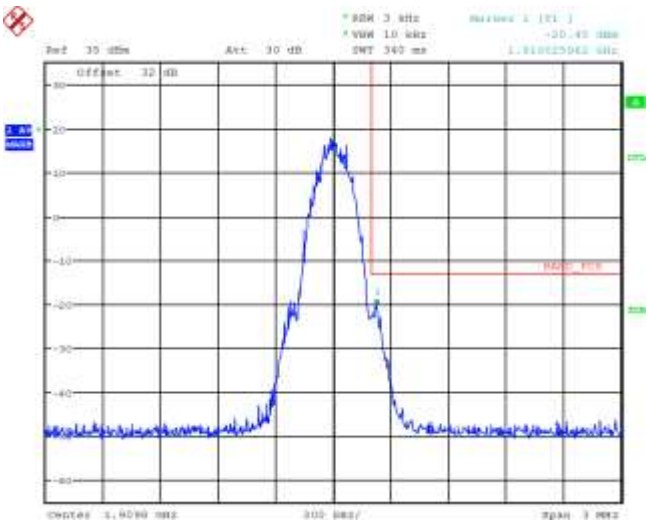


Figure 1-38a: PCS1900 Band, High Channel Mask in EDGE mode



GSM Conducted RF Emission Test Data cont'd

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

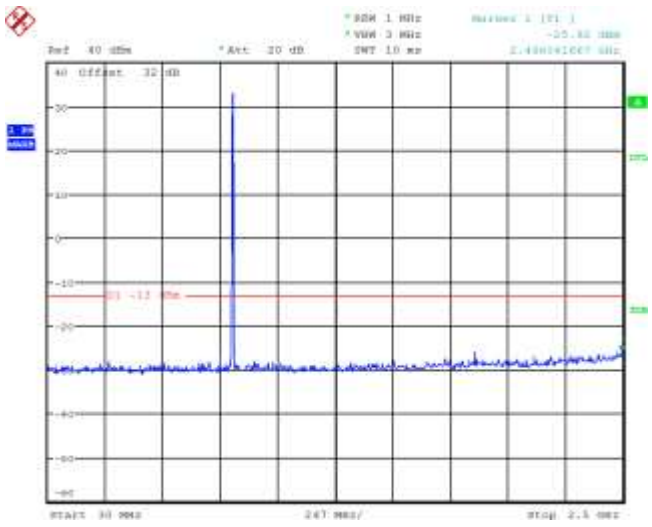


Figure 1-40a: GSM850 band, Spurious Conducted Emissions, Low channel in Edge Mode

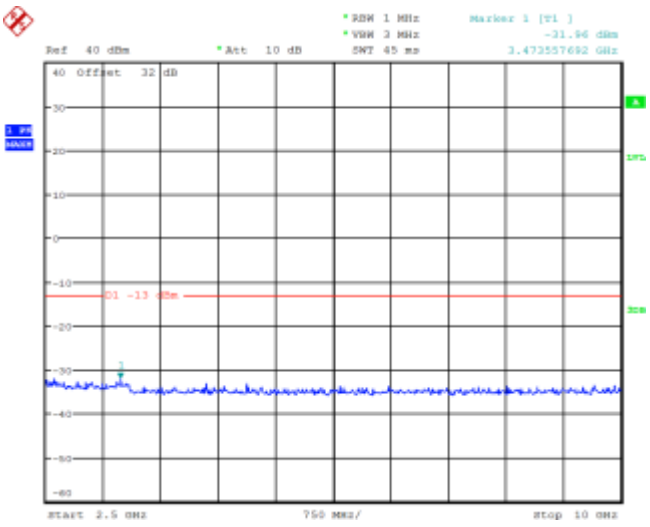


Figure 1-41a: GSM850 band, Spurious Conducted Emissions, Middle channel in Edge Mode

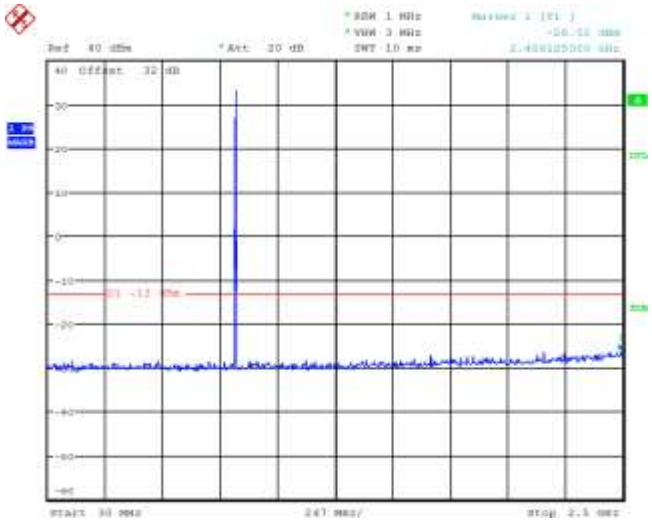
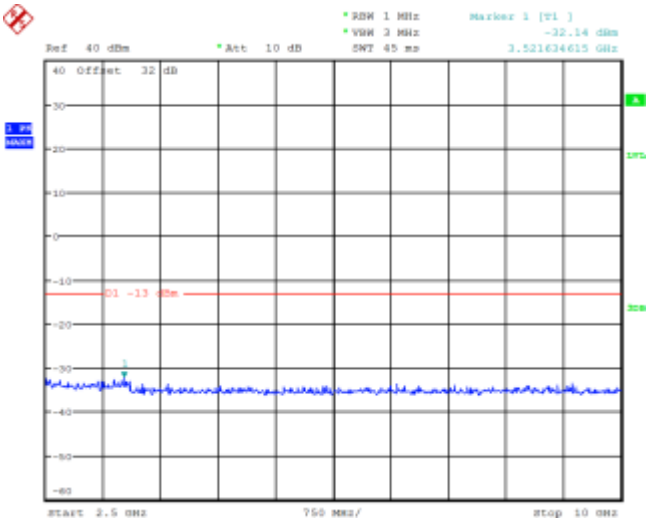


Figure 1-42a: GSM850 band, Spurious Conducted Emissions, Middle channel in Edge Mode



GSM Conducted RF Emission Test Data cont'd

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

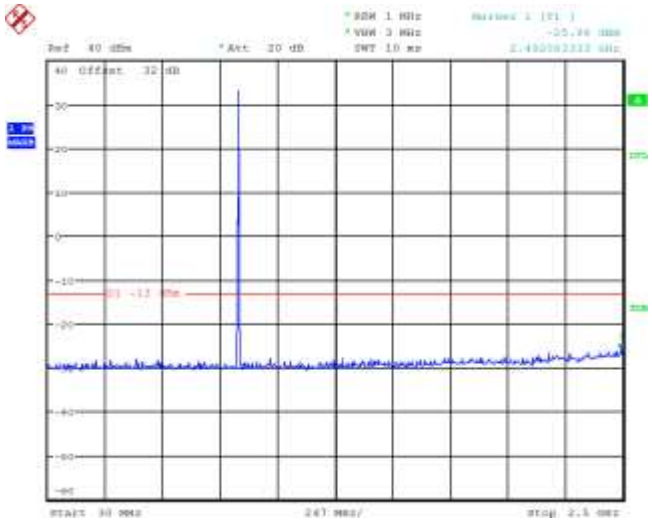


Figure 1-44a: GSM850 band, Spurious Conducted Emissions, High channel in Edge Mode

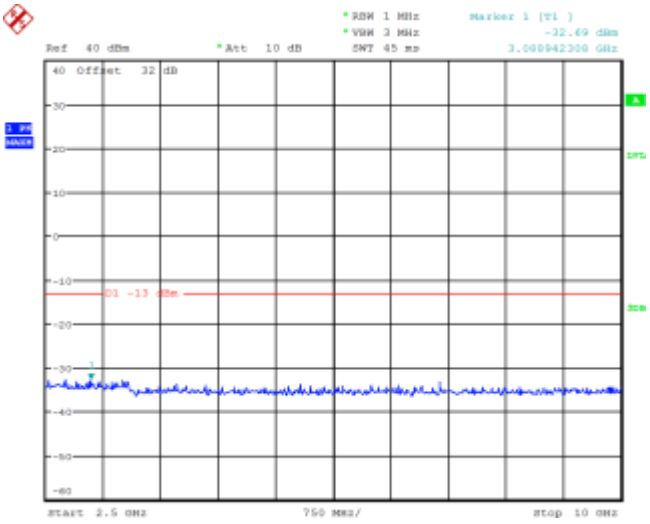


Figure 1-45a: PCS1900 band, Spurious Conducted Emissions, Low channel in Edge Mode

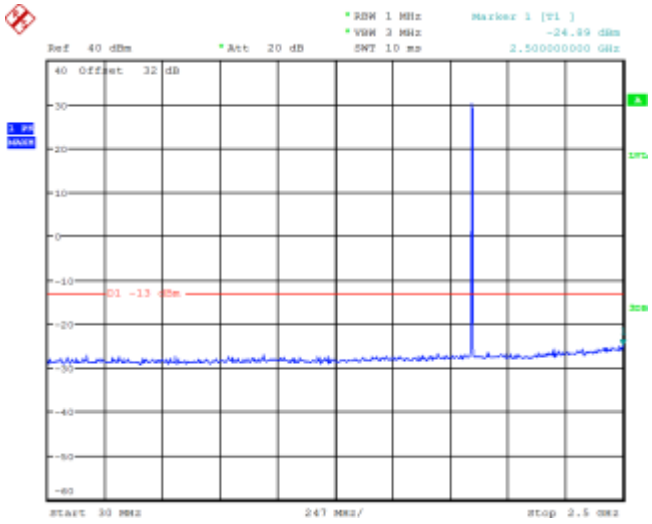
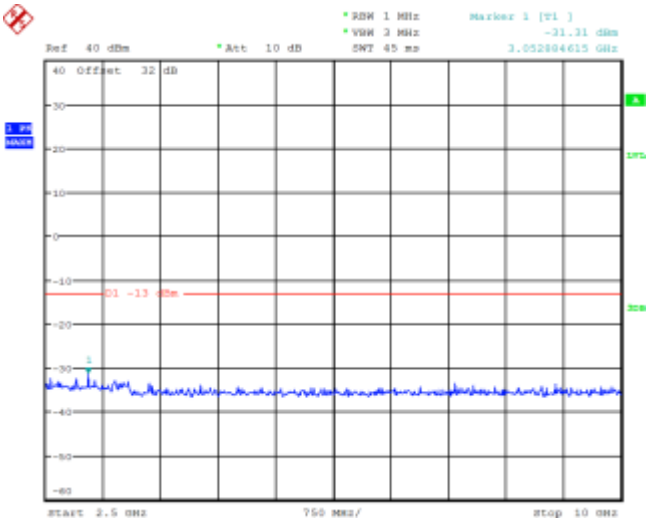


Figure 1-46a: PCS1900 band, Spurious Conducted Emissions, Low channel in Edge Mode



GSM Conducted RF Emission Test Data cont'd

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

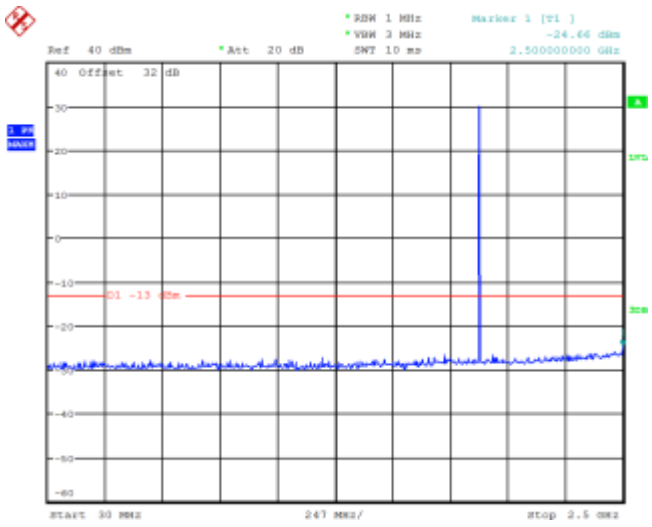


Figure 1-48a: PCS1900 band, Spurious Conducted Emissions, middle channel in Edge Mode

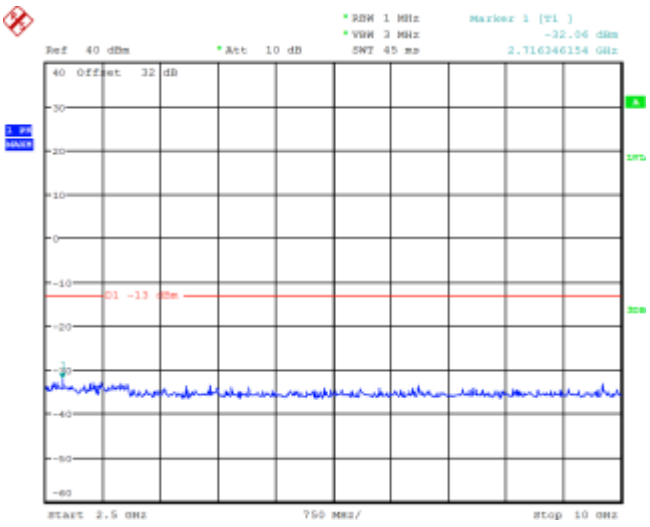


Figure 1-49a: PCS1900 band, Spurious Conducted Emissions, High channel in Edge Mode

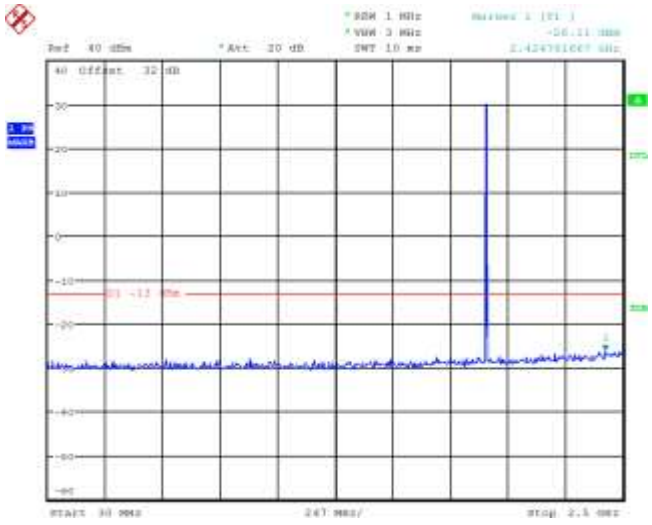
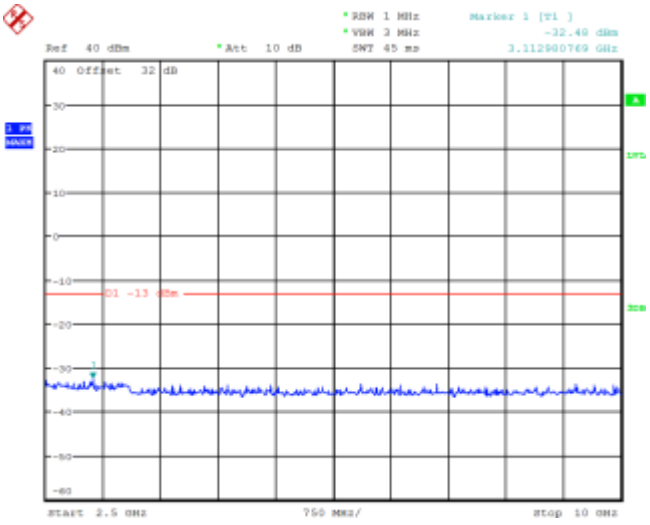
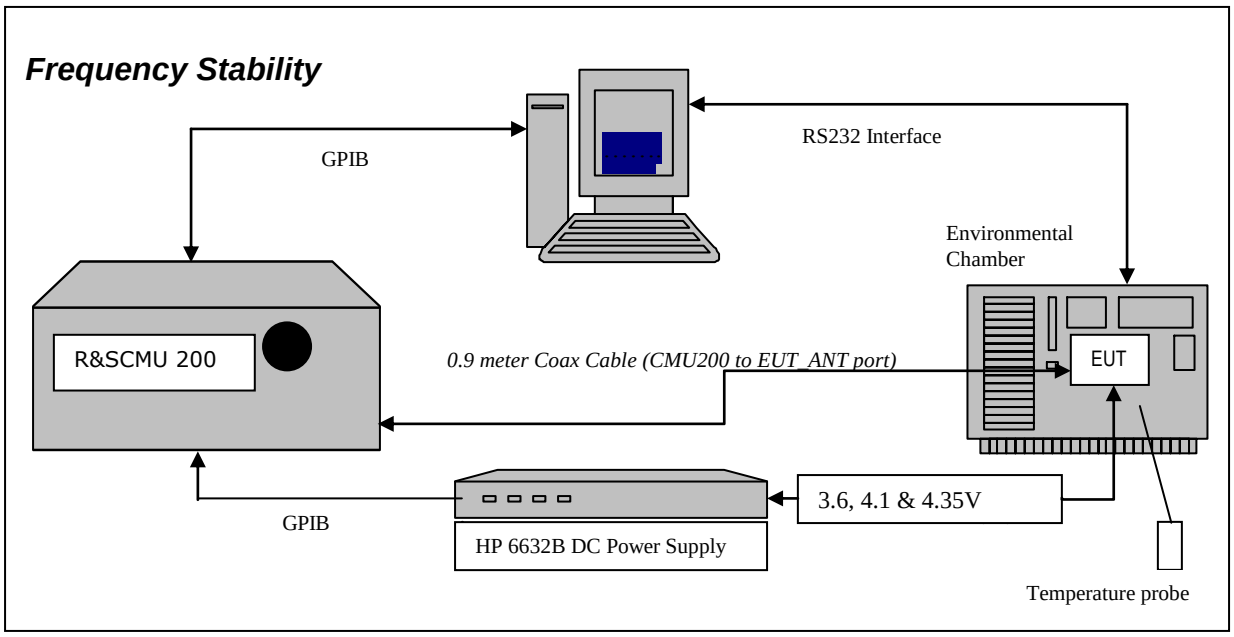


Figure 1-50a: PCS1900 band, Spurious Conducted Emissions, High channel in Edge Mode



APPENDIX 1B – GSM FREQUENCY STABILITY TEST DATA

GSM Frequency Stability Test Data



The following tests were performed on model RFW121LW.

The measurements were performed by Berkin Can.

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2 Required Measurements
2.995 Frequency Stability - Procedures
(a,b) Frequency Stability - Temperature Variation
(d) Frequency Stability - Voltage Variation

24.235 *Frequency Stability*.
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.
The EUT meets the requirements as stated in CFR 47 chapter 1, Section 24.235, CFR 47 chapter 1, Section 22.917 Frequency Stability.
Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-metre coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMU 200 and the EUT antenna port.
Calibration for the Cable Loss was performed in the RF Laboratory using the Agilent power meter and Agilent Signal Generator.

Test setup:

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

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

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

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

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

Procedure:

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

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

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

The maximum frequency error in the GSM850 band measured was -0.0324 PPM.
The maximum frequency error in the PCS1900 band measured was -0.0359 PPM.

Date of Test: June 18, 2013

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	-12.40	-0.0150
189	836.40	3.6	20	-12.91	-0.0154
251	848.60	3.6	20	-15.11	-0.0178

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.1	20	-9.17	-0.0111
189	836.40	4.1	20	-8.52	-0.0102
251	848.60	4.1	20	-7.30	-0.0086

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.35	20	7.10	0.0086
189	836.40	4.35	20	-7.04	-0.0084
251	848.60	4.35	20	-5.75	-0.0068

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	-20.28	-0.0246
128	824.20	3.6	-20	-7.68	-0.0093
128	824.20	3.6	-10	8.01	0.0097
128	824.20	3.6	0	15.82	0.0192
128	824.20	3.6	10	7.17	0.0087
128	824.20	3.6	20	-12.40	-0.0150
128	824.20	3.6	30	-7.62	-0.0092
128	824.20	3.6	40	20.60	0.0250
128	824.20	3.6	50	-4.84	-0.0059
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
128	824.20	4.1	-30	-14.92	-0.0181
128	824.20	4.1	-20	-12.91	-0.0157
128	824.20	4.1	-10	14.21	0.0172
128	824.20	4.1	0	7.88	0.0096
128	824.20	4.1	10	9.17	0.0111
128	824.20	4.1	20	-9.17	-0.0111
128	824.20	4.1	30	-11.17	-0.0136
128	824.20	4.1	40	19.37	0.0235
128	824.20	4.1	50	-5.42	-0.0066
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
128	824.20	4.35	-30	-24.73	-0.0300
128	824.20	4.35	-20	-11.49	-0.0139
128	824.20	4.35	-10	14.79	0.0179
128	824.20	4.35	0	10.33	0.0125
128	824.20	4.35	10	8.46	0.0103
128	824.20	4.35	20	7.10	0.0086
128	824.20	4.35	30	-13.56	-0.0165
128	824.20	4.35	40	16.40	0.0199
128	824.20	4.35	50	4.97	0.0060

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	-20.21	-0.0242
189	836.40	3.6	-20	-5.23	-0.0063
189	836.40	3.6	-10	14.53	0.0174
189	836.40	3.6	0	19.05	0.0228
189	836.40	3.6	10	7.88	0.0094
189	836.40	3.6	20	-12.91	-0.0154
189	836.40	3.6	30	-10.14	-0.0121
189	836.40	3.6	40	27.12	**0.0324**
189	836.40	3.6	50	6.91	0.0083
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
189	836.40	4.1	-30	-17.69	-0.0212
189	836.40	4.1	-20	-9.94	-0.0119
189	836.40	4.1	-10	17.76	0.0212
189	836.40	4.1	0	9.69	0.0116
189	836.40	4.1	10	9.81	0.0117
189	836.40	4.1	20	-8.52	-0.0102
189	836.40	4.1	30	-16.14	-0.0193
189	836.40	4.1	40	22.92	0.0274
189	836.40	4.1	50	4.91	0.0059
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
189	836.40	4.35	-30	-25.05	-0.0299
189	836.40	4.35	-20	-5.88	-0.0070
189	836.40	4.35	-10	16.27	0.0195
189	836.40	4.35	0	9.88	0.0118
189	836.40	4.35	10	8.14	0.0097
189	836.40	4.35	20	-7.04	-0.0084
189	836.40	4.35	30	-18.60	-0.0222
189	836.40	4.35	40	16.59	0.0198
189	836.40	4.35	50	5.81	0.0069

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	-5.88	-0.0069
251	848.8	3.6	-20	-7.94	-0.0094
251	848.8	3.6	-10	12.01	0.0141
251	848.8	3.6	0	20.60	0.0243
251	848.8	3.6	10	10.20	0.0120
251	848.8	3.6	20	-15.11	-0.0178
251	848.8	3.6	30	-7.23	-0.0085
251	848.8	3.6	40	25.83	0.0304
251	848.8	3.6	50	5.23	0.0062
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
251	848.8	4.1	-30	-14.85	-0.0175
251	848.8	4.1	-20	-9.94	-0.0117
251	848.8	4.1	-10	16.14	0.0190
251	848.8	4.1	0	14.85	0.0175
251	848.8	4.1	10	7.49	0.0088
251	848.8	4.1	20	-7.30	-0.0086
251	848.8	4.1	30	-8.14	-0.0096
251	848.8	4.1	40	22.21	0.0262
251	848.8	4.1	50	6.46	0.0076
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
251	848.8	4.35	-30	-8.27	-0.0097
251	848.8	4.35	-20	-7.62	-0.0090
251	848.8	4.35	-10	14.85	0.0175
251	848.8	4.35	0	7.81	0.0092
251	848.8	4.35	10	10.91	0.0129
251	848.8	4.35	20	-5.75	-0.0068
251	848.8	4.35	30	18.14	0.0214
251	848.8	4.35	40	14.85	0.0175
251	848.8	4.35	50	4.78	0.0056

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	52.88	0.0286
661	1880.00	3.6	20	60.37	0.0321
810	1909.80	3.6	20	60.96	0.0319

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperatur e (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.1	20	60.96	0.0329
661	1880.00	4.1	20	61.21	0.0326
810	1909.80	4.1	20	63.41	0.0332

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperatur e (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.35	20	66.38	0.0359
661	1880.00	4.35	20	60.18	0.0320
810	1909.80	4.35	20	60.63	0.0317

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	53.92	0.0291
512	1850.20	3.6	-20	51.14	0.0276
512	1850.20	3.6	-10	48.62	0.0263
512	1850.20	3.6	0	53.79	0.0291
512	1850.20	3.6	10	57.15	0.0309
512	1850.20	3.6	20	52.88	0.0286
512	1850.20	3.6	30	53.85	0.0291
512	1850.20	3.6	40	58.18	0.0314
512	1850.20	3.6	50	57.86	0.0313
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
512	1850.20	4.1	-30	45.01	0.0243
512	1850.20	4.1	-20	62.12	0.0336
512	1850.20	4.1	-10	51.01	0.0276
512	1850.20	4.1	0	57.08	0.0309
512	1850.20	4.1	10	62.18	0.0336
512	1850.20	4.1	20	60.96	0.0329
512	1850.20	4.1	30	54.24	0.0293
512	1850.20	4.1	40	65.02	0.0351
512	1850.20	4.1	50	58.95	0.0319
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
512	1850.20	4.35	-30	49.85	0.0269
512	1850.20	4.35	-20	53.72	0.0290
512	1850.20	4.35	-10	50.82	0.0275
512	1850.20	4.35	0	55.85	0.0302
512	1850.20	4.35	10	56.95	0.0308
512	1850.20	4.35	20	66.38	**0.0359**
512	1850.20	4.35	30	61.67	0.0333
512	1850.20	4.35	40	58.70	0.0317
512	1850.20	4.35	50	63.73	0.0344

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	50.24	0.0267
661	1880.00	3.6	-20	49.01	0.0261
661	1880.00	3.6	-10	49.78	0.0265
661	1880.00	3.6	0	51.59	0.0274
661	1880.00	3.6	10	58.76	0.0313
661	1880.00	3.6	20	60.37	0.0321
661	1880.00	3.6	30	57.15	0.0304
661	1880.00	3.6	40	50.11	0.0267
661	1880.00	3.6	50	58.31	0.0310
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
661	1880.00	4.1	-30	53.01	0.0282
661	1880.00	4.1	-20	55.66	0.0296
661	1880.00	4.1	-10	50.17	0.0267
661	1880.00	4.1	0	55.53	0.0295
661	1880.00	4.1	10	60.57	0.0322
661	1880.00	4.1	20	61.21	0.0326
661	1880.00	4.1	30	60.70	0.0323
661	1880.00	4.1	40	59.66	0.0317
661	1880.00	4.1	50	57.02	0.0303
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
661	1880.00	4.35	-30	50.62	0.0269
661	1880.00	4.35	-20	49.53	0.0263
661	1880.00	4.35	-10	48.69	0.0259
661	1880.00	4.35	0	55.53	0.0295
661	1880.00	4.35	10	59.47	0.0316
661	1880.00	4.35	20	60.18	0.0320
661	1880.00	4.35	30	63.80	0.0339
661	1880.00	4.35	40	59.28	0.0315
661	1880.00	4.35	50	61.21	0.0326

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	58.70	0.0307
810	1909.80	3.6	-20	57.34	0.0300
810	1909.80	3.6	-10	49.98	0.0262
810	1909.80	3.6	0	53.85	0.0282
810	1909.80	3.6	10	54.05	0.0283
810	1909.80	3.6	20	60.96	0.0319
810	1909.80	3.6	30	56.56	0.0296
810	1909.80	3.6	40	63.15	0.0331
810	1909.80	3.6	50	56.50	0.0296
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
810	1909.80	4.1	-30	49.14	0.0257
810	1909.80	4.1	-20	53.14	0.0278
810	1909.80	4.1	-10	49.40	0.0259
810	1909.80	4.1	0	49.85	0.0261
810	1909.80	4.1	10	60.70	0.0318
810	1909.80	4.1	20	63.41	0.0332
810	1909.80	4.1	30	53.08	0.0278
810	1909.80	4.1	40	54.95	0.0288
810	1909.80	4.1	50	59.73	0.0313
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
810	1909.80	4.35	-30	47.33	0.0248
810	1909.80	4.35	-20	49.07	0.0257
810	1909.80	4.35	-10	44.36	0.0232
810	1909.80	4.35	0	59.73	0.0313
810	1909.80	4.35	10	60.76	0.0318
810	1909.80	4.35	20	60.63	0.0317
810	1909.80	4.35	30	60.31	0.0316
810	1909.80	4.35	40	59.79	0.0313
810	1909.80	4.35	50	56.44	0.0296

APPENDIX 1C – GSM RADIATED EMISSIONS TEST DATA

Radiated Power Test Data Results

Date of test: May 30, 2014

The following measurements were performed by Rex Zhang.
The environmental tests conditions were: Temperature: 25.6 °C
Relative Humidity: 39.3 %

The BlackBerry® smartphone was standalone, horizontal down 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) (dBm)	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	-33.39	-24.16	V-V	11.22	28.69	0.74	38.50	9.81
F0	128	824.20	850	Dipole	H	-24.16		H-H	10.26				
F0	190	836.60	850	Dipole	V	-33.27	-24.28	V-V	11.17	28.31	0.68	38.50	10.19
F0	190	836.60	850	Dipole	H	-24.28		H-H	10.05				
F0	251	848.80	850	Dipole	V	-33.11	-23.93	V-V	11.50	**28.82**	0.76	38.50	9.68
F0	251	848.80	850	Dipole	H	-23.93		H-H	11.73				

GSM850 Band in EDGE Mode

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole) (dBm)	(W)	Limit (dBm)	Diff. To Limit (dB)
F0	128	824.20	850	Dipole	V	-36.02	-26.60	V-V	8.76	**26.23**	0.42	38.50	12.27
F0	128	824.20	850	Dipole	H	-26.60		H-H	7.82				
F0	190	836.60	850	Dipole	V	-36.59	-27.32	V-V	8.04	25.18	0.33	38.50	13.32
F0	190	836.60	850	Dipole	H	-27.32		H-H	8.00				
F0	251	848.80	850	Dipole	V	-36.54	-27.17	V-V	8.19	25.57	0.36	38.50	12.93
F0	251	848.80	850	Dipole	H	-27.17		H-H	8.48				

Radiated Power Test Data Results cont'd

Date of test: May 07, 2014
The following measurements were performed by Rex Zhang.

The environmental tests conditions were: Temperature: 27.6 °C
Relative Humidity: 41.7 %
The BlackBerry® smartphone was standalone, side button up and LCD Screen pointing to RX antenna when the turntable is at 0 degree position.
Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

PCS1900 Band in Call Mode

								Substitution Method					
EUT				Receive Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBm)	Max (V,H) dBm	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator) (dBm)	(W)	Limit (dBm)	Diff to Limit (dB)
F0	512	1850.20	1900	Horn	V	-23.11	-23.11	V-V	-12.27	28.42	0.70	33	4.58
F0	512	1850.20	1900	Horn	H	-30.35		H-H	-11.29				
F0	661	1880.00	1900	Horn	V	-23.12	-23.12	V-V	-11.55	**28.69**	0.74	33	4.31
F0	661	1880.00	1900	Horn	H	-31.37		H-H	-10.60				
F0	810	1909.80	1900	Horn	V	-23.68	-23.68	V-V	-11.91	28.42	0.70	33	4.58
F0	810	1909.80	1900	Horn	H	-31.44		H-H	-11.11				

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	-24.19	-24.19	V-V	-13.37	27.30	0.54	33	5.70
F0	512	1850.20	1900	Horn	H	-31.62		H-H	-12.41				
F0	661	1880.00	1900	Horn	V	-24.45	-24.45	V-V	-12.84	**27.37**	0.55	33	5.63
F0	661	1880.00	1900	Horn	H	-32.61		H-H	-11.92				
F0	810	1909.80	1900	Horn	V	-24.70	-24.70	V-V	-12.90	27.34	0.54	33	5.66
F0	810	1909.80	1900	Horn	H	-32.39		H-H	-12.19				

Radiated Emissions Test Data Results cont'd

GSM850 Call Mode

The following measurements were performed by Rex Zhang.

Date of Test: April 25, 2014
The environmental test conditions were: Temperature: 25.7 ºC
Relative Humidity: 36.4 %

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 horizontal facing down 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 were at least 25.0 dB below the limit.

The following measurements were performed by Kevin Guo.

Date of Test: June 2, 2014
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, with horizontal down and the 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.

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)
1672.84	190	H	2.45	162	PK	48.84	-85.89	-28.737	-13.00	**-15.7**
2509.972	190	H	2.60	175	PK	47.25	-90.75	-29.332	-13.00	-16.3

All other emissions were at least 25.0 dB below the limit.

Radiated Emissions Test Data Results cont'd

GSM850 EDGE Mode

Date of Test: April 25, 2014

The environmental test conditions were: Temperature: 25.7 ºC
Relative Humidity: 36.4 %

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 horizontal facing down 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 were at least 25.0 dB below the limit.

Date of Test: June 2, 2014

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, with horizontal down and the 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.

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)
2509.45	190	H	2.60	164	PK	48.84	-86.356	-35.699	-13.00	**-22.7**

All other emissions were at least 25.0 dB below the limit.

Radiated Emissions Test Data Results cont'd

PCS1900 CALL Mode

Date of Test: May 26, 2014

The environmental test conditions were: Temperature: 25.7 ºC
Relative Humidity: 17.5 %

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 side button jack pointing up and the LCD facing to 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 were at least 25.0 dB below the limit.

Date of Test: May 26-28, 2014

The environmental test conditions were: Temperature: 24.3 – 27 ºC
Relative Humidity: 23.6 – 36.2 %

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 side button jack pointing up and the LCD facing to 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 were at least 25.0 dB below the limit.

Radiated Emissions Test Data Results cont'd

PCS1900 EDGE Mode

Date of Test: May 26, 2014

The environmental test conditions were: Temperature: 25.7 ºC
Relative Humidity: 17.5 %

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 side button jack pointing up and the LCD facing 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 were at least 25.0 dB below the limit.

Date of Test: May 26-28, 2014

The environmental test conditions were: Temperature: 24.3 – 27 ºC
Relative Humidity: 23.6 – 36.2 %

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.

Measurements were performed in PCS1900 EDGE Tx mode, channels 512, 661, 810.

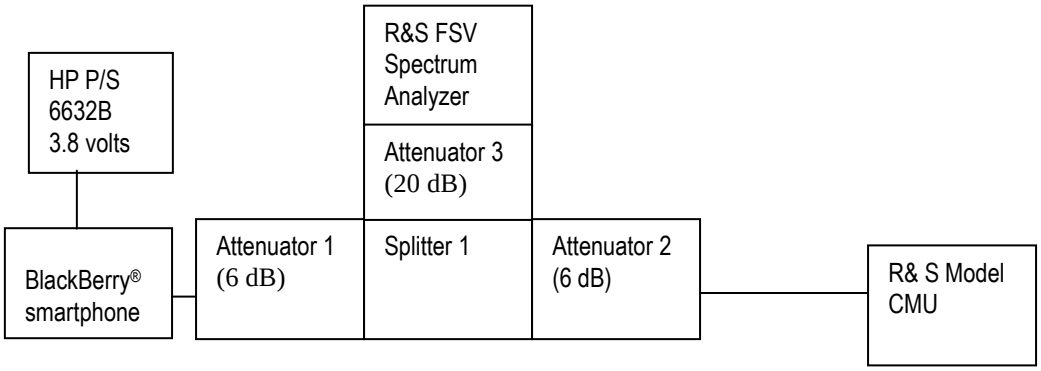
All emissions were at least 25.0 dB below the limit.

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

WCDMA Band II/IV/V Conducted RF Emission Test Data

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

Test Setup Diagram



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

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

Date of Test: April 16-17, 2014

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

The following measurements were performed by Chuan Tran.

WCDMA Conducted RF Emission Test Data cont'd

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

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each carrier frequency of low, middle and high, the modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth.
The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.
The worst case –26dBc bandwidth for WCDMA Band V was measured to be 4.57 MHz, WCDMA Band II was measured to be 4.57 MHz and for the WCDMA Band IV it was measured to be 4.590 MHz as shown below. Results were derived in a 100 kHz resolution bandwidth.
On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

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

The following tests were performed on model RFW121LW.

WCDMA Band V Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
826.400	4.57	4.167
836.400	4.57	**4.175**
846.600	4.56	4.159

WCDMA Band II Frequency (MHz)	26dBc Occupied Bandwidth (MHz	99% Occupied Bandwidth (MHz)
1852.400	4.57	**4.167**
1880.000	4.56	**4.167**
1907.600	4.56	**4.167**

WCDMA Band IV Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
1712.4	4.570	**4.170**
1732.6	4.590	4.167
1752.6	4.580	4.167

Peak to Average Ratio (PAR)

The peak to average ratio was measured on the low, middle and high channels.
On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.
The worst case measured was 6.91 dB on the low channel of WCDMA Band II.
The worst case measured was 6.68 dB on low and high channels of WCDMA Band IV.

Measurement Plots for WCDMA Band II/IV/V Voice mode

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

See Figures 2-1b to 2-6b for the plots of the conducted spurious emissions.
See Figures 2-7b to 2-12b for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.
See Figures 2-13b to 2-14b for the plots of the Channel mask.
See Figures 2-15b to 2-17b for the plots of the Peak to Average Ratio (WCDMA Band IV).

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

WCDMA Band V Frequency (MHz)	99% Occupied Bandwidth (MHz)
826.400	4.167
836.400	4.167
846.600	**4.183**

WCDMA Band II Frequency (MHz)	99% Occupied Bandwidth (MHz)
1852.400	4.167
1880.000	4.167
1907.600	**4.183**

WCDMA Band IV Frequency (MHz)	99% Occupied Bandwidth (MHz)
1712.4	4.170
1732.6	4.167
1752.6	**4.175**

Measurement Plots for WCDMA Band V/II/IV in HSUPA mode
Refer to the following measurement plots for more detail:

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

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

WCDMA Conducted RF Emission Test Data cont'd

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

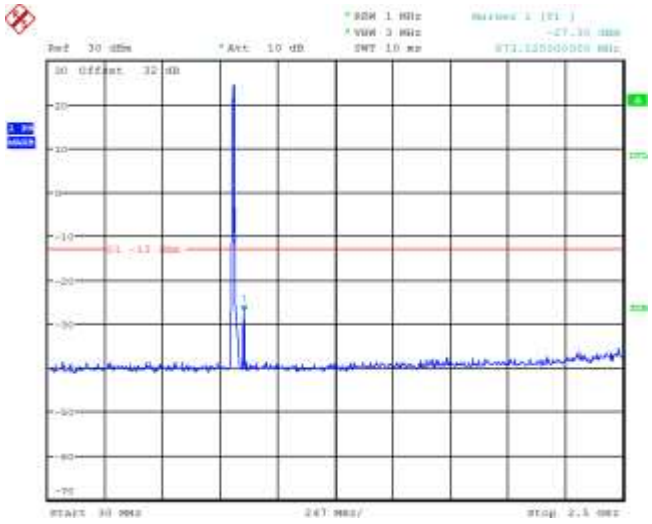


Figure 2-2a: Band V, Spurious Conducted Emissions, Low channel

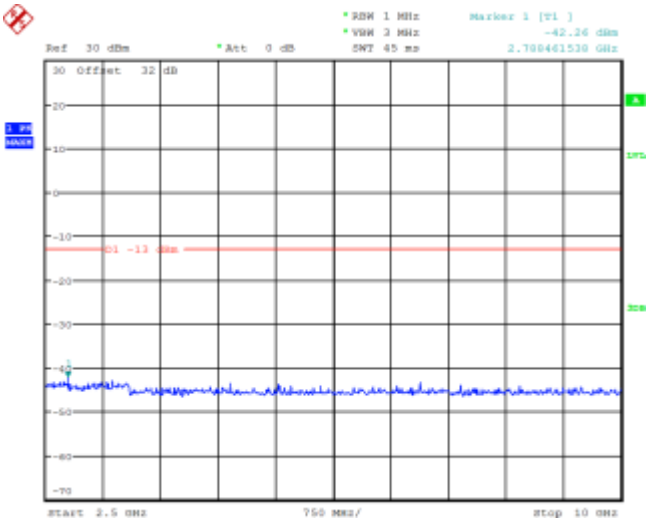


Figure 2-3a: Band V, Spurious Conducted Emissions, Middle channel

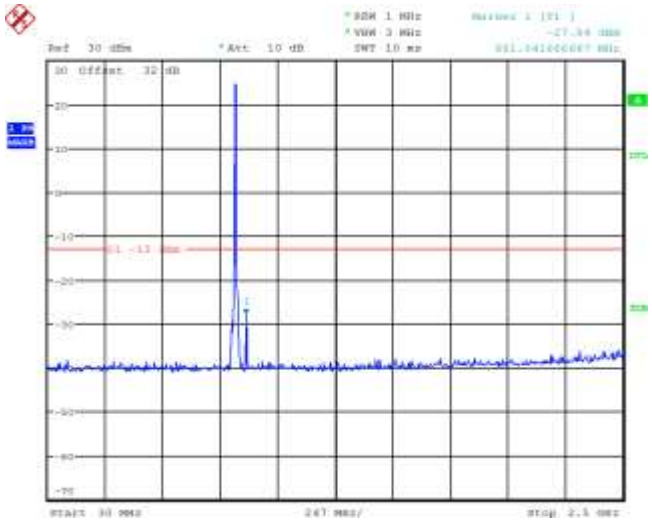
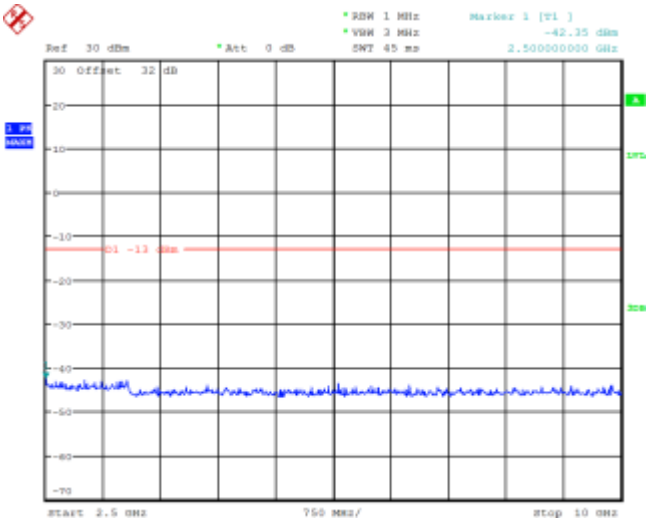


Figure 2-4a: Band V, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

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

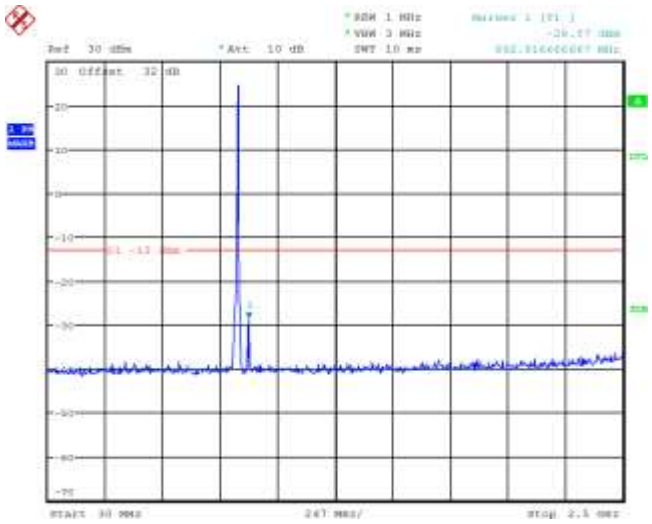


Figure 2-6a: Band V, Spurious Conducted Emissions, High Channel

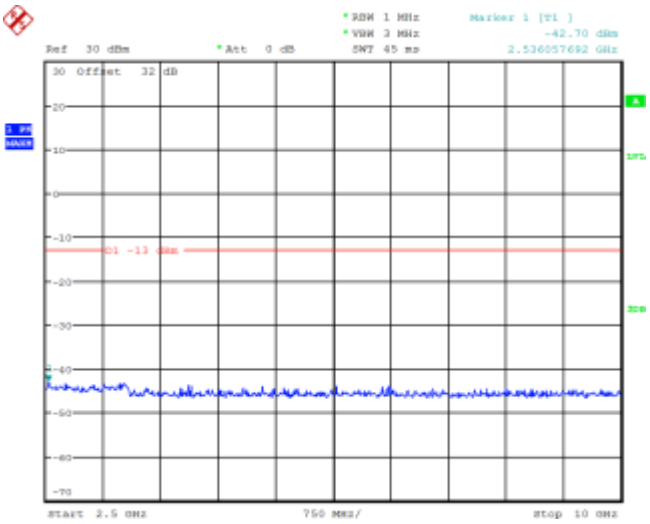


Figure 2-2a:, BAND II Spurious Conducted Emissions, Low Channel

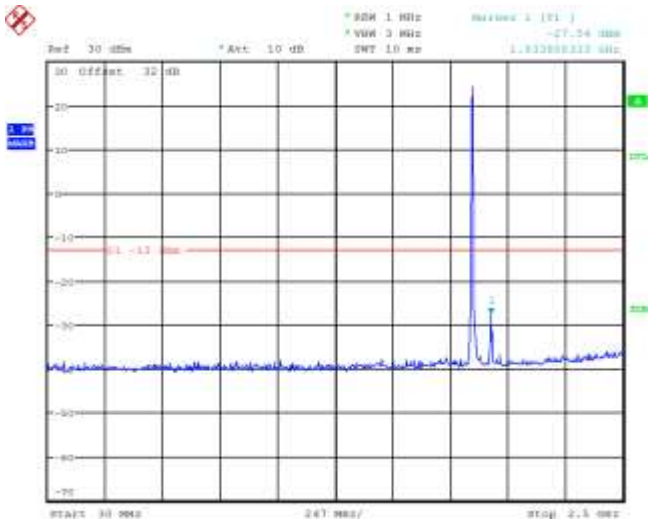
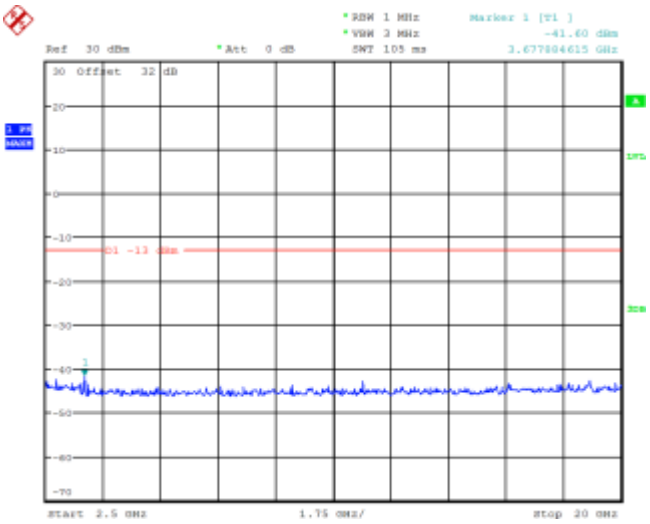


Figure 2-8a: BAND II, Spurious Conducted Emissions, Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

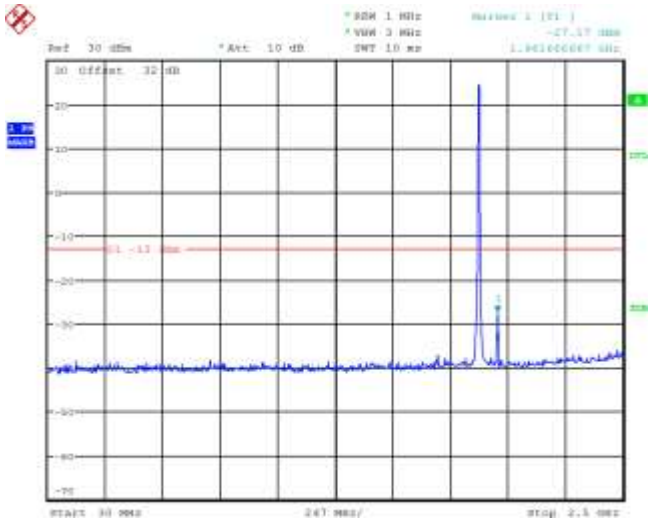


Figure 2-10a: BAND II, Spurious Conducted Emissions, Middle Channel

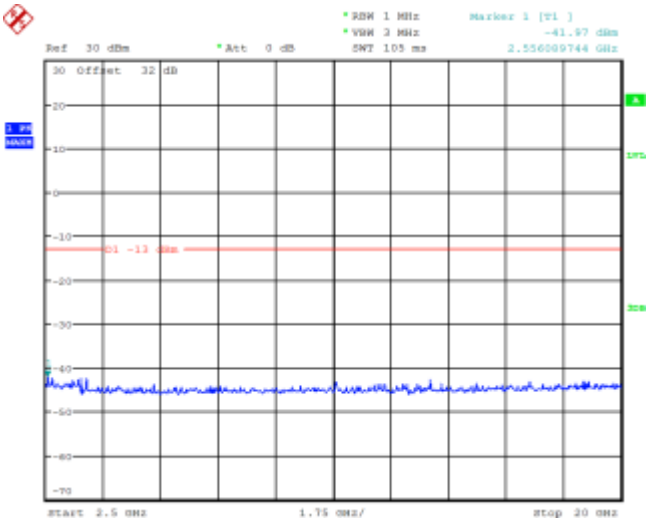


Figure 2-11a: BAND II, Spurious Conducted Emissions, High Channel

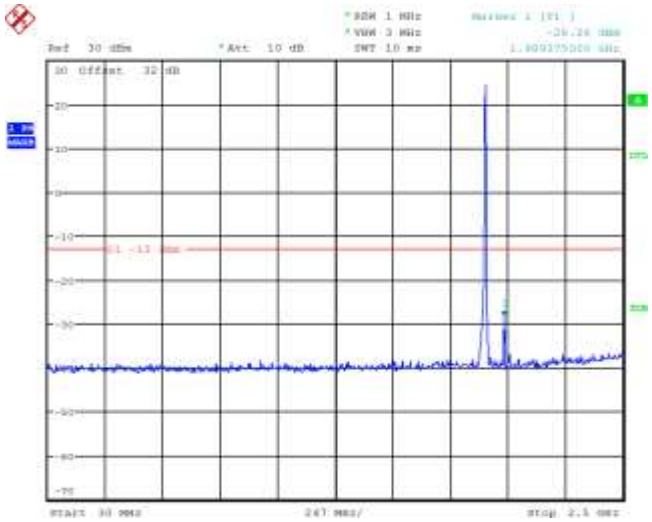
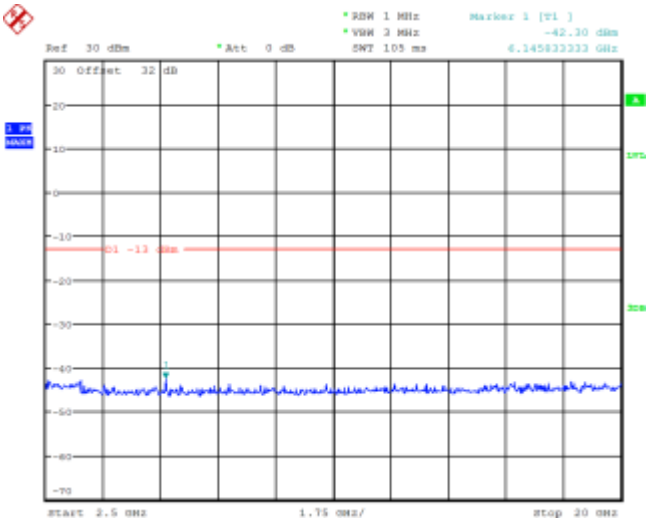


Figure 2-12a: BAND II, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

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

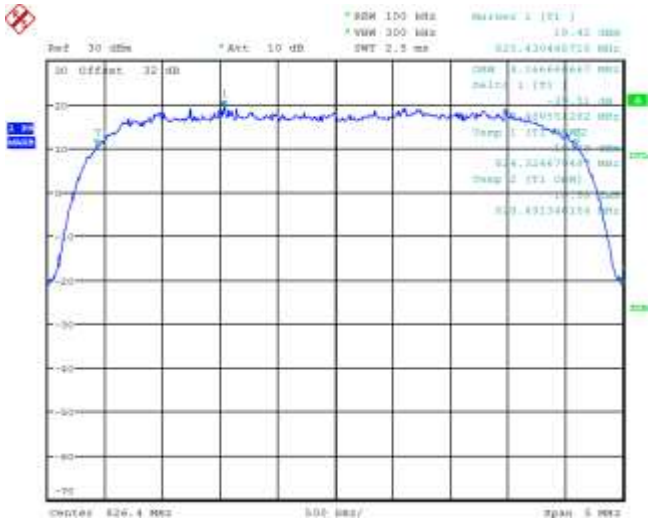


Figure 2-14a: Occupied Bandwidth, Band V Middle Channel

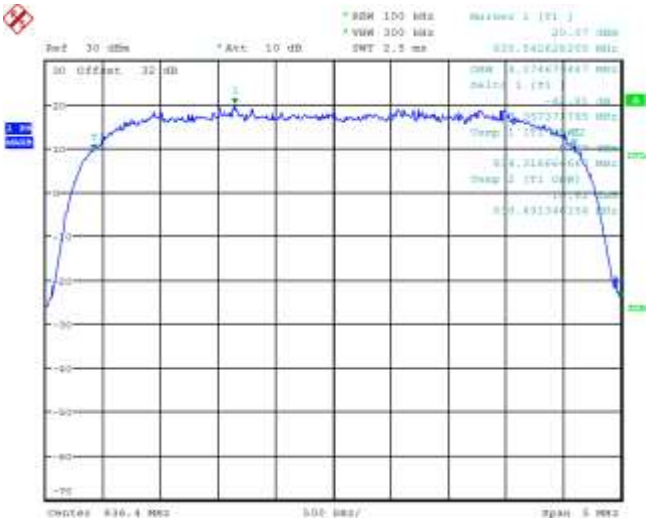


Figure 2-15a: Occupied Bandwidth, Band V High Channel

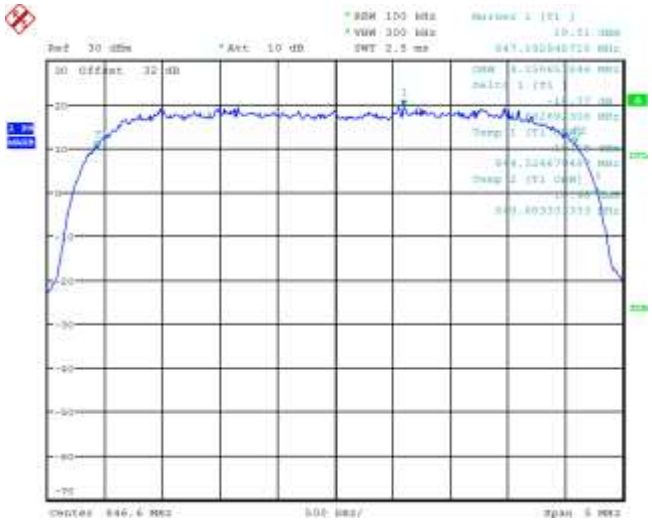
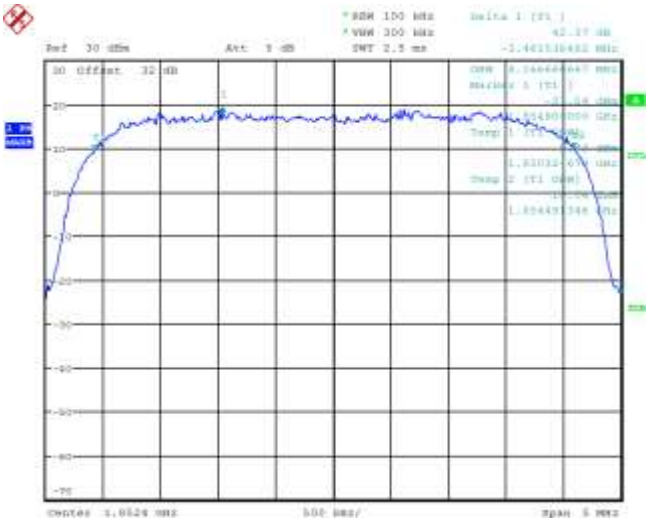


Figure 2-16a: Occupied Bandwidth, Band II Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

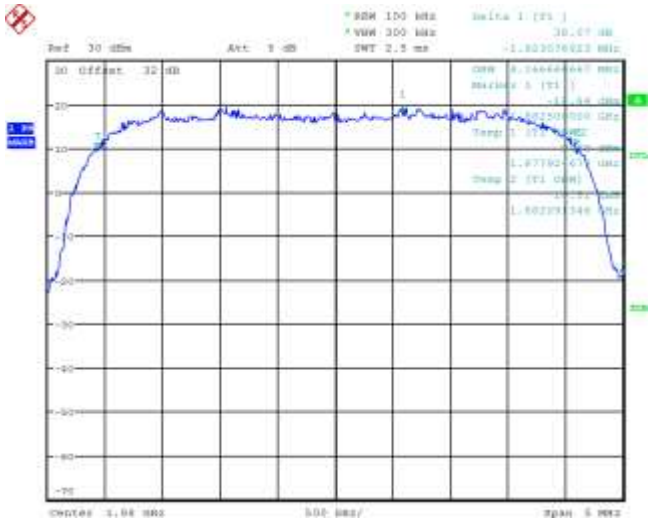


Figure 2-18a: Occupied Bandwidth, Band II High Channel

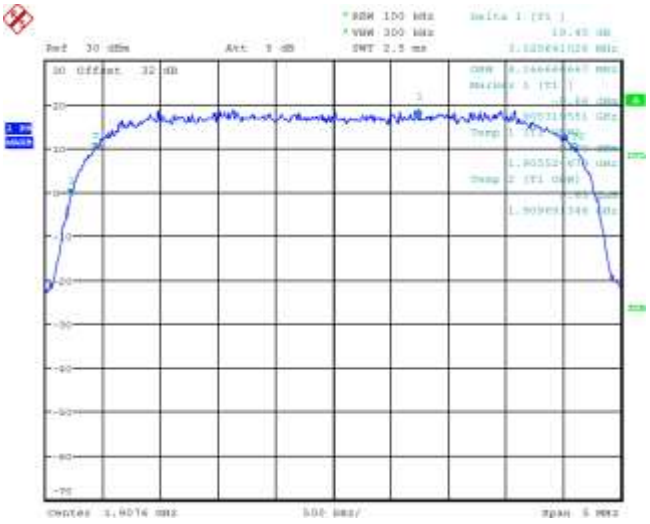


Figure 2-19a: -26 dBc Bandwidth, Band V Low Channel

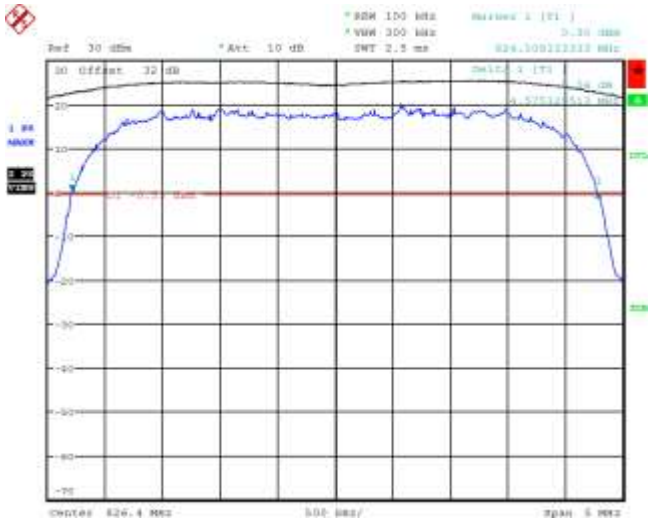
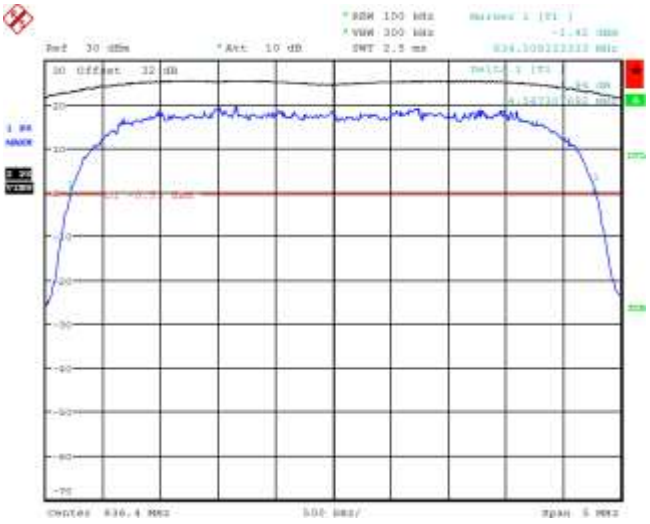


Figure 2-20a: -26 dBc Bandwidth, Band V Middle Channel



WCDMA Conducted RF Emission Test Data cont'd

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

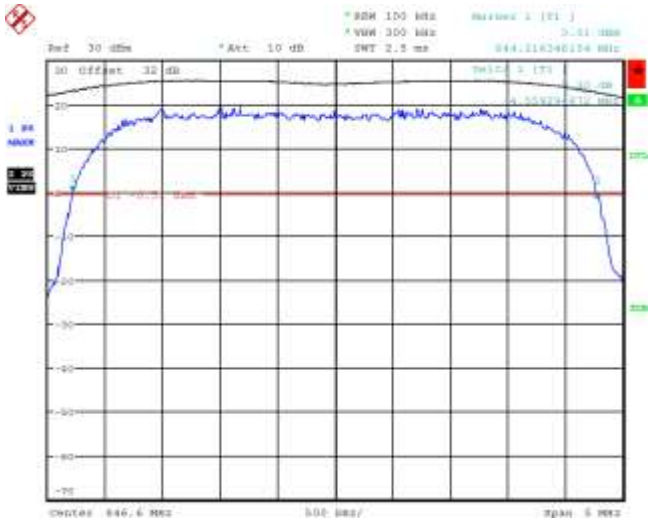


Figure 2-22a: -26 dBc Bandwidth, Band II Low Channel

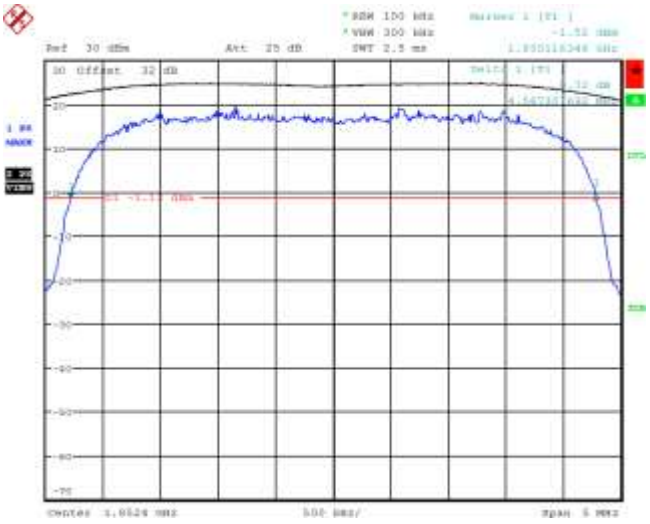


Figure 2-23a: -26 dBc Bandwidth, Band II Middle Channel

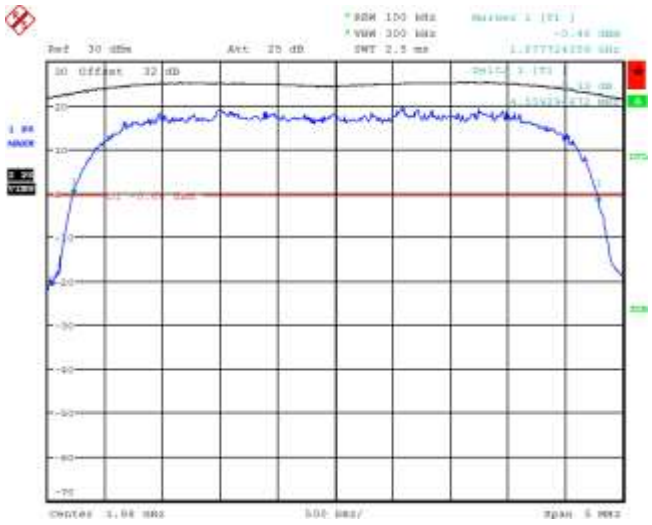
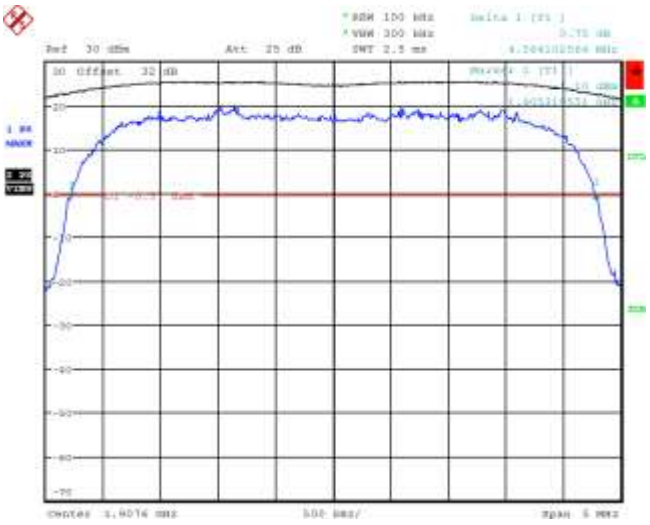


Figure 2-24a: -26 dBc Bandwidth, Band II High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 2-25a: Band V Low Channel Mask

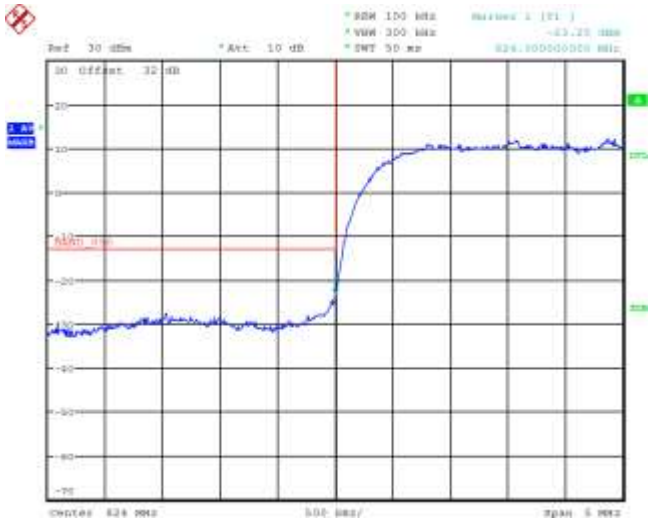


Figure 2-26a: Band V High Channel Mask

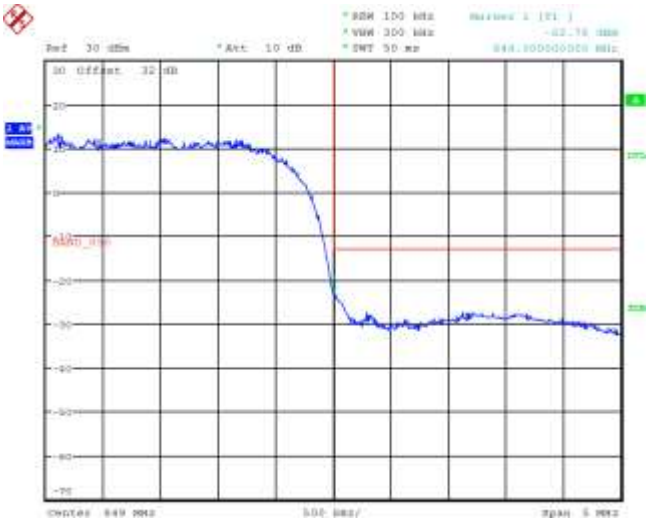


Figure 2-27a: Band II Low Channel Mask

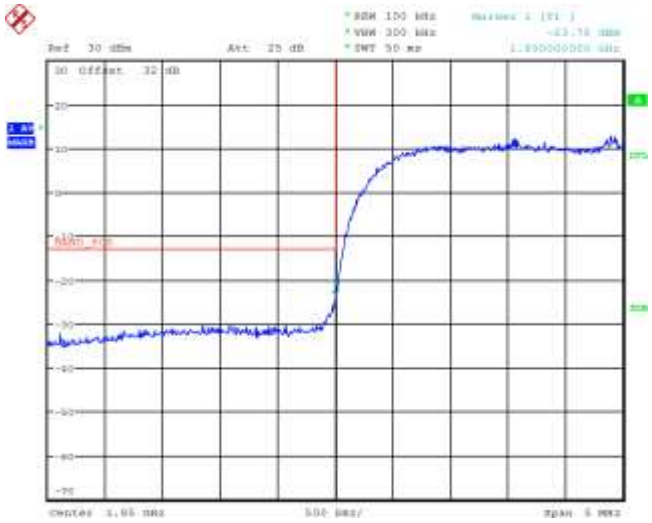
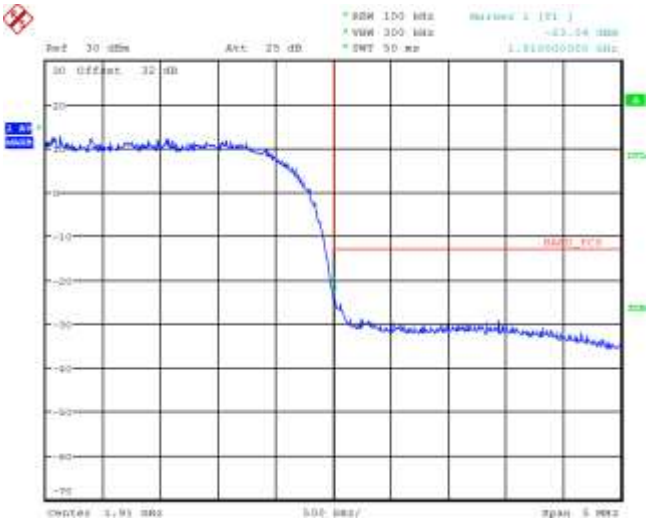


Figure 2-28a: Band II High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

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

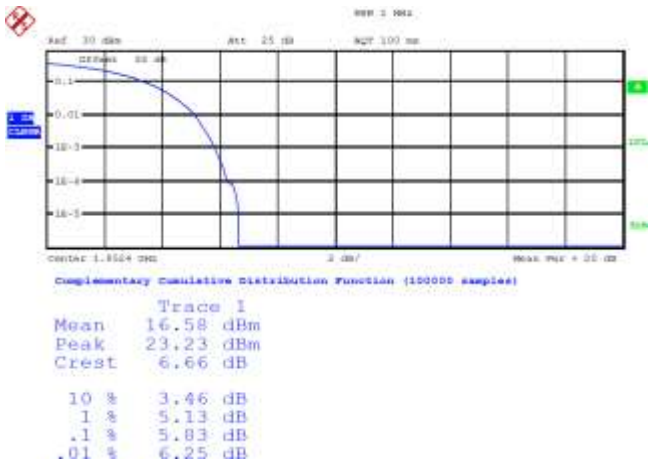


Figure 2-30a: Band II, PAR Mid Channel

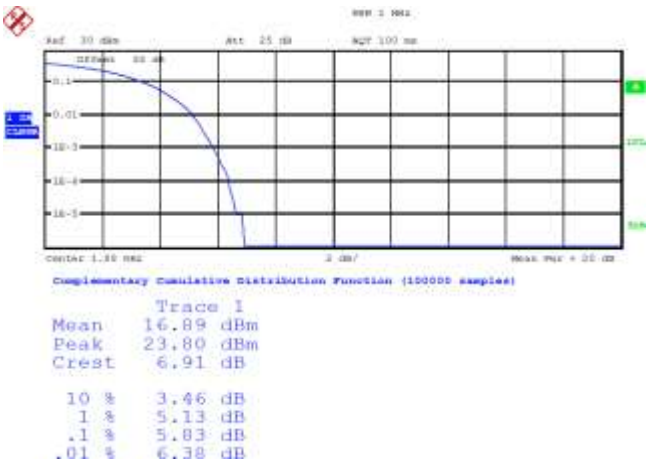
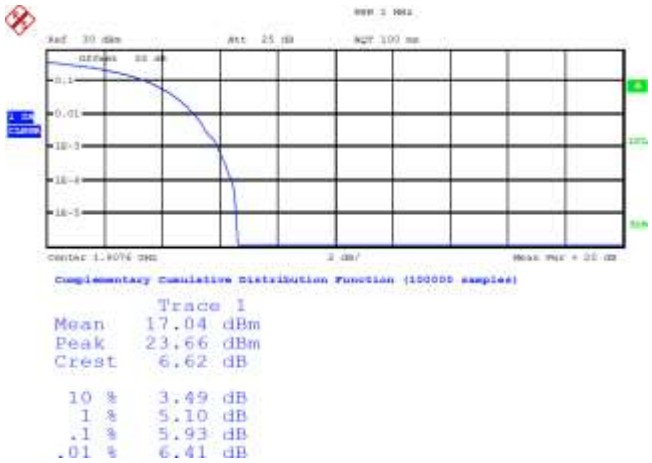


Figure 2-31a: Band II, PAR High Channel



WCDMA Conducted RF Emission Test Data cont'd

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

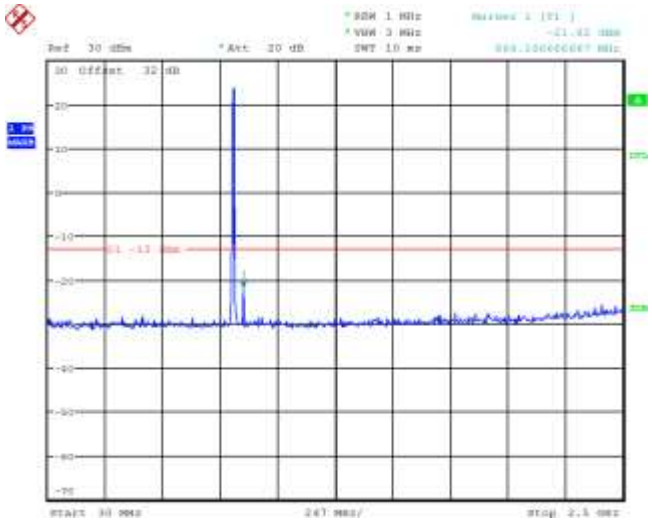


Figure 2-33a: Band V HSUPA, Spurious Conducted Emissions, Low channel

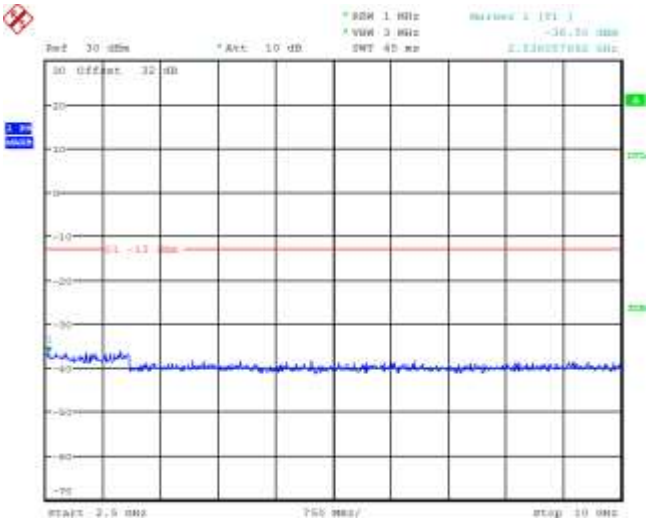


Figure 2-34a: Band V HSUPA, Spurious Conducted Emissions, Middle channel

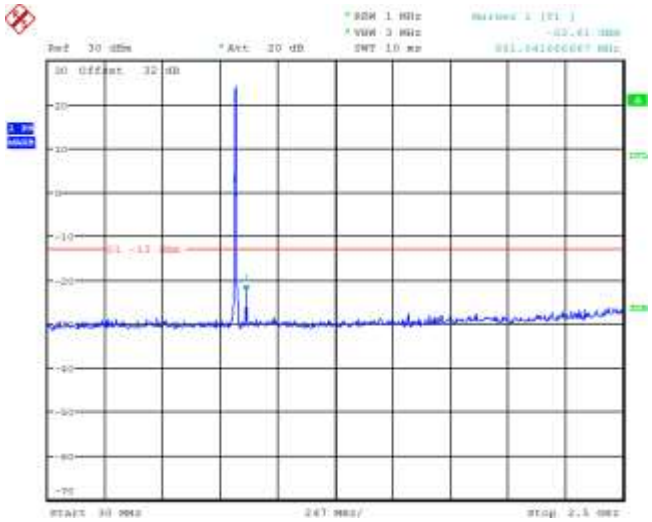
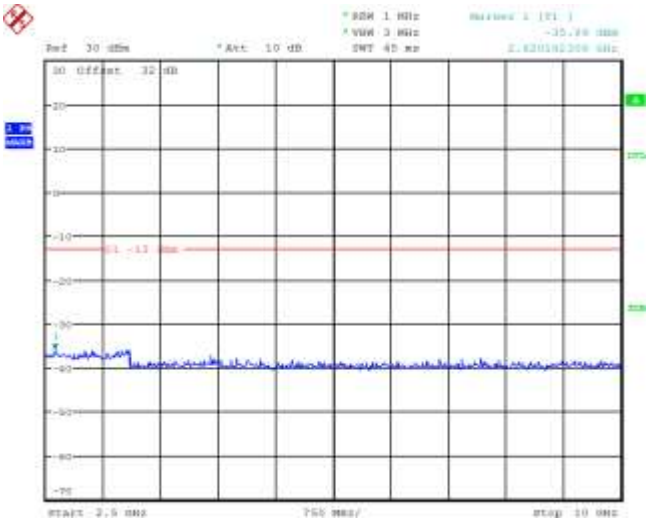


Figure 2-35a: Band V HSUPA, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

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

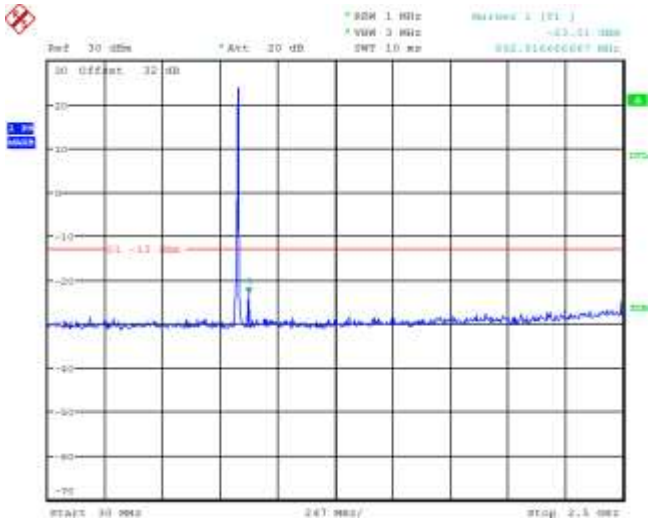


Figure 2-37a: Band V HSUPA, Spurious Conducted Emissions, High Channel

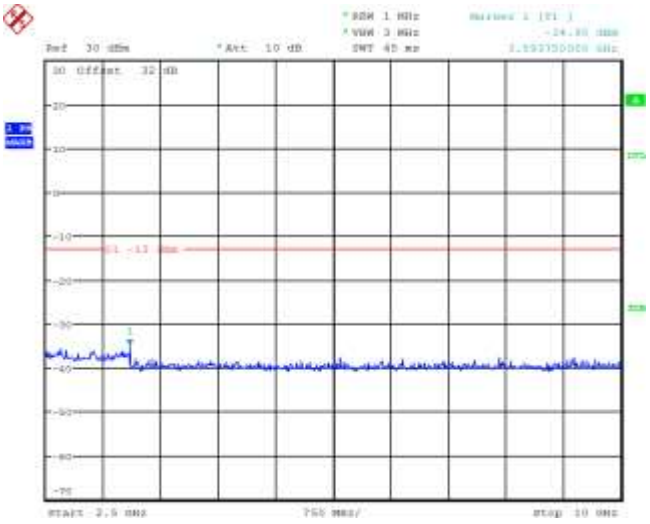


Figure 2-38a: Band II HSUPA, Spurious Conducted Emissions, Low Channel

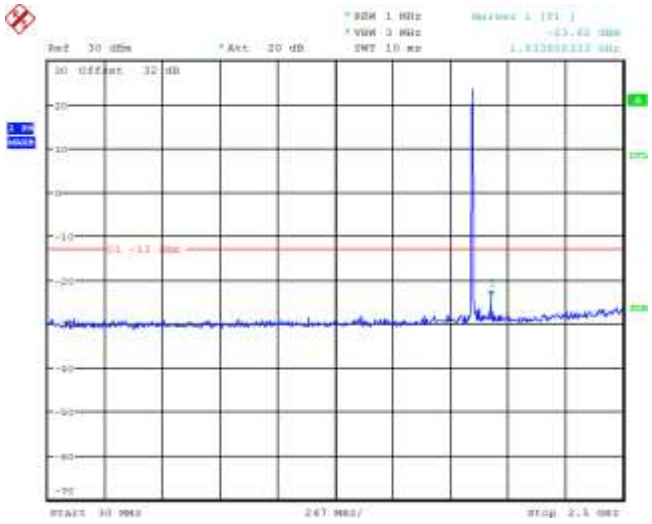
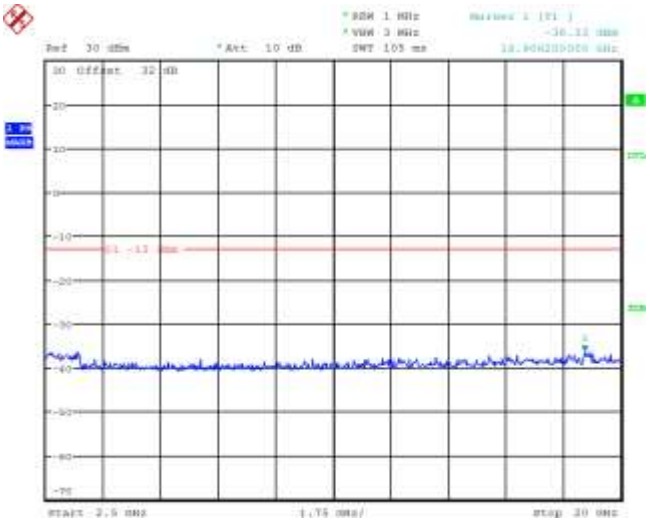


Figure 2-39a: Band II HSUPA, Spurious Conducted Emissions, Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

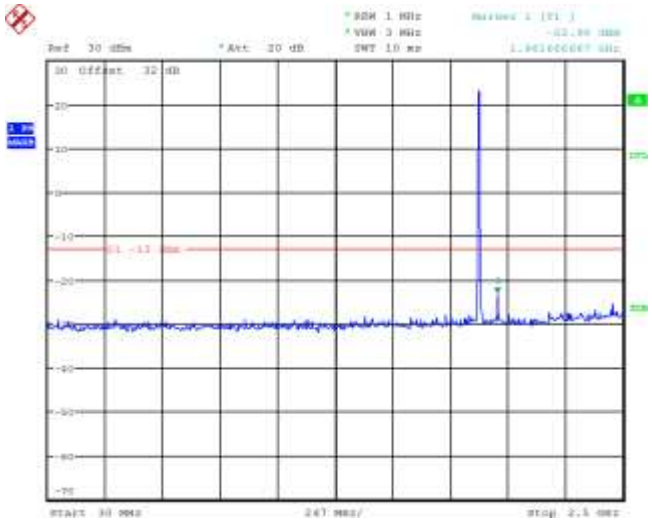


Figure 2-41a: Band II HSUPA, Spurious Conducted Emissions, Middle Channel

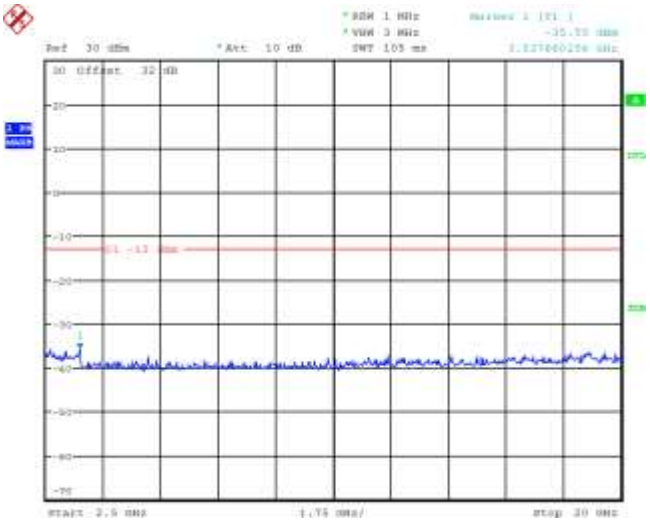


Figure 2-42a: Band II HSUPA, Spurious Conducted Emissions, High Channel

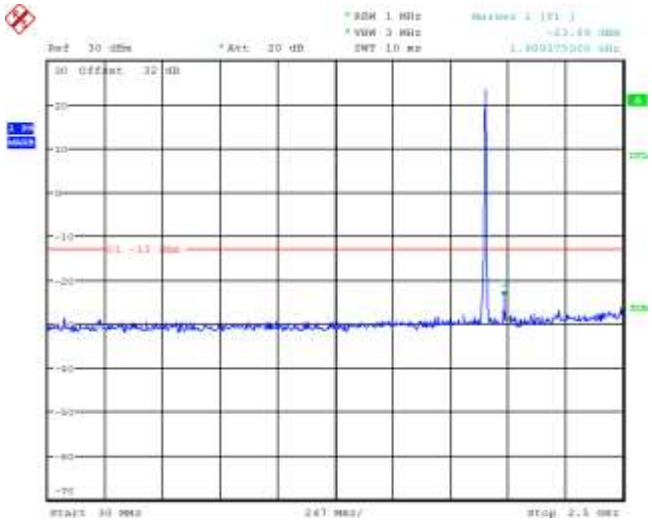
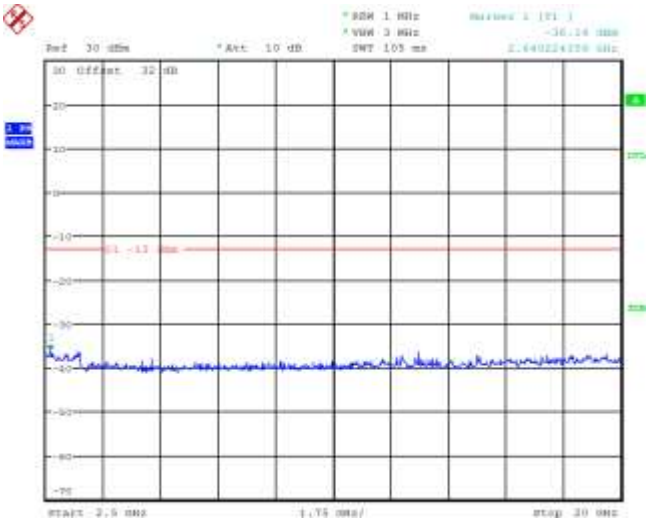


Figure 2-43a: Band II HSUPA, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 2-44a: Occupied Bandwidth, Band V HSUPA Low Channel

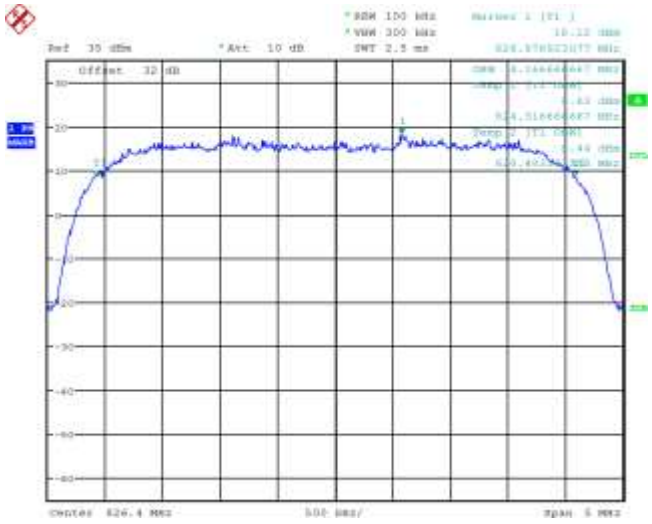


Figure 2-45a: Occupied Bandwidth, Band V HSUPA Middle Channel

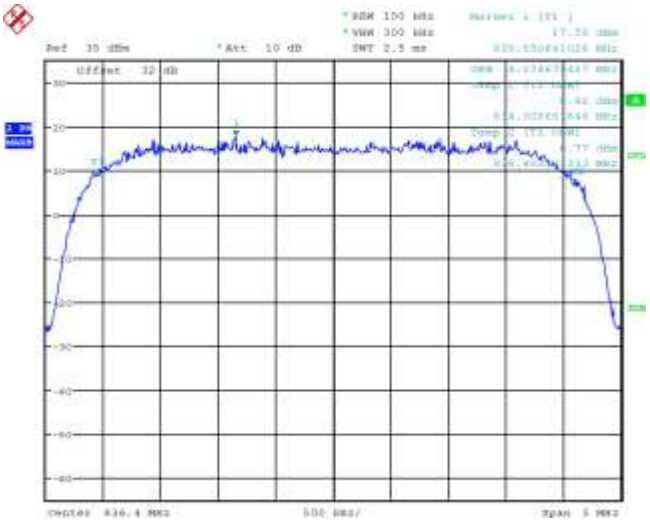


Figure 2-46a: Occupied Bandwidth, Band V HSUPA High Channel

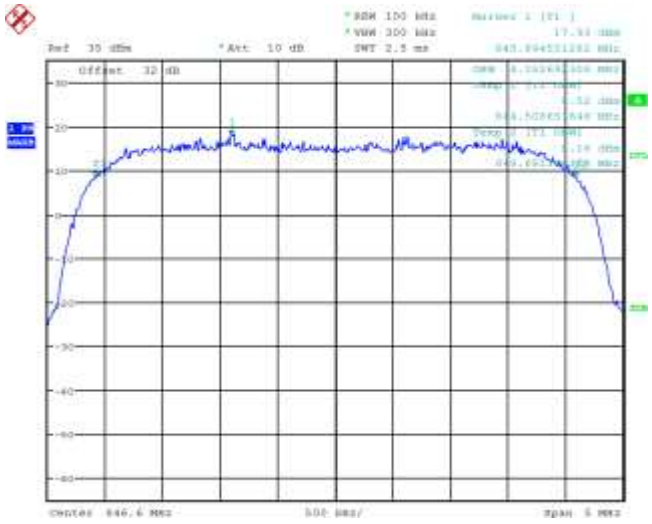
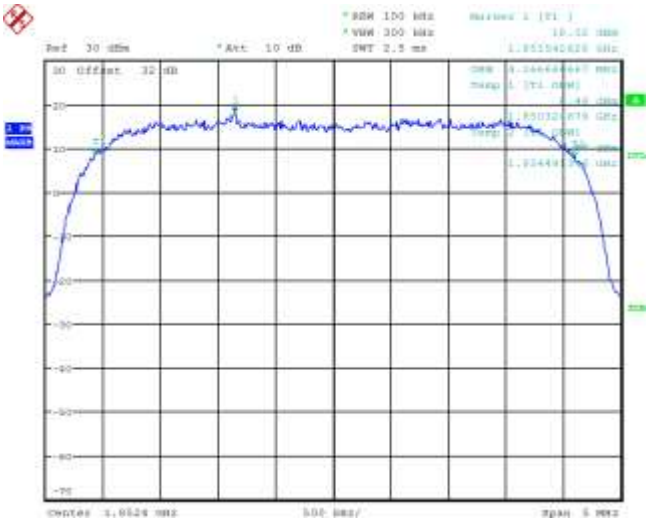


Figure 2-47a: Occupied Bandwidth, Band II HSUPA Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

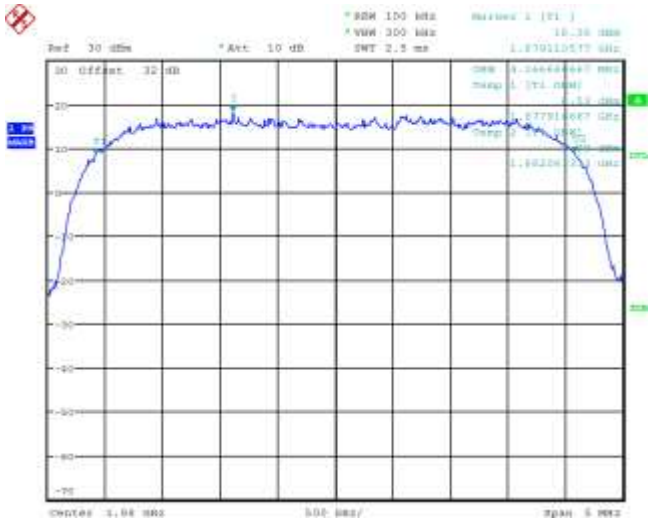


Figure 2-49a: Occupied Bandwidth, Band II HSUPA High Channel

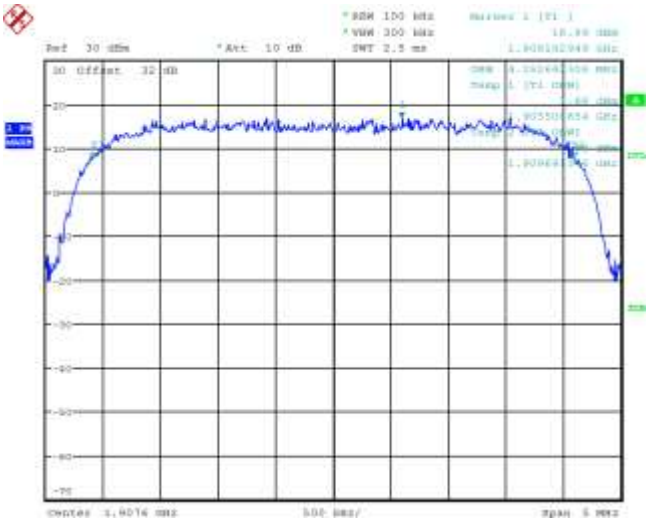


Figure 2-50a: Band V , HSUPA Low Channel Mask

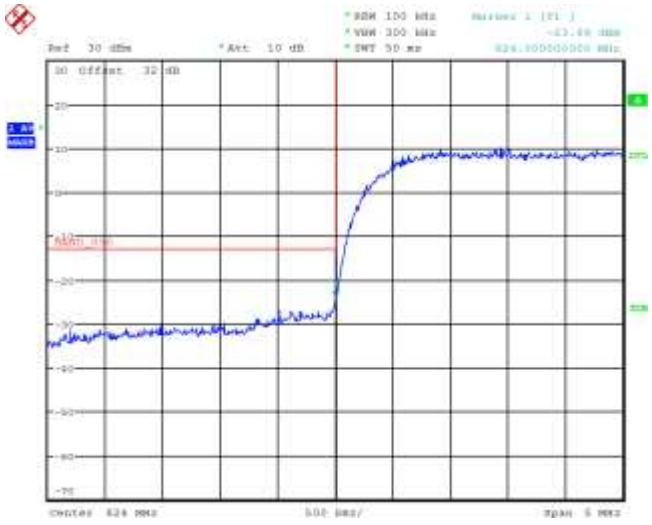
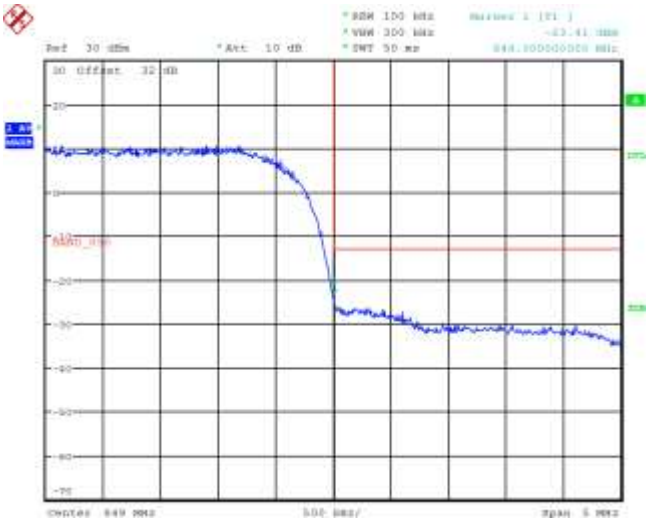


Figure 2-51a: Band V , HSUPA High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

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

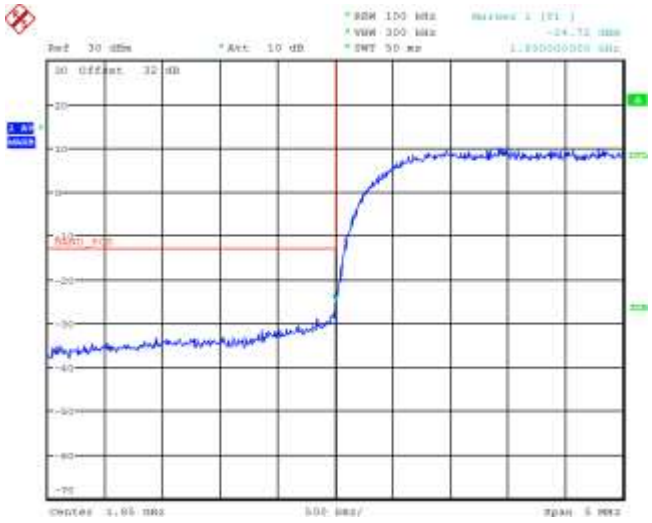
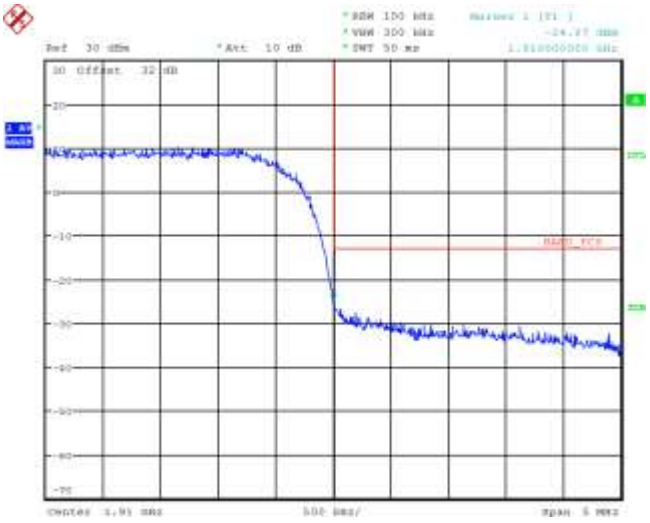


Figure 2-53a: Band II, HSUPA High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

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

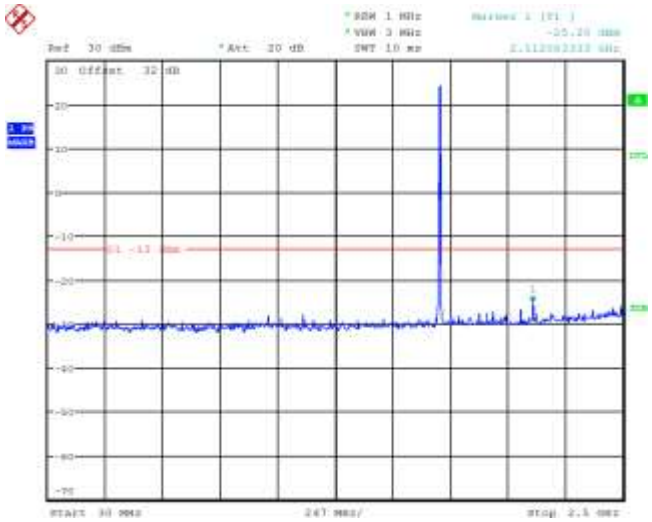


Figure 2-2b: Band IV, Spurious Conducted Emissions, Low channel

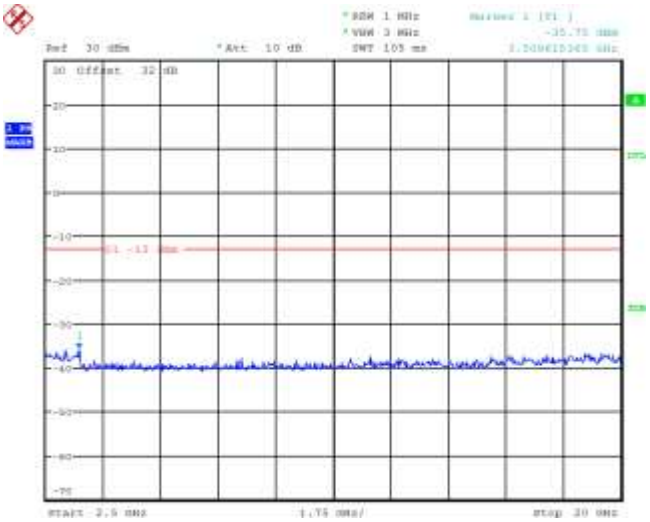


Figure 2-3b: Band IV, Spurious Conducted Emissions, Middle channel

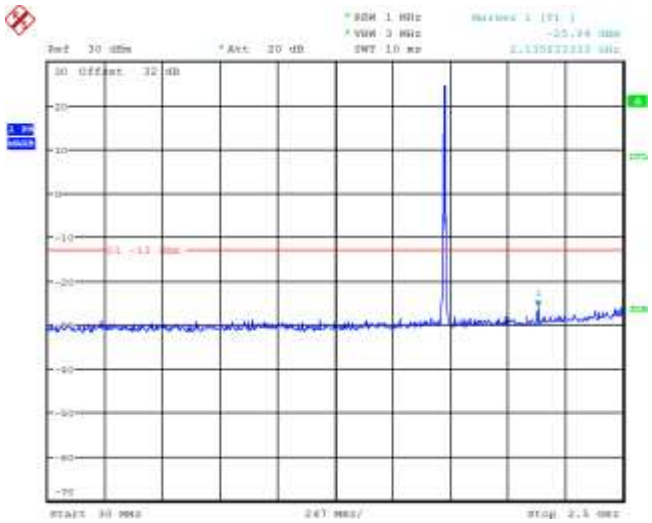
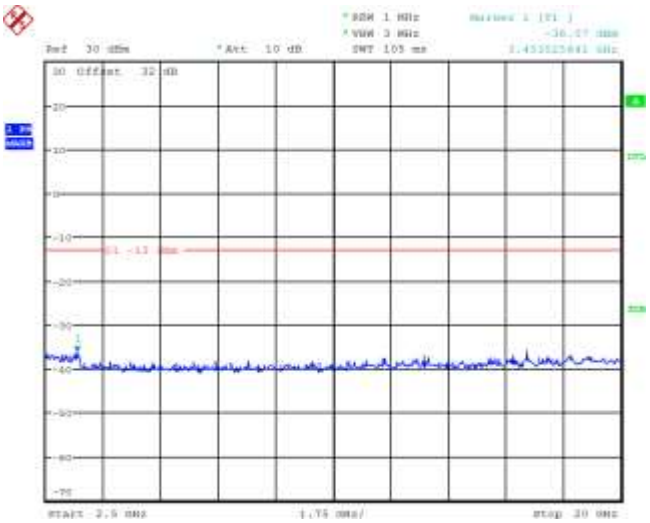


Figure 2-4b: Band IV, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 2-5b: Band IV, Spurious Conducted Emissions, High Channel

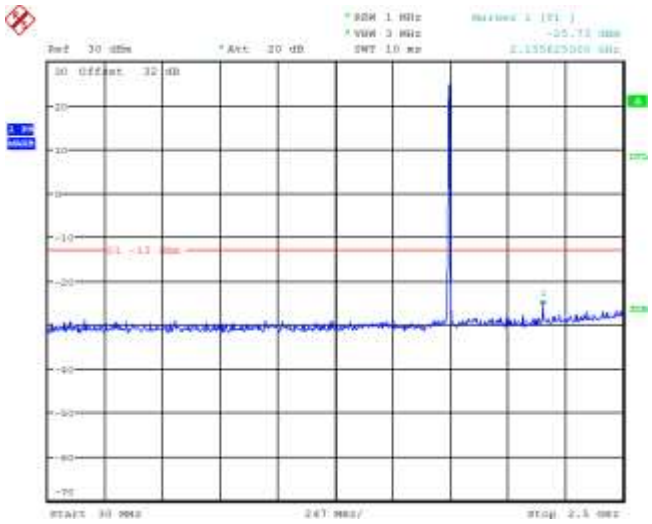
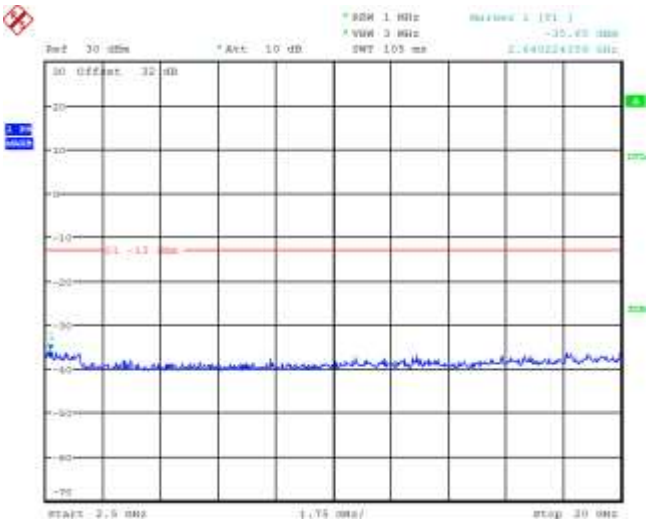


Figure 2-6b: Band IV, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 2-7b: Occupied Bandwidth, Band IV Low Channel

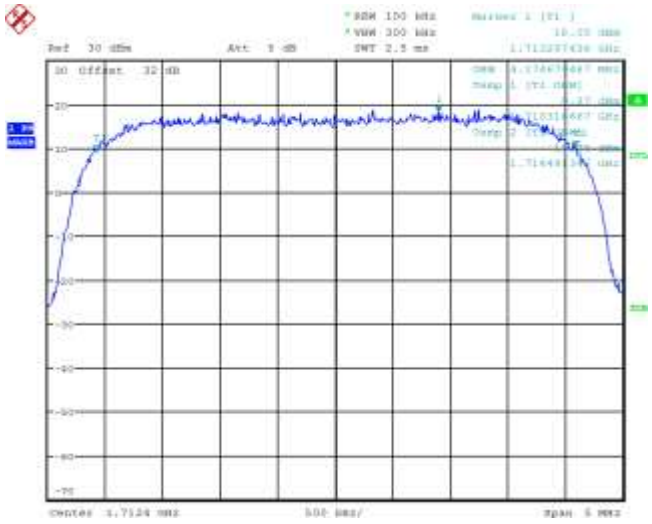


Figure 2-8b: Occupied Bandwidth, Band IV Middle Channel

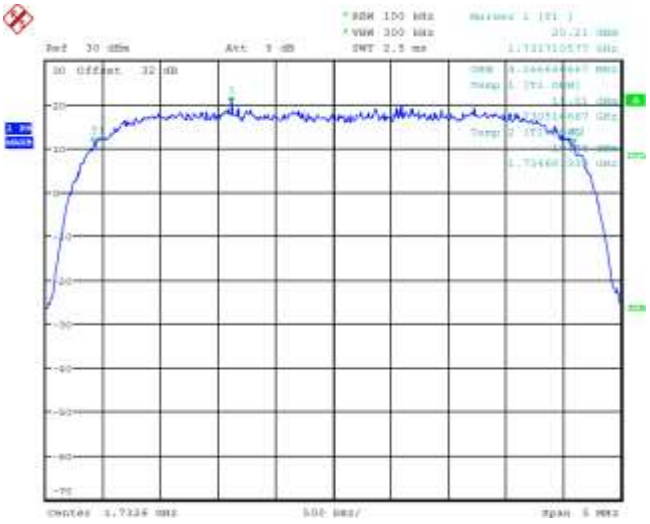


Figure 2-9b: Occupied Bandwidth, Band IV High Channel

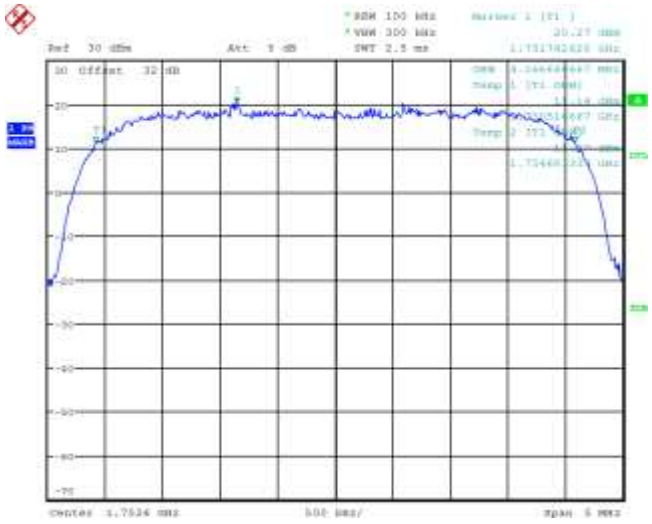


Figure 2-10b: -26 dBc Bandwidth, Band IV Low Channel

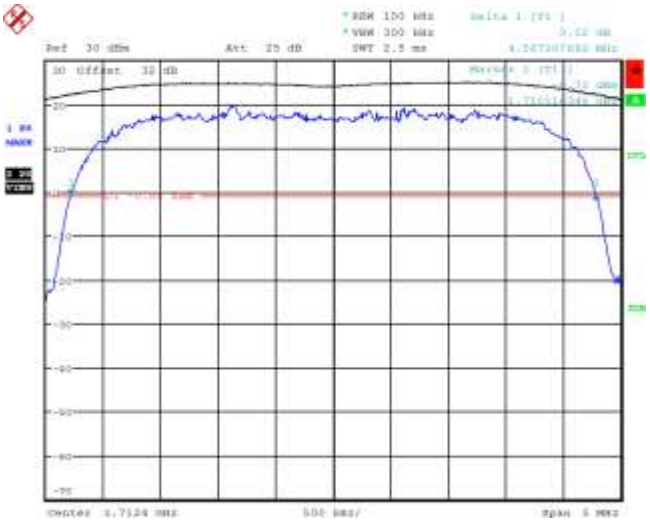


Figure 2-11b: -26 dBc Bandwidth, Band IV Middle Channel

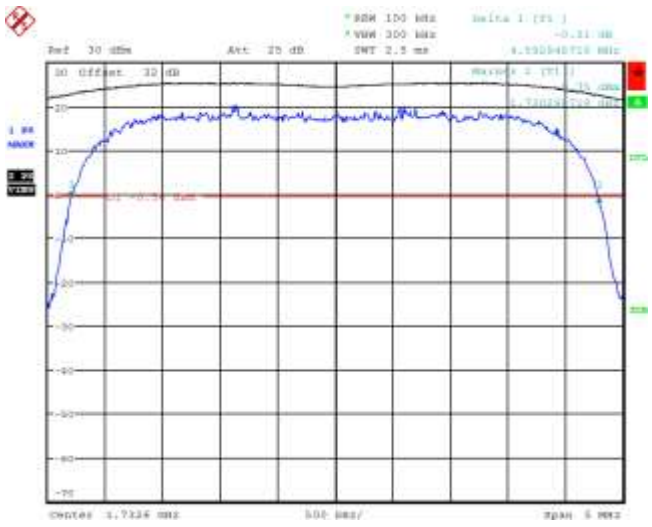


Figure 2-12b: -26 dBc Bandwidth, Band IV High Channel

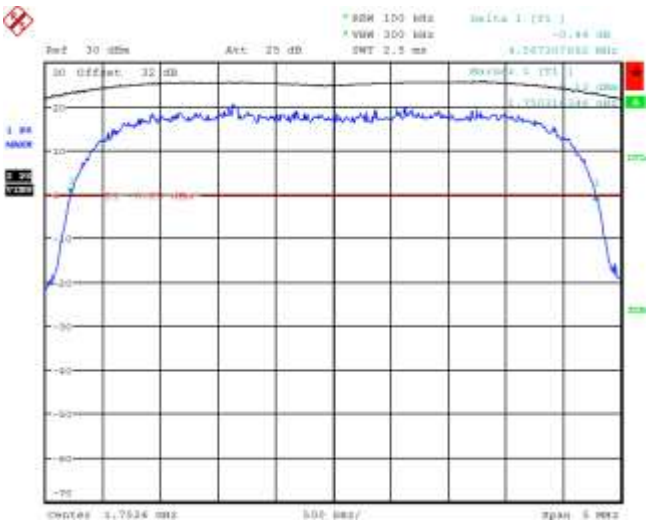


Figure 2-13b: Band IV Low Channel Mask

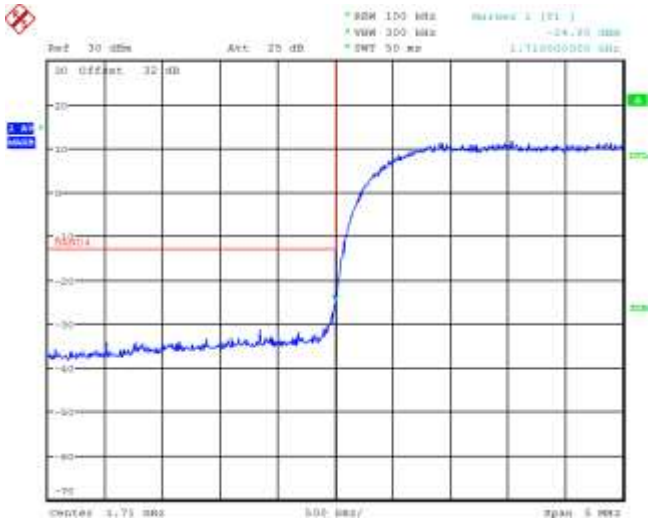
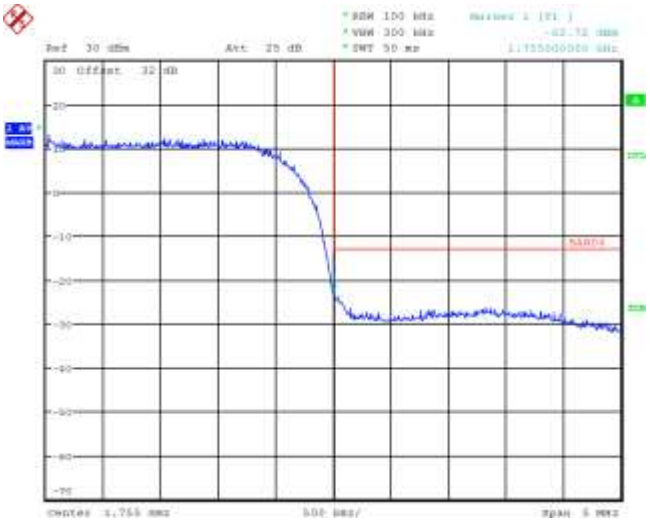


Figure 2-14b: Band IV High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

Figure 2-15b: Band IV, PAR Low Channel

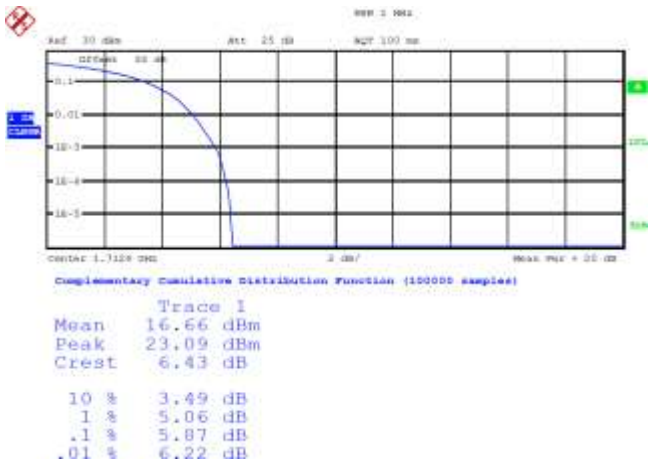


Figure 2-16b: Band IV, PAR Mid Channel

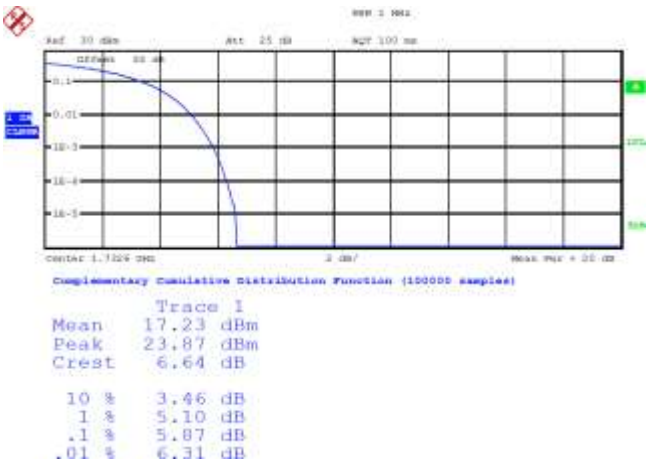
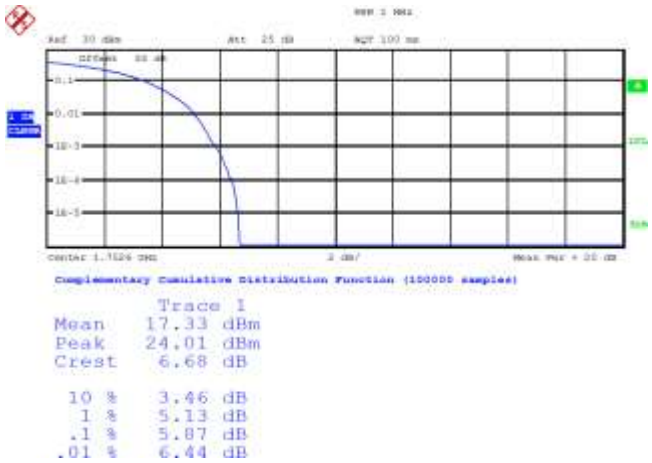


Figure 2-17b: Band IV, PAR High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 2-18b: Band IV HSUPA, Spurious Conducted Emissions, Low channel

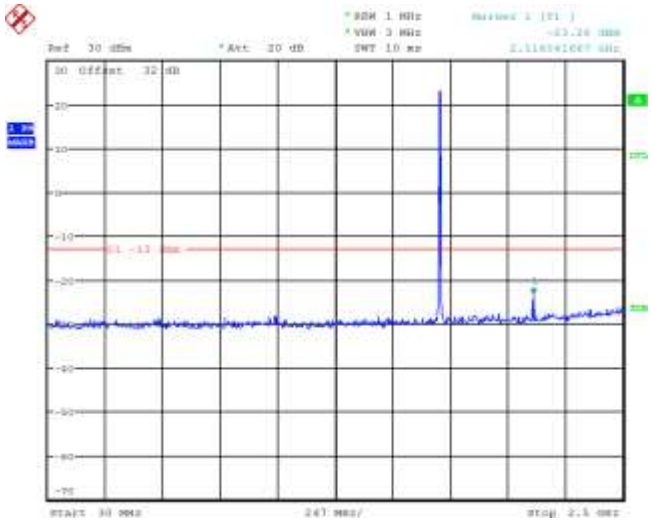


Figure 2-19b: Band IV HSUPA, Spurious Conducted Emissions, Low channel

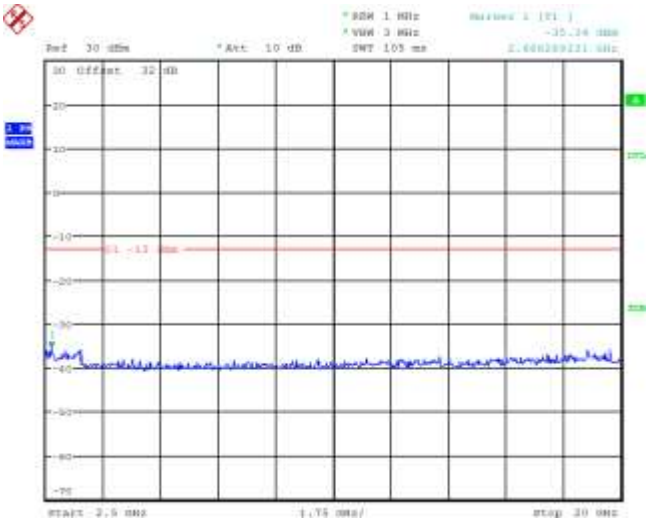


Figure 2-20b: Band IV HSUPA, Spurious Conducted Emissions, Middle channel

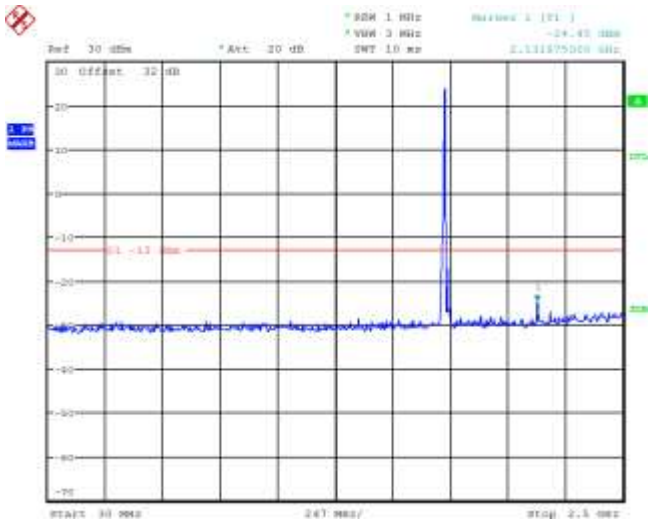
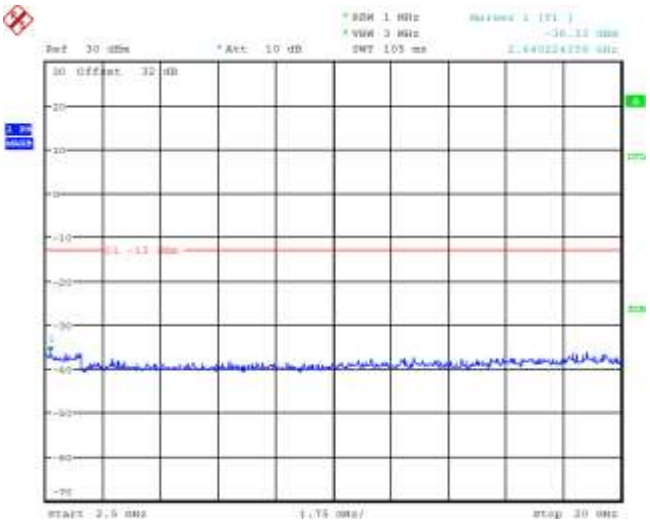


Figure 2-21b: Band IV HSUPA, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 2-22b: Band IV HSUPA, Spurious Conducted Emissions, High Channel

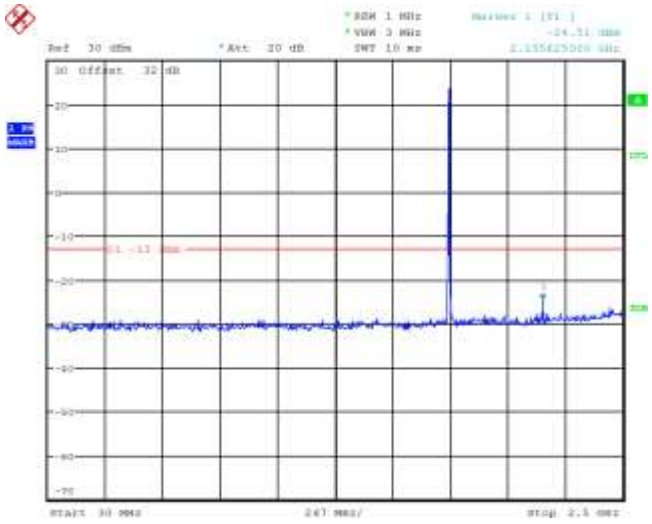


Figure 2-23b: Band IV HSUPA, Spurious Conducted Emissions, High Channel

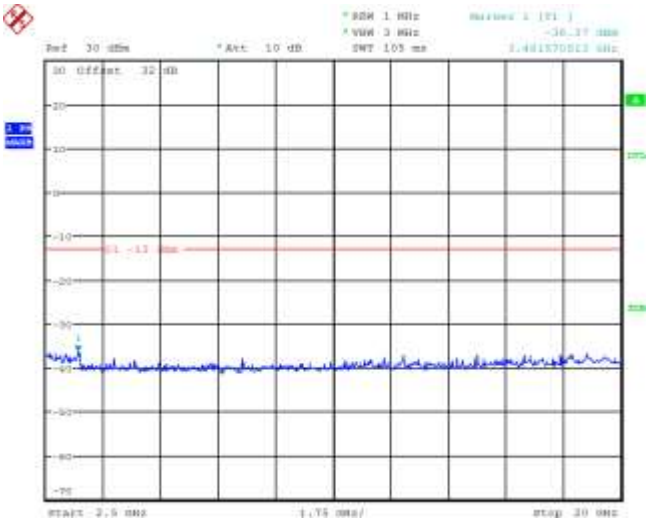


Figure 2-24b: Occupied Bandwidth, Band IV HSUPA Low Channel

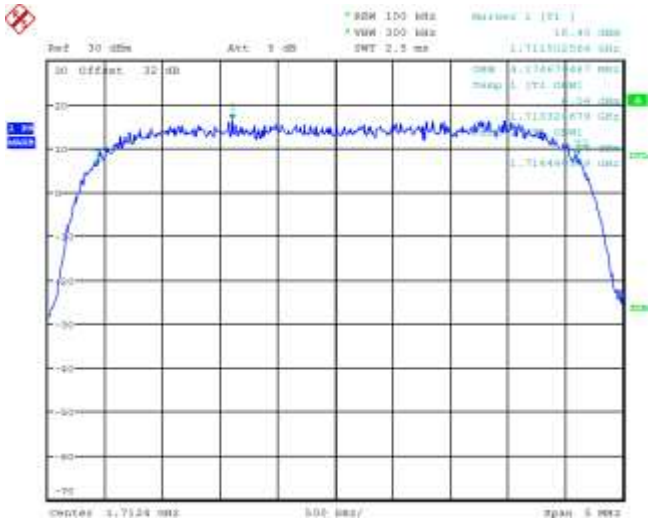
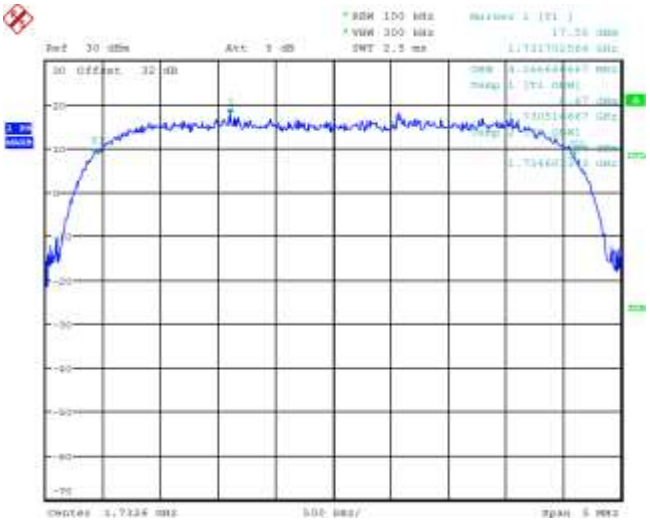


Figure 2-25b: Occupied Bandwidth, Band IV HSUPA Middle Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 2-26b: Occupied Bandwidth, Band IV
HSUPA High Channel

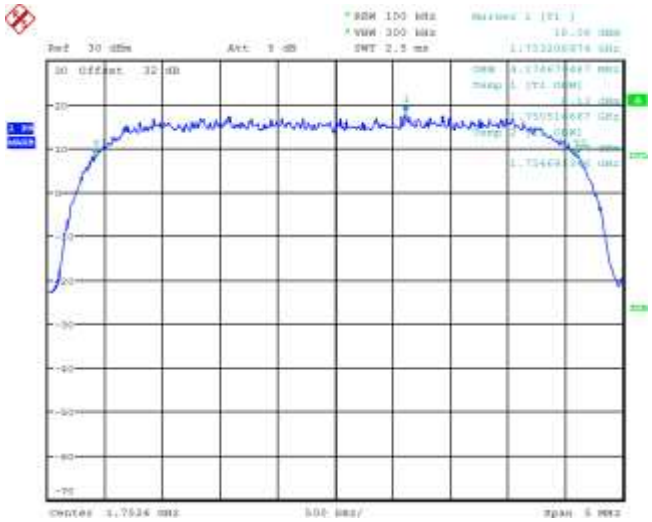


Figure 2-27b: Band IV , HSUPA Low Channel Mask

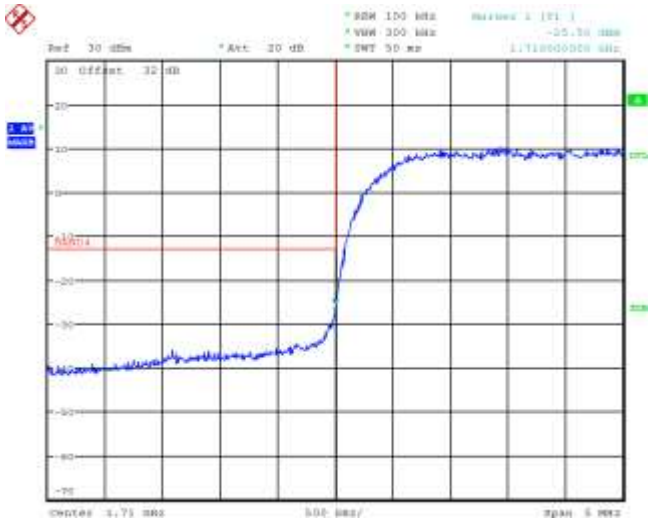
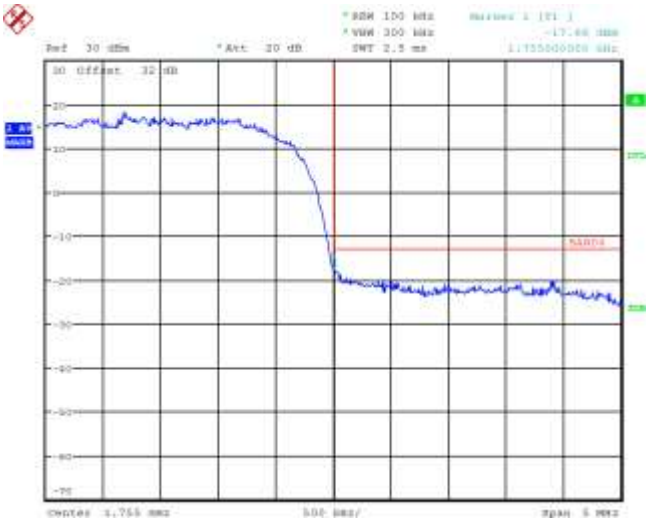
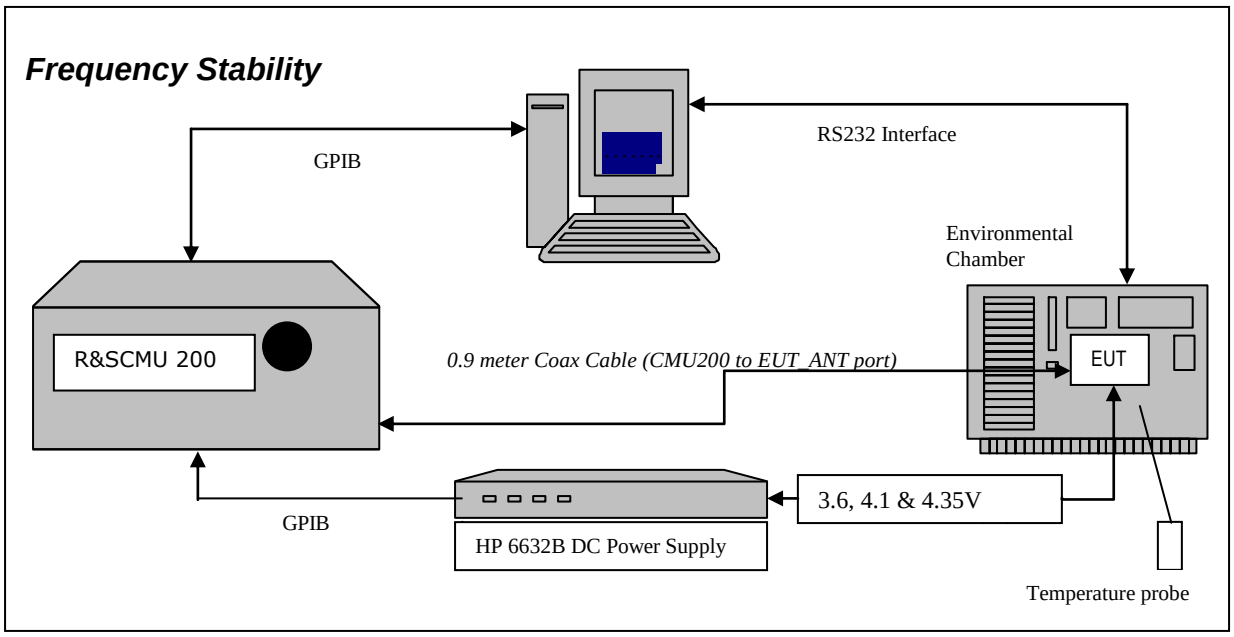


Figure 2-28b: Band IV , HSUPA High Channel Mask



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

WCDMA Frequency Stability Test Data



The following measurements were performed by Chuan Tran.

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2 Required Measurements
2.1055 Frequency Stability - Procedures
(a,b) Frequency Stability - Temperature Variation
(d) Frequency Stability - Voltage Variation

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

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

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

Test Setup:

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

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

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

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

The EUT output power and frequency was measured at 3.6 volts, 4.1 volts and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 826.4, 836.4 and 846.6 MHz for the WCDMA band V. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million.
After the initial one-hour soak at the beginning of the tests, a period of thirty minutes soak was initialized between each ascending temperature step, before proceeding to the next measurement test cycle.

Procedure:

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

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

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

The maximum frequency error in the WCDMA band V measured was 0.0088PPM.
The maximum frequency error in the WCDMA band II measured was 0.0157 PPM.
The maximum frequency error in the WCDMA Band IV measured was -0.0217 PPM.

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

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

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

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

WCDMA Band V Results: channel 4132 @ maximum transmitted power

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

WCDMA Band V Results: channel 4182 @ maximum transmitted power

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

WCDMA Band V Results: channel 4233 @ maximum transmitted power

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

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

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

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

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

WCDMA Band II Results: channel 9262 @ maximum transmitted power

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

WCDMA Band II Results: channel 9400 @ maximum transmitted power

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

WCDMA Band II Results: channel 9538 @ maximum transmitted power

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

WCDMA Band IV results: channels 1312, 1413 and 1513 @ 20°C maximum transmitted power

Traffic Channel Number	WCDMA Band IV Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
1312	1712.4	3.6	20	-5.43	-0.0032
1413	1732.6	3.6	20	-10.45	-0.0060
1513	1752.6	3.6	20	9.28	0.0061

Traffic Channel Number	WCDMA Band IV Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
1312	1712.4	4.1	20	-6.53	-0.0038
1413	1732.6	4.1	20	-9.51	-0.0055
1513	1752.6	4.1	20	8.67	0.0057

Traffic Channel Number	WCDMA Band IV Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
1312	1712.4	4.35	20	-8.76	-0.0051
1413	1732.6	4.35	20	-8.87	-0.0051
1513	1752.6	4.35	20	9.67	0.0064

WCDMA Band IV Results: channel 1312 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
1312.00	1712.40	3.6	-30	12.62	0.0074
1312.00	1712.40	3.6	-20	-14.68	-0.0086
1312.00	1712.40	3.6	-10	-19.96	-0.0117
1312.00	1712.40	3.6	0	-22.46	-0.0131
1312.00	1712.40	3.6	10	-15.40	-0.0090
1312.00	1712.40	3.6	20	-5.43	-0.0032
1312.00	1712.40	3.6	30	14.22	0.0083
1312.00	1712.40	3.6	40	21.94	0.0128
1312.00	1712.40	3.6	50	25.13	0.0147
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1312.00	1712.40	4.1	-30	13.67	0.0080
1312.00	1712.40	4.1	-20	-17.01	-0.0099
1312.00	1712.40	4.1	-10	-19.49	-0.0114
1312.00	1712.40	4.1	0	-23.27	-0.0136
1312.00	1712.40	4.1	10	-14.59	-0.0085
1312.00	1712.40	4.1	20	-6.53	-0.0038
1312.00	1712.40	4.1	30	12.53	0.0073
1312.00	1712.40	4.1	40	21.62	0.0126
1312.00	1712.40	4.1	50	24.40	0.0142
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1312.00	1712.40	4.35	-30	14.02	0.0082
1312.00	1712.40	4.35	-20	-14.36	-0.0084
1312.00	1712.40	4.35	-10	-19.58	-0.0114
1312.00	1712.40	4.35	0	-20.36	-0.0119
1312.00	1712.40	4.35	10	-14.91	-0.0087
1312.00	1712.40	4.35	20	-8.76	-0.0051
1312.00	1712.40	4.35	30	13.87	0.0081
1312.00	1712.40	4.35	40	21.24	0.0124
1312.00	1712.40	4.35	50	25.45	0.0149

WCDMA Band IV Results: channel 1413 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
1413.00	1732.60	3.6	-30	-11.20	-0.0065
1413.00	1732.60	3.6	-20	-12.08	-0.0070
1413.00	1732.60	3.6	-10	-8.82	-0.0051
1413.00	1732.60	3.6	0	-12.18	-0.0070
1413.00	1732.60	3.6	10	-8.19	-0.0047
1413.00	1732.60	3.6	20	-10.45	-0.0060
1413.00	1732.60	3.6	30	-8.24	-0.0048
1413.00	1732.60	3.6	40	-7.28	-0.0042
1413.00	1732.60	3.6	50	-10.44	-0.0060
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1413.00	1732.60	4.1	-30	-11.86	-0.0068
1413.00	1732.60	4.1	-20	-12.94	-0.0075
1413.00	1732.60	4.1	-10	-11.35	-0.0066
1413.00	1732.60	4.1	0	-9.31	-0.0054
1413.00	1732.60	4.1	10	-10.30	-0.0059
1413.00	1732.60	4.1	20	-9.51	-0.0055
1413.00	1732.60	4.1	30	-10.04	-0.0058
1413.00	1732.60	4.1	40	-6.76	-0.0039
1413.00	1732.60	4.1	50	-9.80	-0.0057
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1413.00	1732.60	4.35	-30	-8.12	-0.0047
1413.00	1732.60	4.35	-20	-11.96	-0.0069
1413.00	1732.60	4.35	-10	-8.35	-0.0048
1413.00	1732.60	4.35	0	-9.06	-0.0052
1413.00	1732.60	4.35	10	-10.35	-0.0060
1413.00	1732.60	4.35	20	-8.87	-0.0051
1413.00	1732.60	4.35	30	-9.70	-0.0056
1413.00	1732.60	4.35	40	-9.31	-0.0054
1413.00	1732.60	4.35	50	-8.16	-0.0047

WCDMA Band IV Results: channel 1513 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
1513.00	1752.6	3.6	-30	-13.55	-0.0090
1513.00	1752.6	3.6	-20	14.19	0.0094
1513.00	1752.6	3.6	-10	21.65	0.0143
1513.00	1752.6	3.6	0	23.67	0.0156
1513.00	1752.6	3.6	10	17.04	0.0113
1513.00	1752.6	3.6	20	9.28	0.0061
1513.00	1752.6	3.6	30	-11.73	-0.0078
1513.00	1752.6	3.6	40	-19.15	-0.0127
1513.00	1752.6	3.6	50	-23.91	-0.0158
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1513.00	1752.6	4.1	-30	-18.05	-0.0119
1513.00	1752.6	4.1	-20	12.91	0.0085
1513.00	1752.6	4.1	-10	21.36	0.0141
1513.00	1752.6	4.1	0	22.86	0.0151
1513.00	1752.6	4.1	10	17.12	0.0113
1513.00	1752.6	4.1	20	8.67	0.0057
1513.00	1752.6	4.1	30	-12.70	-0.0084
1513.00	1752.6	4.1	40	-19.81	-0.0131
1513.00	1752.6	4.1	50	-23.64	-0.0156
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1513.00	1752.6	4.35	-30	-12.77	-0.0084
1513.00	1752.6	4.35	-20	14.98	0.0099
1513.00	1752.6	4.35	-10	20.92	0.0138
1513.00	1752.6	4.35	0	21.93	0.0145
1513.00	1752.6	4.35	10	17.06	0.0113
1513.00	1752.6	4.35	20	9.67	0.0064
1513.00	1752.6	4.35	30	-11.25	-0.0074
1513.00	1752.6	4.35	40	-20.52	-0.0136
1513.00	1752.6	4.35	50	-24.84	-0.0164

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

Radiated Power Test Data Results

The following measurements were performed by Rex Zhang.

Date of Test: May 1, 2014

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

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

WCDMA Band V Call Service Mode

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBm)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Dipole) (dBm)	(W)	Limit (dBm)	Diff. To Limit (dB)
F0	4132	826.40	V	Dipole	V	-41.02	-31.15	V-V	5.23	**22.55**	0.18	38.5	15.95
F0	4132	826.40	V	Dipole	H	-31.15		H-H	4.62				
F0	4182	836.40	V	Dipole	V	-41.95	-31.66	V-V	5.07	22.19	0.17	38.5	16.31
F0	4182	836.40	V	Dipole	H	-31.66		H-H	4.45				
F0	4233	846.60	V	Dipole	V	-41.90	-32.28	V-V	3.69	22.54	0.18	38.5	15.96
F0	4233	846.60	V	Dipole	H	-32.28		H-H	5.41				

WCDMA Band V HSUPA 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)	(W)	Limit (dBm)	Diff. To Limit (dB)
F0	4132	826.40	V	Dipole	V	-42.32	-32.39	V-V	4.06	**21.38**	0.14	38.50	17.12
F0	4132	826.40	V	Dipole	H	-32.39		H-H	3.39				
F0	4182	836.40	V	Dipole	V	-43.62	-32.92	V-V	3.80	20.92	0.12	38.50	17.58
F0	4182	836.40	V	Dipole	H	-32.92		H-H	3.13				
F0	4233	846.60	V	Dipole	V	-43.45	-33.63	V-V	2.24	21.26	0.13	38.50	17.24
F0	4233	846.60	V	Dipole	H	-33.63		H-H	4.13				

Radiated Power Test Data Results cont'd

Date of Test: May 1, 2014

The environmental test conditions were: Temperature: 25.2 ºC
Relative Humidity: 36.8 %

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

WCDMA Band II 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	II	Horn	V	-27.34	-27.34	V-V	-15.70	**25.53**	0.36	33.0	7.47
F0	9262	1852.40	II	Horn	H	-27.67		H-H	-14.12				
F0	9400	1880.00	II	Horn	V	-28.28	-28.28	V-V	-16.12	24.02	0.25	33.0	8.98
F0	9400	1880.00	II	Horn	H	-28.31		H-H	-15.27				
F0	9538	1907.60	II	Horn	V	-28.79	-28.56	V-V	-16.53	23.71	0.23	33.0	9.29
F0	9538	1907.60	II	Horn	H	-28.56		H-H	-15.81				

WCDMA Band II HSUPA 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	II	Horn	V	-29.54	-29.18	V-V	-17.54	**23.64**	0.23	33.0	9.36
F0	9262	1852.40	II	Horn	H	-29.18		H-H	-16.01				
F0	9400	1880.00	II	Horn	V	-29.57	-28.94	V-V	-16.80	23.38	0.22	33.0	9.62
F0	9400	1880.00	II	Horn	H	-28.94		H-H	-15.91				
F0	9538	1907.60	II	Horn	V	-29.73	-29.36	V-V	-17.31	22.95	0.20	33.0	10.05
F0	9538	1907.60	II	Horn	H	-29.36		H-H	-16.57				

Radiated Power Test Data Results

Date of Test: May 1, 2014

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

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

WCDMA Band IV 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)	(W)	Limit (dBm)	Diff. To Limit (dB)
F0	1312	1712.4	IV	Dipole	V	-24.60	-24.60	V-V	-14.82	**26.60**	0.46	38.5	3.40
F0	1312	1712.4	IV	Dipole	H	-33.85		H-H	-13.68				
F0	1413	1732.6	IV	Dipole	V	-24.96	-24.96	V-V	-14.94	26.30	0.43	38.5	3.70
F0	1413	1732.6	IV	Dipole	H	-34.18		H-H	-14.03				
F0	1513	1752.6	IV	Dipole	V	-26.51	-26.51	V-V	-16.21	24.74	0.30	38.5	5.26
F0	1513	1752.6	IV	Dipole	H	-35.63		H-H	-15.44				

WCDMA Band IV HSUPA 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)	(W)	Limit (dBm)	Diff. To Limit (dB)
F0	1312	1712.4	IV	Dipole	V	-25.65	-25.65	V-V	-15.90	**25.51**	0.36	38.50	4.49
F0	1312	1712.4	IV	Dipole	H	-35.45		H-H	-14.77				
F0	1413	1732.6	IV	Dipole	V	-26.26	-26.26	V-V	-16.27	24.99	0.32	38.50	5.01
F0	1413	1732.6	IV	Dipole	H	-35.89		H-H	-15.34				
F0	1513	1752.6	IV	Dipole	V	-28.26	-28.26	V-V	-17.99	22.97	0.20	38.50	7.03
F0	1513	1752.6	IV	Dipole	H	-37.78		H-H	-17.21				

Radiated Emissions Test Data Results cont'd

WCDMA Band V Call Service Mode

The following measurements were performed by Savtej Sandhu.

Date of Test: April 28, 2014

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

The BlackBerry® smartphone was standalone, with horizontal 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 WCDMA Band V Call mode on channels 4132, 4182, and 4233.

All emissions were at least 25.0 dB below the limit.

The following measurements were performed by Masud Attayi

Date of Test: April 28-May 1, 2014

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

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

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

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

All emissions were at least 25.0 dB below the limit.

Radiated Emissions Test Data Results cont'd

WCDMA V HSUPA Mode

Date of Test: April 28, 2014

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

The BlackBerry® smartphone was standalone, with horizontal 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 WCDMA Band V HSUPA mode on channels 4132, 4182, and 4233.

All emissions were at least 25.0 dB below the limit.

Date of Test: April 28-May 1, 2014

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

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

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

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

All emissions were at least 25.0 dB below the limit.

Radiated Emissions Test Data Results cont'd

WCDMA Band II Call Service mode

Date of Test: April 25 and 30, 2014

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

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

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

All emissions were at least 25.0 dB below the limit.

Date of Test: April 25 - 30, 2014

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

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

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

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

All emissions were at least 25.0 dB below the limit.

Radiated Emissions Test Data Results cont'd

WCDMA Band II HSUPA Mode

Date of Test: April 25 and 30, 2014

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

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

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

All emissions were at least 25.0 dB below the limit.

Date of Test: April 25 - 30, 2014

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

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

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

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

All emissions were at least 25.0 dB below the limit.

Radiated Emissions Test Data Results cont'd

WCDMA Band IV Call Service mode

Date of Test: April 25, 2014

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

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

Measurements were performed in WCDMA Band IV Call mode on channels 1312, 1413 and 1513.

All emissions were at least 25.0 dB below the limit.

Date of Test: April 28 and 30, 2014

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

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

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

Measurements were performed in WCDMA Band IV HSUPA mode on channels 1312, 1413 and 1513.

All emissions were at least 25.0 dB below the limit.

Radiated Emissions Test Data Results cont'd

WCDMA Band IV HSUPA Mode

Date of Test: April 25, 2014

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

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

Measurements were performed in WCDMA Band IV Call mode on channels 1312, 1413 and 1513.

All emissions were at least 25.0 dB below the limit.

Date of Test: April 28 and 30, 2014

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

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

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

Measurements were performed in WCDMA Band IV HSUPA mode on channels 1312, 1413 and 1513.

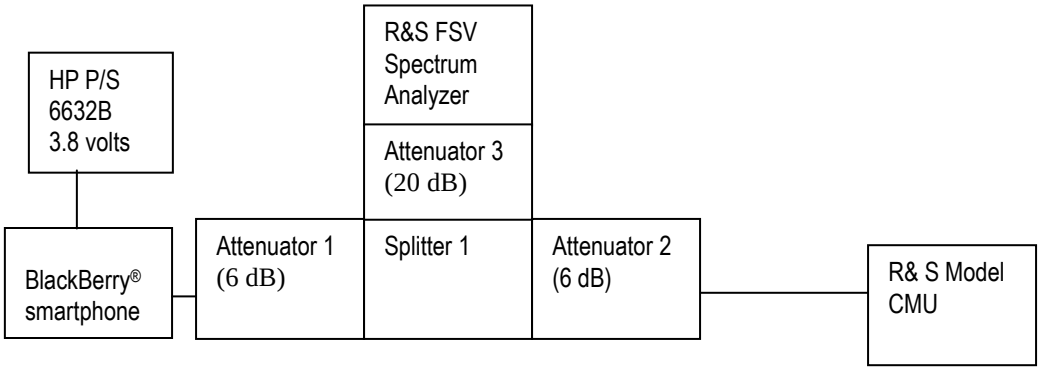
All emissions were at least 25.0 dB below the limit.

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



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

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

Date of Test: April 28 – May 1, 2014

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

The following measurements were performed by Chuan Tran.

LTE Band 2 Conducted RF Emission Test Data cont'd

Emission Designator Table

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

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

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz with different number of RBs as per scalable bandwidths for LTE Band 2, the modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth.
QPSK and 16-QAM modulations were applied to each of the bandwidths. Only the worst case measurements are documented in this report.
A minimum RB condition was also measured (RB = 1).
The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.
The worst case –26dBc bandwidth for LTE Band 2 was measured to be 18.72 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)	
	QPSK	QPSK	16QAM
1852.400	18.72	17.84	**17.87**
1880.000	18.86	17.87	17.84
1907.600	18.56	**17.90**	**17.87**

Peak to Average Ratio (PAR)

For each 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20 MHz with different number of RBs as per scalable bandwidths for LTE Band 2, the peak to average ratio was measured on the low, middle and high channels with QPSK and 16-QAM modulation.
On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.
The worst case measured was 9.10 dB on middle channel in 20MHz bandwidth with 100 RBs.

Measurement Plots for LTE Band 2

Refer to the following measurement plots for more detail:
See Figures 3-1a to 3-18a for the plots of the conducted spurious emissions.
See Figures 3-19a to 3-24a and 3-43a to 3-45a for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.
See Figures 3-25a to 3-36a for the plots of the Channel mask.
See Figures 3-37a to 3-42a for the plots of the Peak to Average Ratio.

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

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

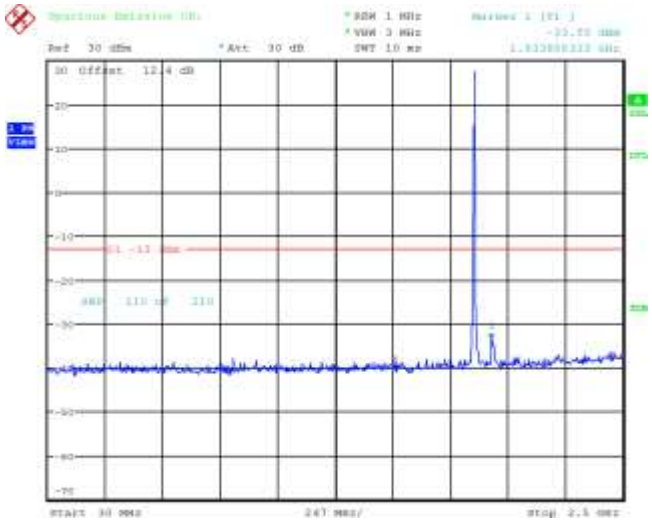


Figure 3-2a: Band 2, Spurious Conducted Emissions, Low channel, 20MHz BW (RB= 100)

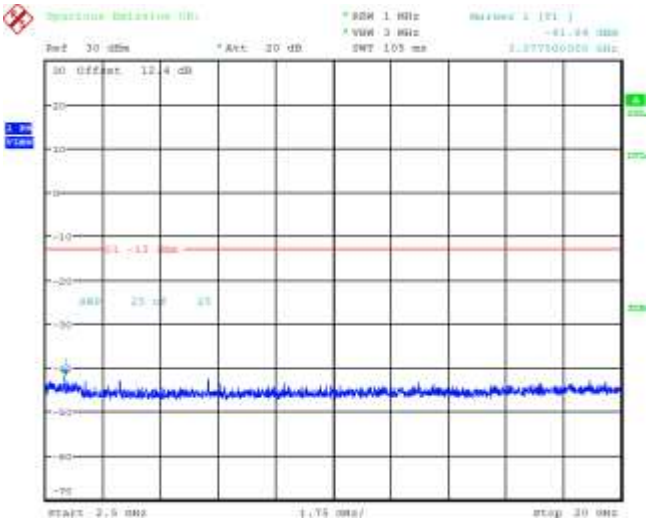


Figure 3-3a: Band 2, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 100)

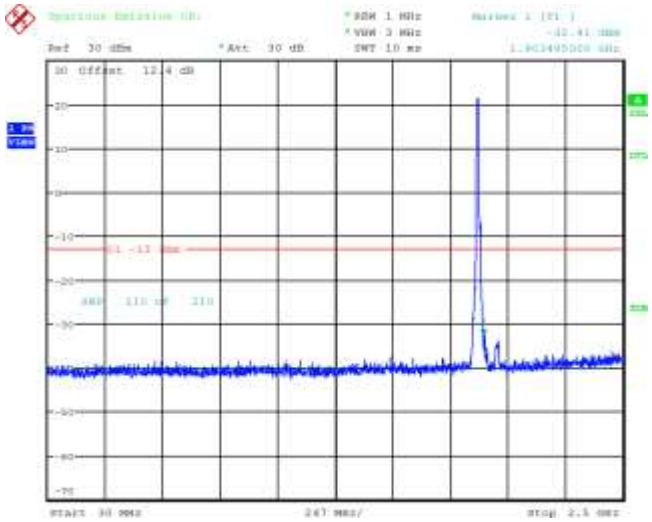
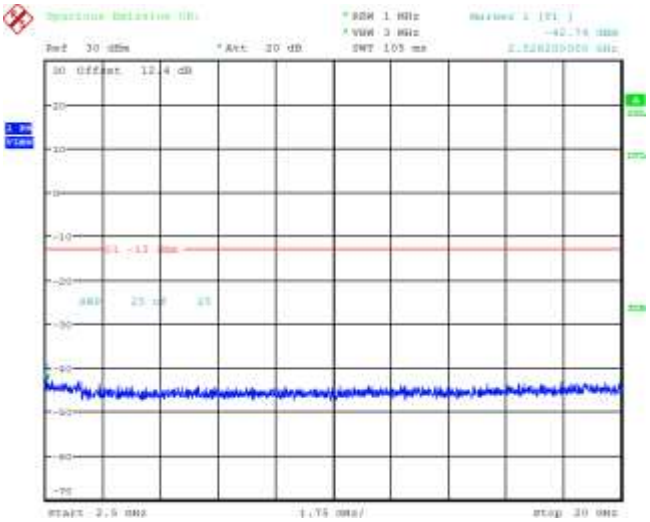


Figure 3-4a: Band 2, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 100)



LTE Band 2 Conducted RF Emission Test Data cont'd

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

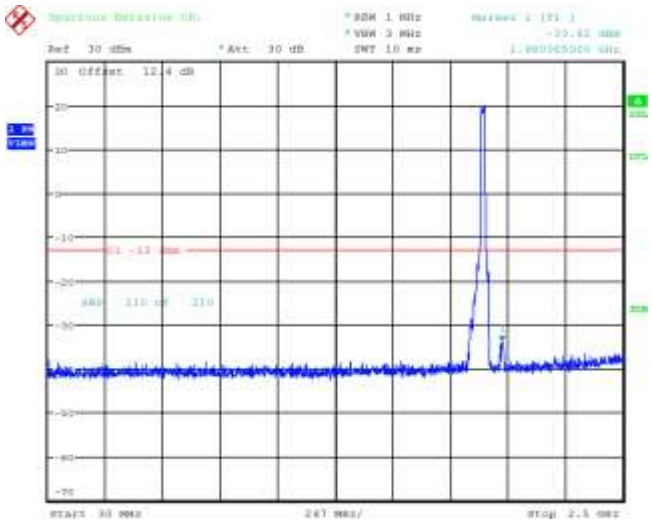


Figure 3-6a: Band 2, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)

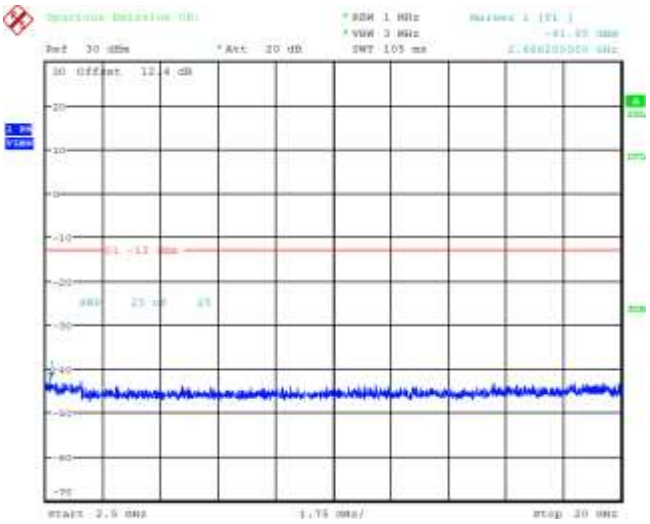


Figure 3-7a: Band 2, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)

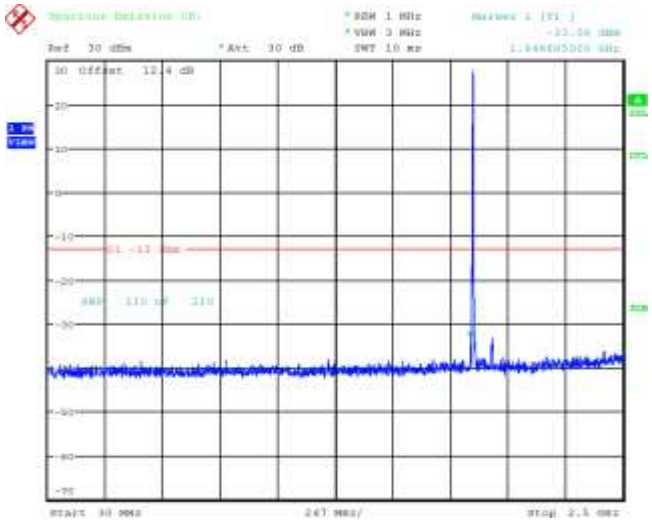
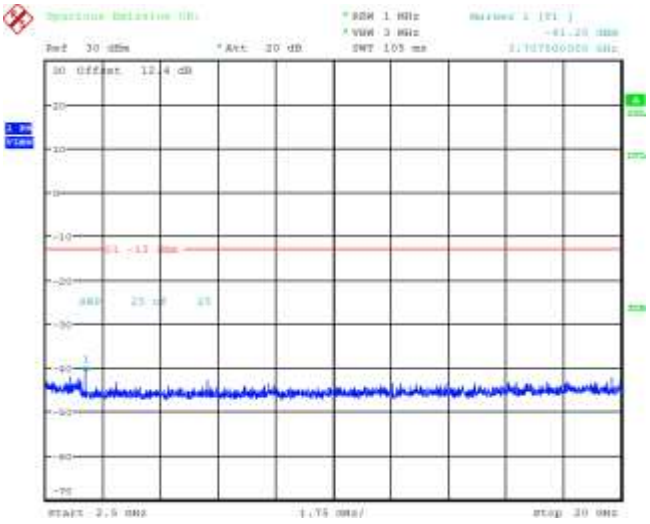


Figure 3-8a: Band 2, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 50)



LTE Band 2 Conducted RF Emission Test Data cont'd

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

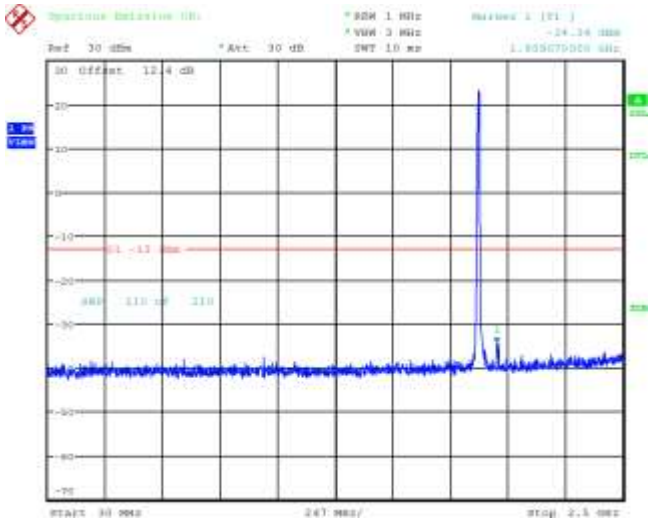


Figure 3-10a: Band 2, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 50)

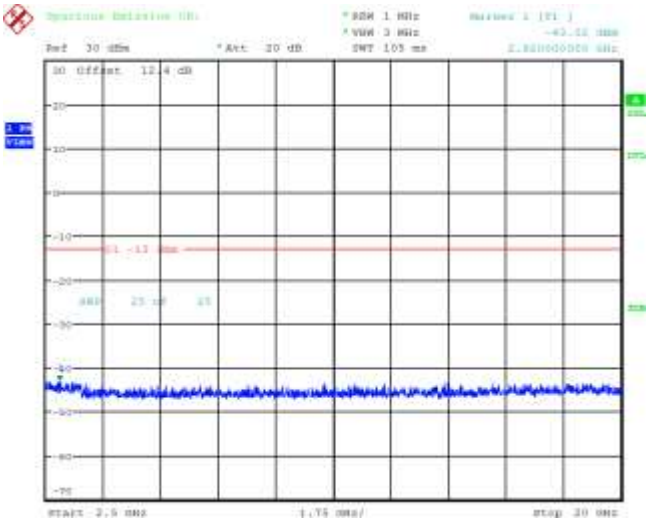


Figure 3-11a: Band 2, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)

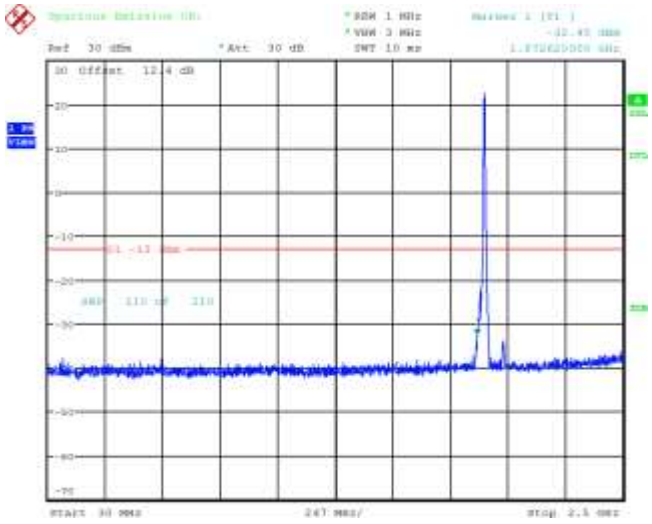
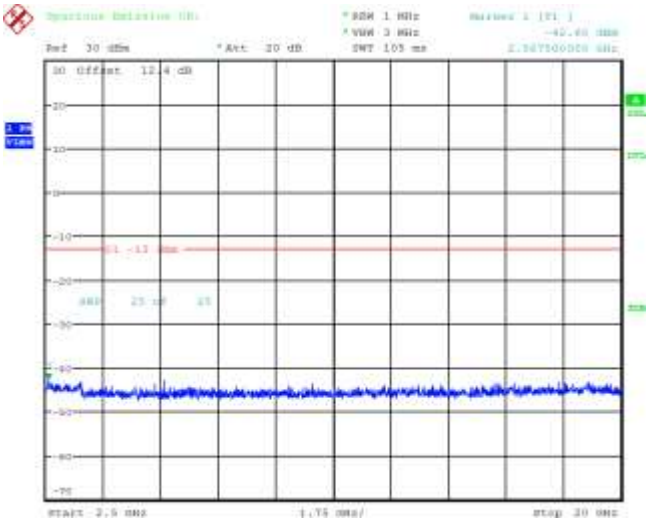


Figure 3-12a: Band 2, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)



LTE Band 2 Conducted RF Emission Test Data cont'd

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

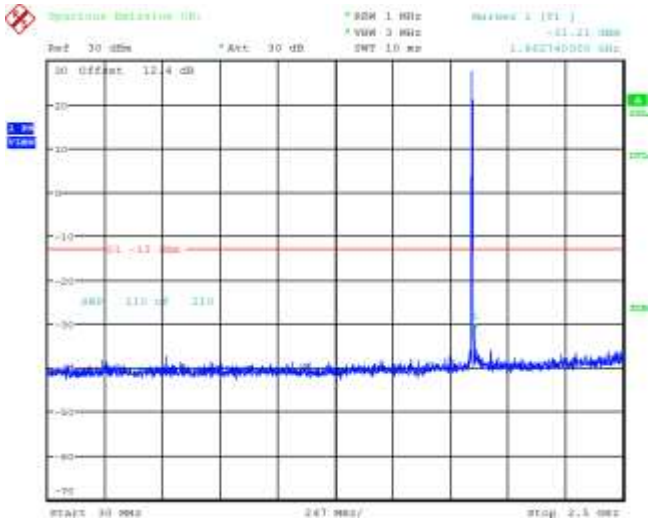


Figure 3-14a: Band 2, Spurious Conducted Emissions, Low channel, 1.4MHz BW (RB= 6)

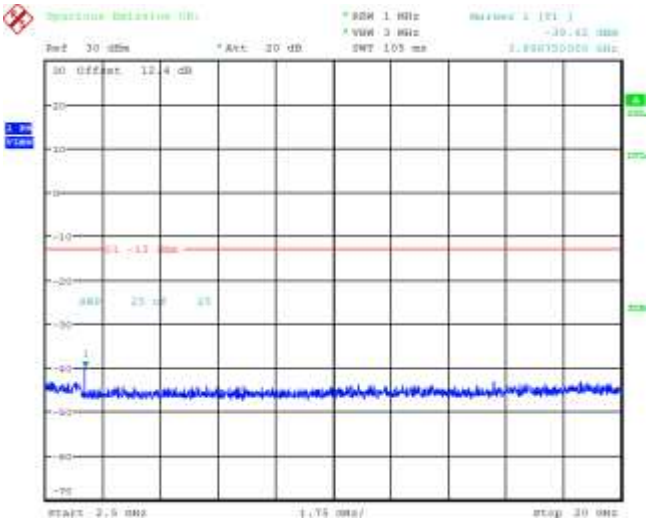


Figure 3-15a: Band 2, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 6)

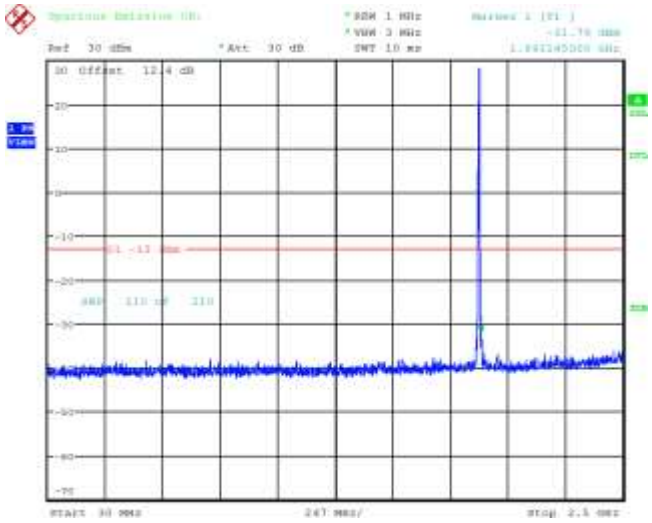
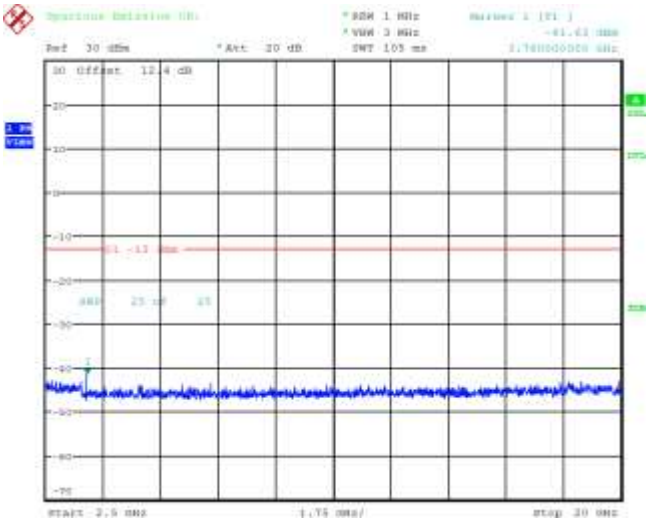


Figure 3-16a: Band 2, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 6)



LTE Band 2 Conducted RF Emission Test Data cont'd

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

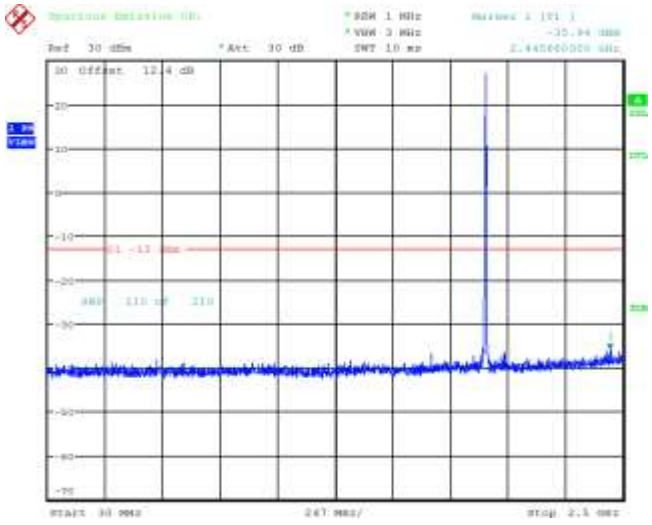


Figure 3-18a: Band 2, Spurious Conducted Emissions, High Channel, 1.4MHz BW (RB= 6)

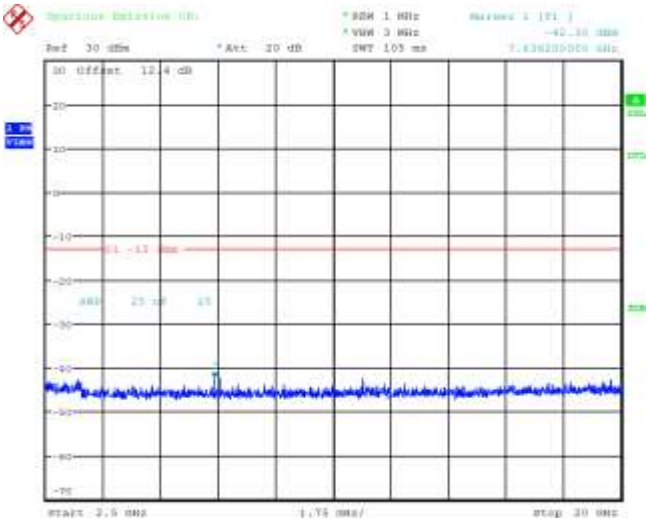


Figure 3-19a: Occupied Bandwidth, Band 2 Low Channel, 20MHz BW (RB= 100)

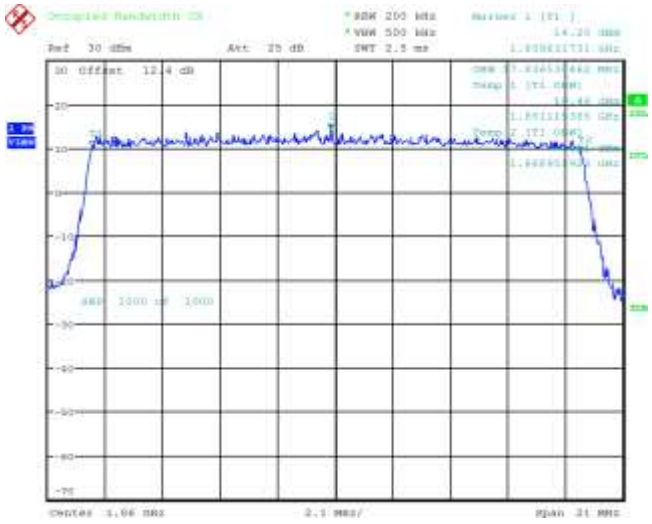
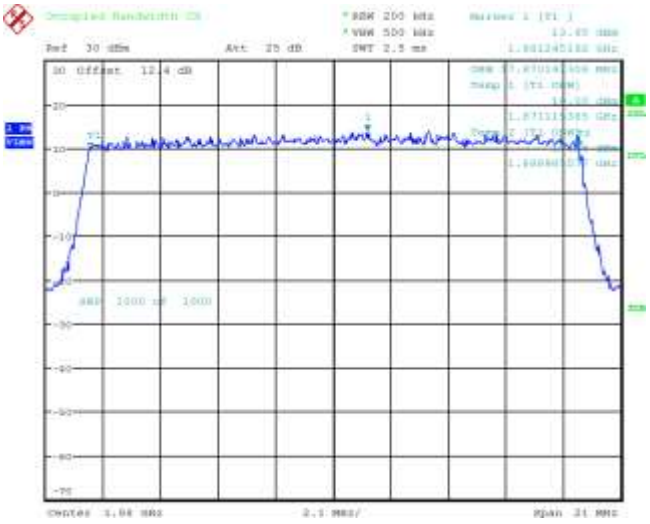


Figure 3-20a: Occupied Bandwidth, Band 2 Middle Channel, 20MHz BW (RB= 100)



LTE Band 2 Conducted RF Emission Test Data cont'd

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

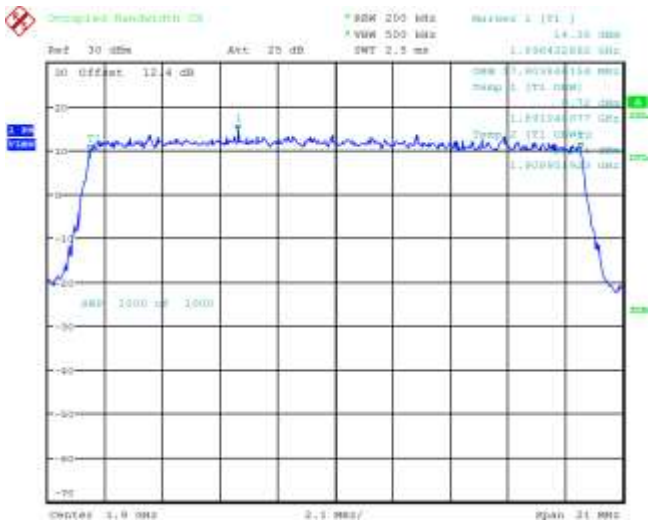


Figure 3-22a: -26 dBc Bandwidth, Band 2 Low Channel, 20MHz BW (RB= 100)

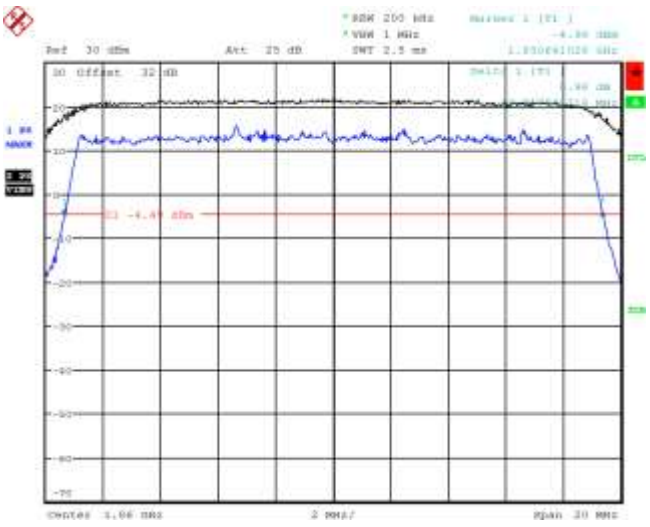


Figure 3-23a: -26 dBc Bandwidth, Band 2 Middle Channel, 20MHz BW (RB= 100)

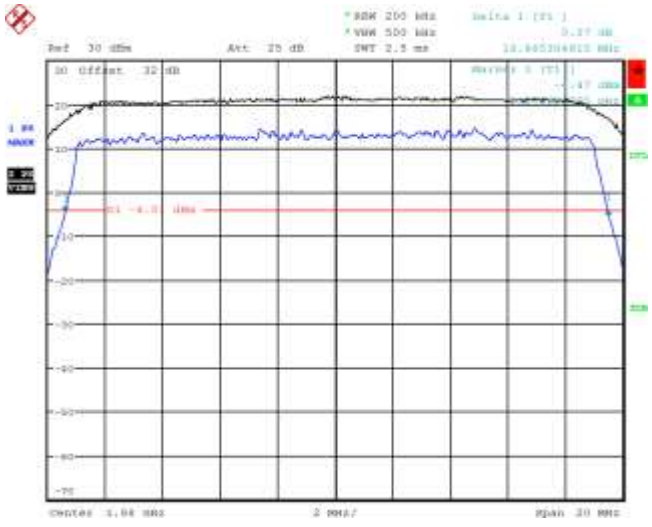
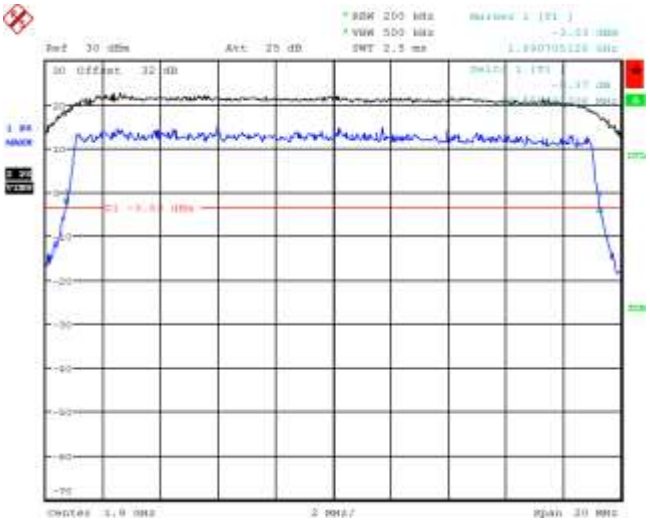


Figure 3-24a: -26 dBc Bandwidth, Band 2 High Channel, 20MHz BW (RB= 100)



LTE Band 2 Conducted RF Emission Test Data cont'd

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

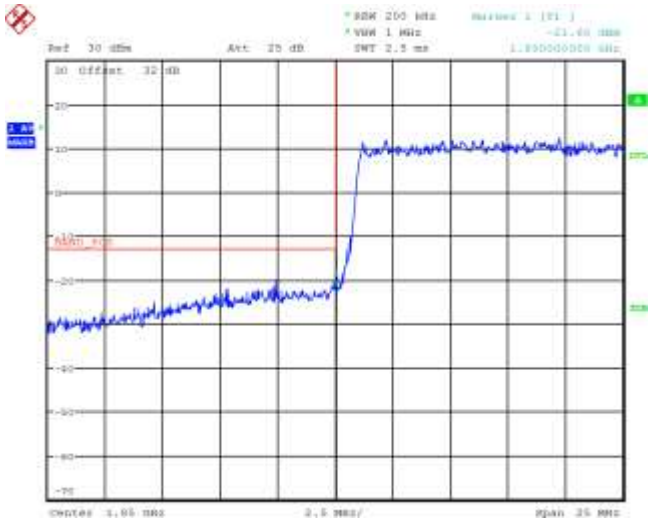


Figure 3-26a: Band 2 High Channel Mask, 20MHz BW, RB = 100

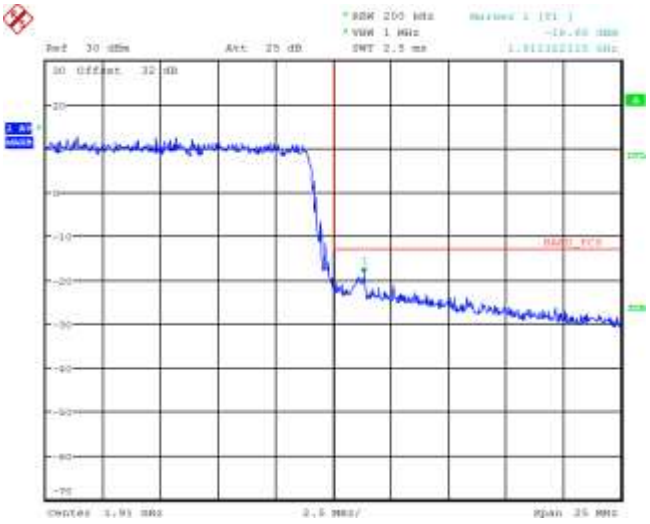


Figure 3-27a: Band 2 Low Channel Mask, 10MHz BW, RB = 50

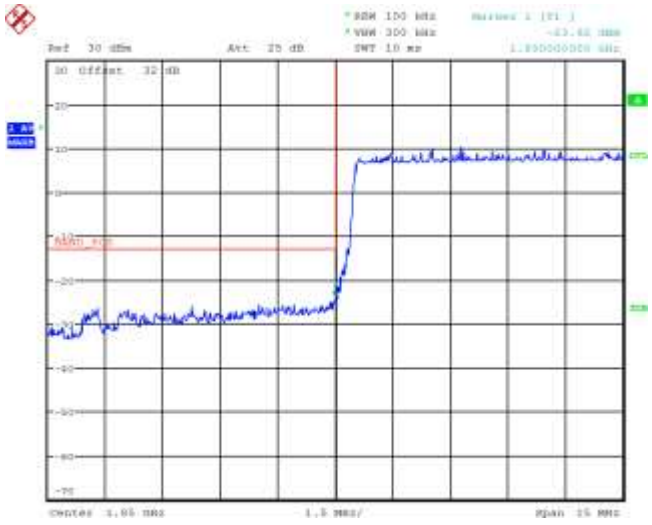
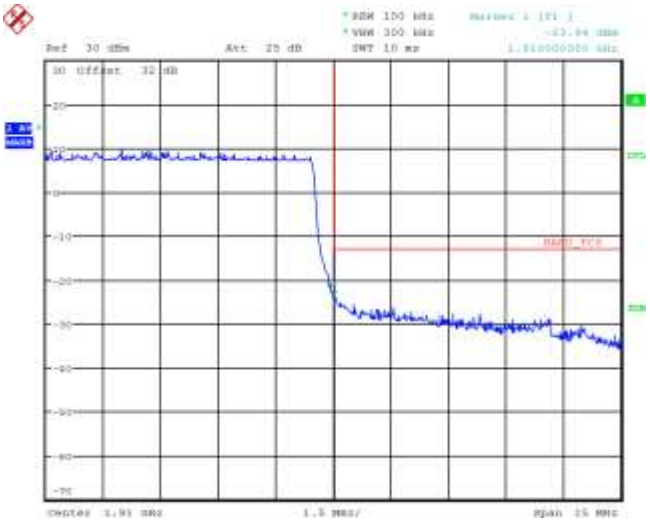


Figure 3-28a: Band 2 High Channel Mask, 10MHz BW, RB = 50



LTE Band 2 Conducted RF Emission Test Data cont'd

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

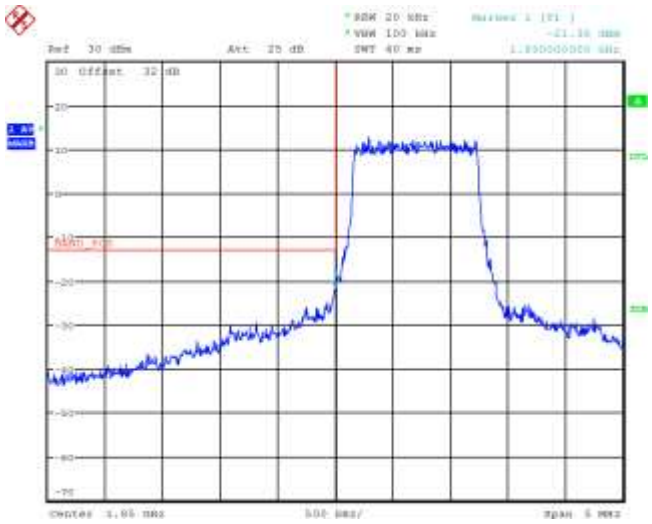


Figure 3-30a: Band 2 High Channel Mask, 1.4MHz BW, RB = 6

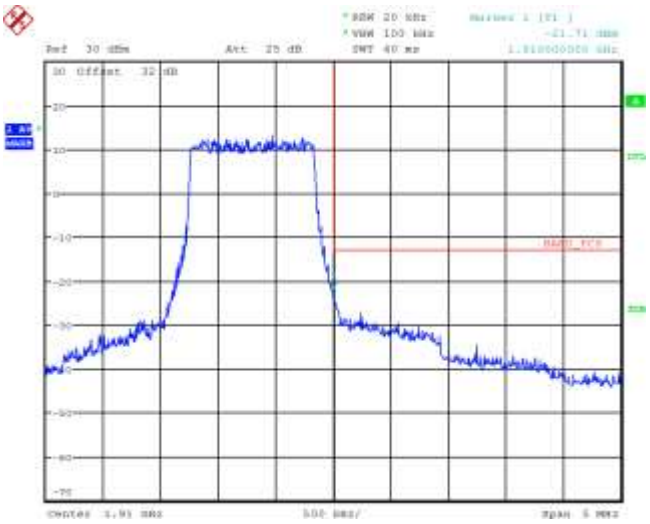


Figure 3-31a: Band 2 Low Channel Mask, 20MHz BW, RB = 1

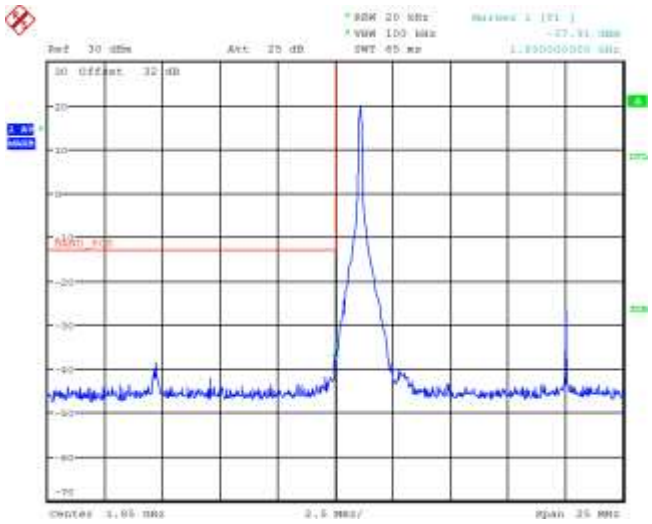
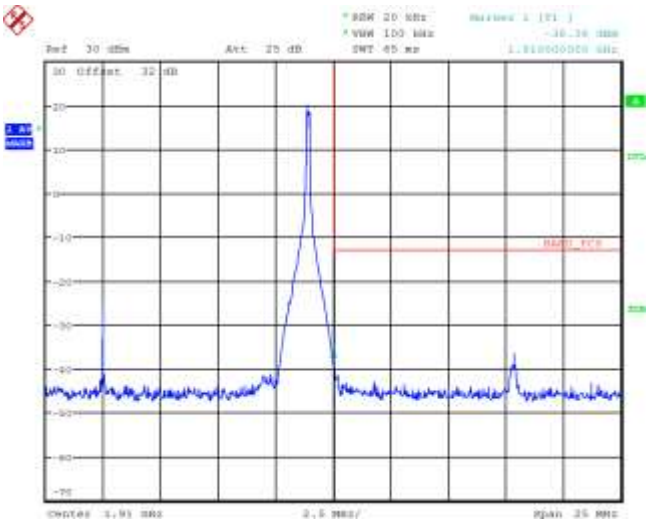


Figure 3-32a: Band 2 High Channel Mask, 20MHz BW, RB = 1



LTE Band 2 Conducted RF Emission Test Data cont'd

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

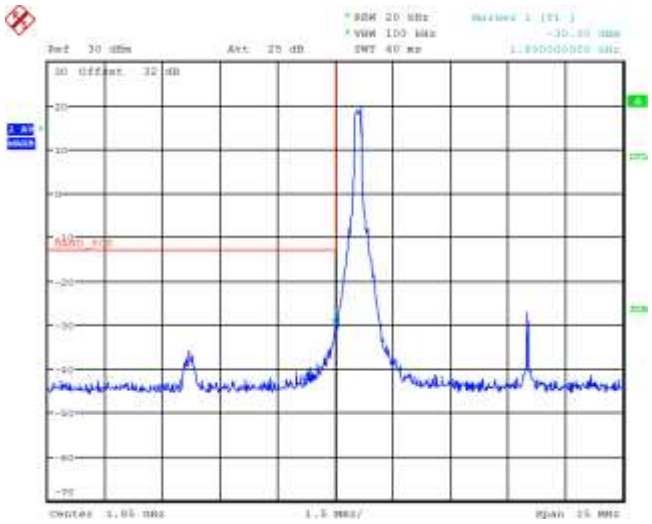


Figure 3-34a: Band 2 High Channel Mask, 10MHz BW, RB = 1

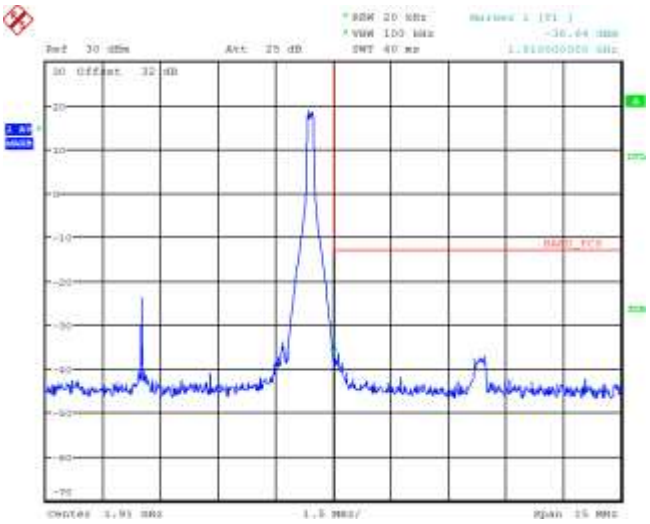


Figure 3-35a: Band 2 Low Channel Mask, 1.4MHz BW, RB = 1

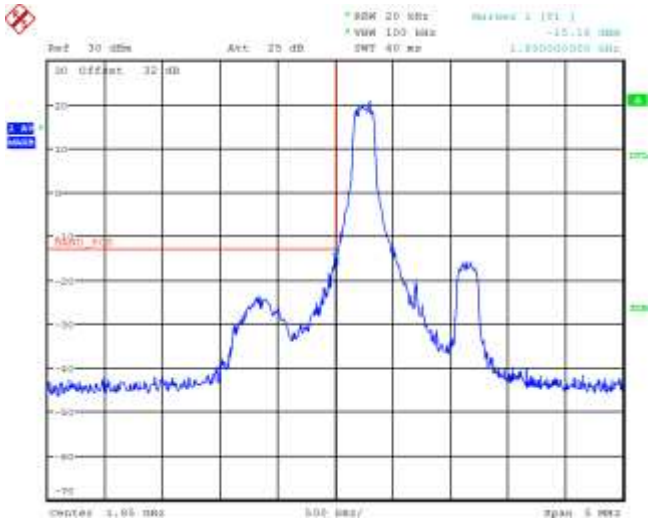
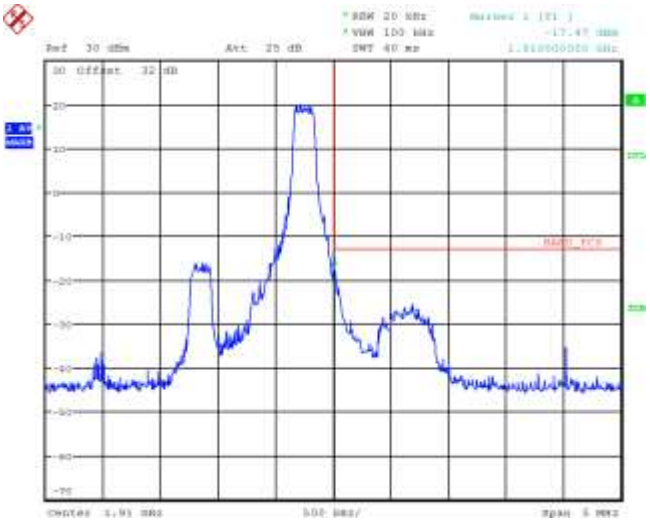


Figure 3-36a: Band 2 High Channel Mask, 1.4MHz BW, RB = 1



LTE Band 2 Conducted RF Emission Test Data cont'd

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

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

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

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

LTE Band 2 Conducted RF Emission Test Data cont'd

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

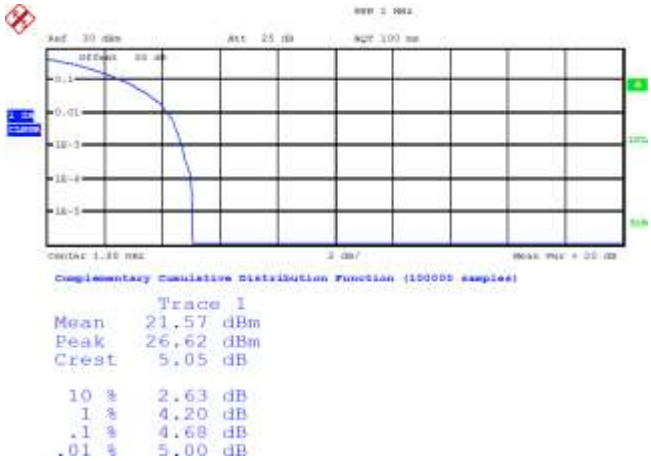
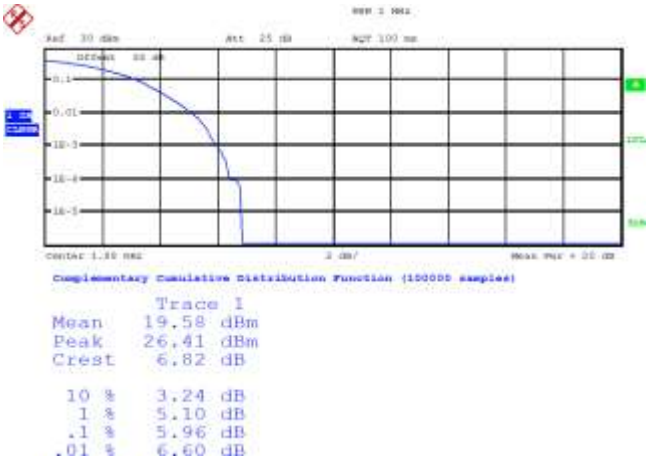


Figure 3-42a: Band 2, Mid Channel PAR, 1.4 MHz BW, RB = 6 16-QAM



LTE Band 2 Conducted RF Emission Test Data cont'd

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

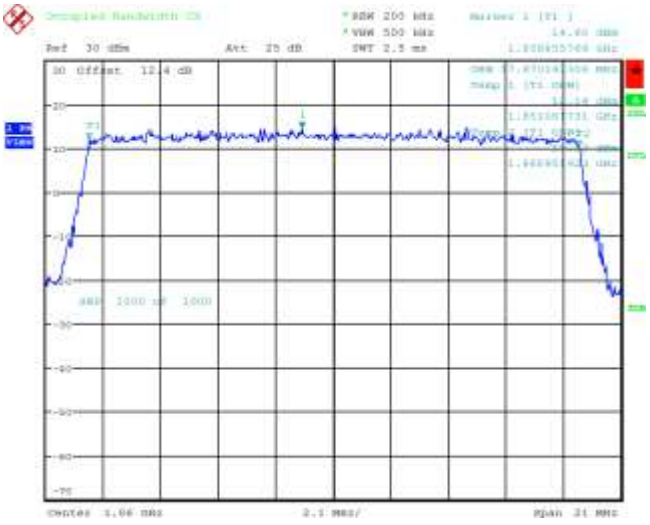


Figure 3-44a: Occupied Bandwidth, Band 2 Mid Channel, 20MHz BW (RB= 100) 16-QAM

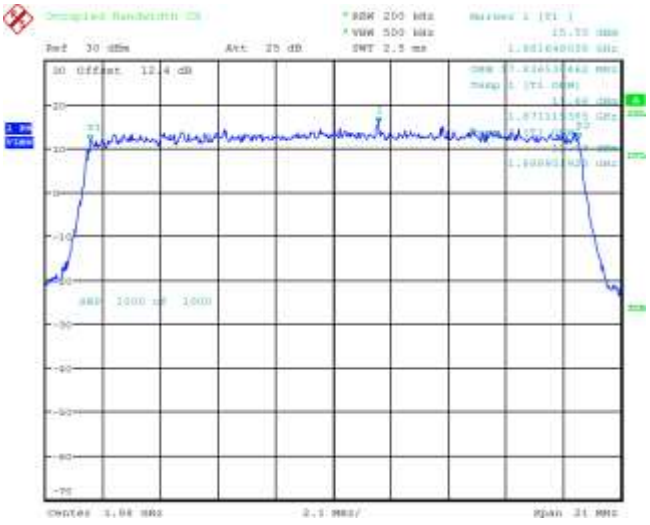
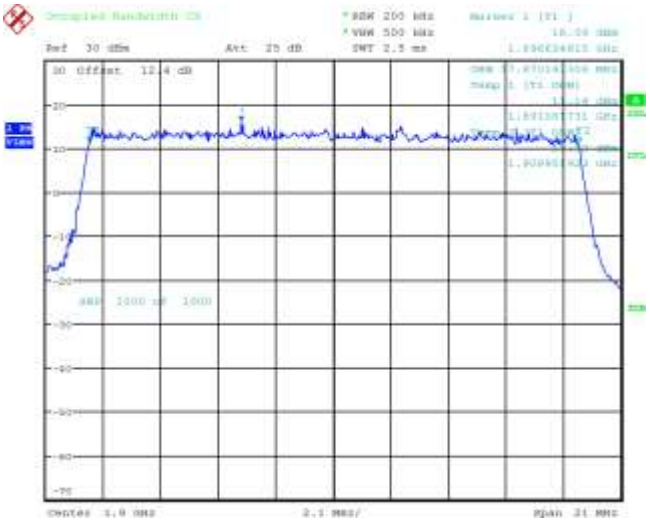
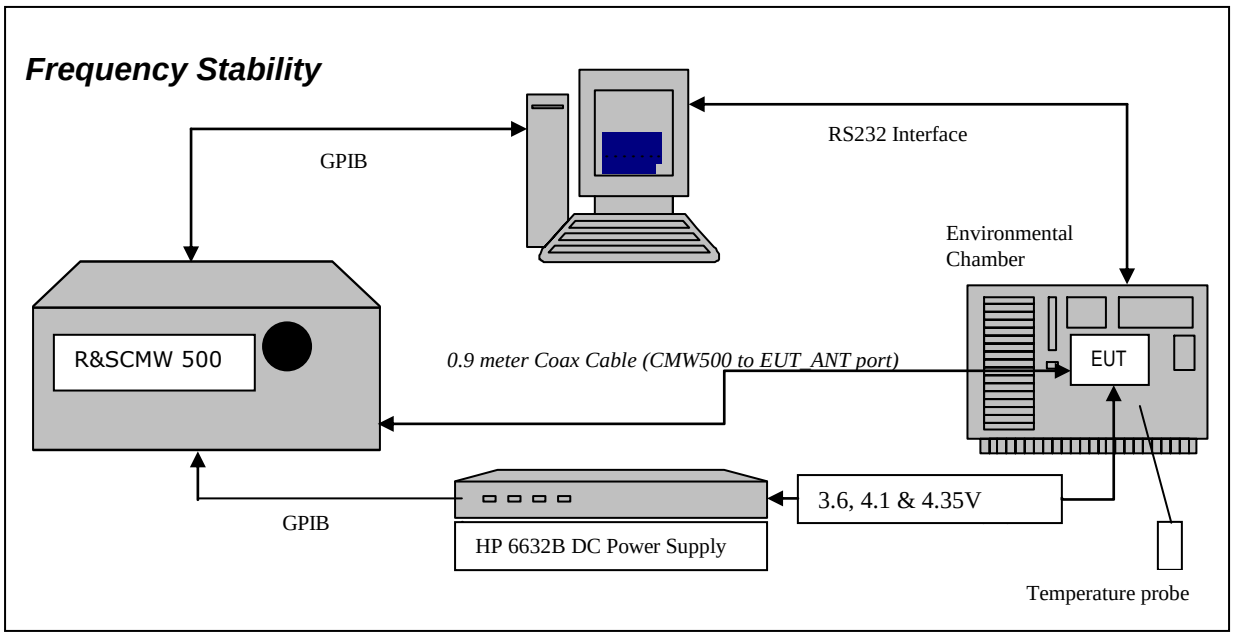


Figure 3-45a: Occupied Bandwidth, Band 2 High Channel, 20MHz BW (RB= 100) 16-QAM



APPENDIX 3B – LTE Band 2 FREQUENCY STABILITY TEST DATA

LTE Frequency Stability Test Data



The following measurements were performed by Chuan Tran.

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2 Required Measurements
2.1055 Frequency Stability - Procedures
(a,b) Frequency Stability - Temperature Variation
(d) Frequency Stability - Voltage Variation

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

The EUT meets the requirements as stated in CFR 47 chapter 1, Section 24.235, CFR 47 and RSS-133, 6.3 Frequency Stability.
Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-metre coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMW 500 and the EUT antenna port.

Test Setup:

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

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

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

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

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

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

Procedure:

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

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

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

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

Date of test: May 7, 2014

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

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

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

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

LTE band 2 Results: channel 18600 @ maximum transmitted power

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

LTE band 2 Results: channel 18900 @ maximum transmitted power

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