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, 195 and RSS-GEN

REPORT NO.: RTS-6066-1510-13C

PRODUCT MODEL NO.: RHK211LW (STV100-1), RHM181LW (STV100-4), RHT181LW (STV100-2)
TYPE NAME: BlackBerry® smartphone
FCC ID: L6ARHK210LW, L6ARHM180LW, L6ARHT180LW
IC: 2503A-RHK210LW

EMISSION DESIGNATOR (GSM): 247KGXW
EMISSION DESIGNATOR (EDGE): 246KG7W
EMISSION DESIGNATOR (WCDMA): 4M15F9W
EMISSION DESIGNATOR (LTE QPSK): See details in Appendix
EMISSION DESIGNATOR (LTE 16QAM): See details in Appendix

DATE: November 16, 2015

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

592

Statement of Performance:

The BlackBerry® smartphone, model RHK211LW (STV100-1) part number CER-62541-001 Rev4-x06-01 and accessories when configured and operated per BlackBerry's operation instructions performs within the requirements of the test standards.

The BlackBerry® smartphone, model RHM181LW (STV100-4) part number CER-62543-001 Rev2-x06-01 and accessories when configured and operated per BlackBerry's operation instructions performs within the requirements of the test standards.

The BlackBerry® smartphone, model RHT181LW (STV100-2) part number CER-62544-001 Rev 1-x08-00 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.

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A. Scope

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

- FCC CFR 47 Part 2, Subpart J, Equipment Authorization Procedures, October, 2014.
- FCC CFR 47 Part 22, Subpart H, Cellular Radiotelephone Services, October, 2014.
- FCC CFR 47 Part 24, Subpart E, Broadband PCS, October, 2014.
- FCC CFR 47 Part 27, Subpart C, Technical Standards, October, 2014.
- FCC CFR 47 Part 27, Subpart D, Competitive Bidding Procedures for the 2305–2320 MHz and 2345–2360 MHz Bands
- FCC CFR 47 Part 27, Subpart F, Competitive Bidding Procedures for the 698–806 MHz Band
- FCC CFR 47 Part 27, Subpart H, Competitive Bidding Procedures for the 698–746 MHz Band
- FCC CFR 47 Part 27, Subpart L, 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 2110–2155 MHz 2155–2180 MHz, 2180–2200 MHz Bands
- Industry Canada, RSS-132 Issue 3, January 2013, Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz.
- Industry Canada, RSS-133 Issue 6, January 2013, 2 GHz Personal Communications Services.
- Industry Canada, RSS-GEN Issue 4, November 2014, General Requirements for Compliance of Radio Apparatus.
- Industry Canada, RSS-139 Issue 3, July 2015, 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.
- Industry Canada, RSS-195 Issue 2, April 2014, Wireless Communication Service (WCS) Equipment Operating in the Bands 2305-2320 MHz and 2345-2360 MHz.

*Note: RSS-195 is currently not in the BlackBerry RTS ISO/IEC 17025 scope of accreditation, whereas all the other listed RSS standards are.

B. Associated Documents

1) RHK211LW-HW_CER-62541-001 - Rev3-x06-02
2) RHK211LW-HW_CER-62541-001 - Rev4-x06-01
3) MultiSourceDeclaration_AAC056_upto_AAC273
4) MultiSourceDeclaration_AAC273_upto_AAC380
5) MultiSourceDeclaration_AAC380_upto_AAC396
6) Test Report RTS-6066-1509-13
7) Test Report RTS-6066-1509-13B
8) RHM181LW-HW_CER-62543-001 – Rev2-x06-01
9) BlackBerrySystemSimilarity_RHK211LW_ RHM181LW
10) BlackBerrySystemSimilarity_ RHM181LW _RHT181LW
11) Test report :1-0042/15-01-05
12) Test report :1-0042/15-01-06
13) Test report :1-0042/15-01-07
14) Test report :1-0042/15-01-08

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 July 21 to October 26, 2015.

BlackBerry® smartphone Samples Tested

Sample	Model	Hardware Information	IMEI	Software Information
1	RHK211LW (STV100-1)	CER-62541-01 Rev2-x06-01	004402243067430	Software build: AAC056
2	RHK211LW (STV100-1)	CER-62541-01 Rev2-x06-01	004402243068065	Software build: AAC056
3	RHK211LW (STV100-1)	CER-62541-001 Rev3-x06-01	004402243071358	Software Build: AAC056
4	RHK211LW (STV100-1)	CER-62541-001 Rev3-x06-01	004402243071390	Software Build: AAC056
5	RHK211LW (STV100-1)	CER-62541-001 Rev3-x06-01	004402243070640	Software Build: AAC056
6	RHK211LW (STV100-1)	CER-62541-001 Rev4-x06-01	004402243079534	Software Build: AAC273
7	RHK211LW (STV100-1)	CER-62541-001 Rev4-x06-01	004402243079500	Software Build: AAC346
8	RHK211LW (STV100-1)	CER-62541-001 Rev4-x06-01	004402243079518	Software Build: AAC396
9	RHM181LW (STV100-4)	CER-62543-001 Rev1-x06-01	004402243069253	Software Build: AAC056
11	RHM181LW (STV100-4)	CER-62543-001 Rev1-x06-01	004402243069311	Software Build: AAC056
12	RHM181LW (STV100-4)	CER-62543-001 Rev 2-x06-01	004402243079914	Software Build: AAC273
13	RHM181LW (STV100-4)	CER-62543-001 Rev 2-x06-01	004402243080045	Software Build: AAC273
14	RHT181LW (STV100-2)	CER-62544-001 Rev 1-x08-00	990004319919183	Software Build: AAC684
15	RHT181LW (STV100-2)	CER-62544-001 Rev 1-x08-00	990004319918524	Software Build: AAC684
16	RHT181LW (STV100-2)	CER-62544-001 Rev 1-x08-00	990004319918599	Software Build: AAC684

RF Conducted Emissions testing was performed on samples 1, 2,9,10,11,14.
Radiated Emissions testing was performed on samples 3, 4, 5, 6, 7,8,12,13,15,16.

The characteristics that may have been affected by the changes from Rev3-x06-01 to Rev4-x06-01 for RHK211LW were verified/re-tested when necessary.

For more details, refer to RHK211LW-HW_CER-62541-001-Rev3-x06-02, RHK211LW-HW_CER-62541-001-Rev4-x06-01 and RHM181LW-HW_CER-62543-001-Rev2-x06-01.

To view the differences between software builds AAC056 to AAC396 for RHK211LW, see document MultiSourceDeclaration_AAC056_upto_AAC273, MultiSourceDeclaration_AAC273_upto_AAC380, and MultiSourceDeclaration_AAC380_upto_AAC396.

The characteristics that may have been affected by the changes from RHK211LW to RHM181LW were verified/re-tested when necessary.
For more details, refer to BlackBerrySystemSimilarity_RHK211LW_ RHM181LW

The characteristics that may have been affected by the changes from Rev1-x06-01 to Rev2-x06-01 for RHM181LW were verified/re-tested when necessary.
For more details, refer to RHM181LW-HW_CER-62543-001-Rev2-x06-01.

To view the differences between software builds AAC056 to AAC273 for RHM181LW, see document MultiSourceDeclaration_AAC056_upto_AAC273,

The characteristics that may have been affected by the changes from RHK211LW to RHT181LW were verified/re-tested when necessary.
For more details, refer to BlackBerrySystemSimilarity_RHM181LW_RHT181LW

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, 5.5 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, 6.6	GSM 850 / PCS1900 Occupied Bandwidth and Band Edge	Pass	1A
Part 24.232(d)	RSS-133, 6.4	PCS1900 Peak to Average Ratio measurements	Pass	1A
Part 2.1055 Part 22.863 Part 24.235	RSS-132, 5.3 RSS-133, 6.3	GSM 850 /PCS 1900 Frequency Stability vs. Temperature and Voltage	Pass	1B
Part 2.1046 Part 22.913(a)(2) Part 24.232(b)(c)	RSS-132, 5.4 RSS-133, 6.4	GSM850 ERP PCS1900 EIRP	Pass	1C & Test report : 1-0042/15-01-05
Part 2.1053 Part 22.917 Part 24.238	RSS-132, 5.5 RSS-133, 6.5	GSM850 / PCS1900 Radiated Spurious/Harmonic Emissions	Pass	1C & Test report : 1-0042/15-01-05
Part 2.1051 Part 22.917 Part 24.238 Part 27.53(h)	RSS-132, 5.5 RSS-133, 6.5 RSS-139, 6.5	WCDMA Band V/II/IV Conducted Spurious Emissions	Pass	2A
Part 2.1049 Part 22.917 Part 24.238 Part 27.53(h)	RSS-GEN, 6.6	WCDMA Band V/II/IV Occupied Bandwidth and Band Edge	Pass	2A
Part 24.232(d) Part 27.50(d)(5)	RSS-133, 6.4 RSS-139, 6.4	WCDMA Band II/IV Peak to Average Ratio measurements	Pass	2A
Part 2.1055(a)(d) Part 22.917 Part 24.235 Part 27.54	RSS-132, 5.3 RSS-133, 6.3 RSS-139, 6.3	WCDMA Band V/II/IV Frequency Stability vs. Temperature and Voltage	Pass	2B
Part 2.1046 Part 22.913(a)(2) Part 24.232(c) Part 27.50(d)(4)	RSS-132, 5.4 RSS-133, 6.4 RSS-139, 6.4	WCDMA Band V ERP WCDMA Band II/IV EIRP	Pass	2C & Test report : 1-0042/15-01-05
Part 2.1053 Part 22.917 Part 24.238 Part 27.53(h)	RSS-132, 5.5 RSS-133, 6.5 RSS-139, 6.5	WCDMA Band V/II/IV Radiated Spurious/Harmonic Emissions	Pass	2C & Test report : 1-0042/15-01-05

Part 2.1051 Part 24.238(a)	RSS-133, 6.5	LTE Band 2 Conducted Spurious Emissions	Pass	3A
Part 2.1049 Part 24.238	RSS-GEN, 6.6	LTE Band 2 Occupied Bandwidth and Band Edge	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 2.1046 Part 24.232(b)(c)	RSS-133, 6.4	LTE Band 2 EIRP	Pass	3C & Test report : 1-0042/15-01-06
Part 2.1053 Part 24.238	RSS-133, 6.5	LTE Band 2 Radiated Spurious/Harmonic Emissions	Pass	3C & Test report : 1-0042/15-01-06
Part 2.1051 Part 22.917	RSS-132, 5.5	LTE Band 5 Conducted Spurious Emissions	Pass	4A
Part 2.1049 Part 22.917	RSS-GEN, 6.6	LTE Band 5 Occupied Bandwidth and Band Edge	Pass	4A
Part 2.1055(a)(d) Part 22.917	RSS-132, 5.3	LTE Band 5 Frequency Stability vs. Temperature and Voltage	Pass	4B
Part 2.1046 Part 22.913(a)(2)	RSS-132, 5.4	LTE Band 5 ERP	Pass	4C
Part 2.1053 Part 22.917	RSS-132, 5.5	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)	RSS-GEN, 6.6	LTE Band 4 Occupied Bandwidth and Band Edge	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 2.1046 Part 27.50(d)(4)	RSS-139, 6.4	LTE Band 4 EIRP	Pass	5C & Test report : 1-0042/15-01-07

Part 2.1053 Part 27.53(h)	RSS-139, 6.5	LTE Band 4 Radiated Spurious/Harmonic Emissions	Pass	5C & Test report : 1-0042/15-01-07
Part 2.1051 Part 27.53(g)	RSS-130, 4.6	LTE Band 12 Conducted Spurious Emissions	Pass	6A
Part 2.1049 Part 27.53(g)	RSS-GEN, 6.6	LTE Band 12 Occupied Bandwidth and Band Edge	Pass	6A
Part 27.50(c)(11)	RSS-130, 4.4	LTE Band 12 Peak to Average Ratio measurements	Pass	6A
Part 2.1055 Part 27.54	RSS-130, 4.3	LTE Band 12 Frequency Stability vs. Temperature and Voltage	Pass	6B
Part 2.1046 Part 27.50(c)(10)	RSS-130, 4.4	LTE Band 12 ERP	Pass	6C
Part 2.1053 Part 27.53(g)	RSS-130, 4.6	LTE Band 12 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, 6.6	LTE Band 17 Occupied Bandwidth and Band Edge	Pass	7A
Part 27.50(c)(11)	RSS-130, 4.4	LTE Band 17 Peak to Average Ratio measurements	Pass	7A
Part 2.1055 Part 27.54	RSS-130, 4.3	LTE Band 17 Frequency Stability vs. Temperature and Voltage	Pass	7B
Part 2.1046 Part 27.50(c)(10)	RSS-130, 4.4	LTE Band 17 ERP	Pass	7C & Test report : 1-0042/15-01-07
Part 2.1053 Part 27.53(g)	RSS-130, 4.6	LTE Band 17 Radiated Spurious/Harmonic Emissions	Pass	7C & Test report : 1-0042/15-01-07
Part 2.1051 Part 27.53(a)(4)	RSS-195, 5.6	LTE Band 30 Conducted Spurious Emissions	Pass	8A
Part 2.1049 Part 27.53(a)(4)	RSS-GEN, 6.6	LTE Band 30 Occupied Bandwidth and Band Edge	Pass	8A
Part 27.50(a)(3)	RSS-195, 5.5	LTE Band 30 Peak to Average Ratio measurements	Pass	8A

Part 2.1055 Part 27.54	RSS-195, 5.4	LTE Band 30 Frequency Stability vs. Temperature and Voltage	Pass	8B
Part 2.1046 Part 27.50(a)(3)	RSS-195, 5.5	LTE Band 30 ERP	Pass	8C
Part 2.1053 Part 27.53(a)(4)	RSS-195, 5.6	LTE Band 30 Radiated Spurious/Harmonic Emissions	Pass	8C
Part 2.1051 Part 27.53(c)	RSS-130, 4.6	LTE Band 13 Conducted Spurious Emissions	Pass	9A
Part 2.1049 Part 27.53(c)	RSS-GEN, 6.6	LTE Band 13 Occupied Bandwidth and Band Edge	Pass	9A
Part 27.50(b)(12)	RSS-130, 4.4	LTE Band 13 Peak to Average Ratio measurements	Pass	9A
Part 2.1055 Part 27.54	RSS-130, 4.3	LTE Band 13 Frequency Stability vs. Temperature and Voltage	Pass	9B
Part 2.1046 Part 27.50(b)(10)	RSS-130, 4.4	LTE Band 13 ERP	Pass	9C & Test report : 1-0042/15-01-07
Part 2.1053 Part 27.53(c)	RSS-130, 4.6	LTE Band 13 Radiated Spurious/Harmonic Emissions	Pass	9C & Test report : 1-0042/15-01-07
Part 2.1051 Part 22.917 Part 24.238	RSS-132, 5.5 RSS-133, 6.5	CDMA Celluar / PCS Conducted Spurious Emissions	Pass	10A
Part 2.1049 Part 22.917 Part 24.238	RSS-GEN, 6.6	CDMA Celluar / PCS Occupied Bandwidth and Band Edge	Pass	10A
Part 24.232(d)	RSS-133, 6.4	CDMA PCS Peak to Average Ratio measurements	Pass	10A
Part 2.1055(a)(d) Part 22.917 Part 24.235	RSS-132, 5.3 RSS-133, 6.3	CDMA Celluar / PCS Frequency Stability vs. Temperature and Voltage	Pass	10B
Part 2.1046 Part 22.913(a)(2) Part 24.232(c)	RSS-132, 5.4 RSS-133, 6.4	CDMA Celluar ERP CDMA PCS EIRP	Pass	10C
Part 2.1053 Part 22.917 Part 24.238	RSS-132, 5.5 RSS-133, 6.5	CDMA Celluar / PCS Radiated Spurious/Harmonic Emissions	Pass	10C

F.Summary of Results

1) Conducted RF Emission Measurements

The following test configurations were measured on model RHK211LW (STV100-1):

- The BlackBerry® smartphone, herein after referred to as EUT, met the requirements of the Tx Conducted Spurious Emissions in the GSM850 as per 47 CFR 2.1051, 22.917, 22.901(d) and RSS-132, 5.5. 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 EUT met the requirements of the Tx Conducted Spurious Emissions in the PCS1900 as per 47 CFR 2.1051, 24.238(a) and RSS-133, 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 1A for test data

The EUT met the requirements of the Occupied Bandwidth and Band Edge in the GSM850 as per 47 CFR 2.202, 22.917 and RSS-GEN, 6.6. 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 low channel in CALL mode, and 246 kHz on middle channel in EDGE mode.
See APPENDIX 1A for test data.

The EUT met the requirements of the Occupied Bandwidth and Band Edge in the PCS1900 as per 47 CFR 2.202, 24.238 and RSS-GEN, 6.6. The EUT was measured in GSM and EDGE mode on the low, middle and high channels. The worst case occupied bandwidth was 247.0 kHz on middle channel in CALL mode, and 245 kHz on the middle channel in EDGE mode.
See APPENDIX 1A for test data.

The EUT met the requirements of the Tx Peak to Average Ratio in the PCS1900 as per 47 CFR 24.232 (5)(d) and RSS-133, 6.4. The EUT was measured on the low, middle and high channels. The worst case Peak to Average Ratio was 9.79 dB on mid channel.
See APPENDIX 1A for test data

The EUT met the requirements of the Frequency Stability in the GSM850 as per 47 CFR 2.1055, 22.917 and RSS-132, 5.3. The EUT was measured in GSM850 mode on the low, middle and high channels.
See APPENDIX 1B for test data.

The EUT met the requirements of the Frequency Stability in the PCS1900 as per 47 CFR 2.1055, 24.235 and RSS-133, 6.3. The EUT was measured in PCS1900 mode on the low, middle and high channels.
See APPENDIX1B for test data.

- The EUT met the requirements of the Tx Conducted Spurious Emissions in the WCDMA band V as per 47 CFR 2.1051, 22.917, 22.901(d) and RSS-132, 5.5. 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 EUT met the requirements of the Tx Conducted Spurious Emissions in the WCDMA band II as per 47 CFR 2.1051, 24.238(a) and RSS-133, 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 EUT met the requirements of the Tx Conducted Spurious Emissions in the WCDMA Band IV as per 47 CFR 2.1051, 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 EUT met the requirements of the Occupied Bandwidth and channel mask in the WCDMA band V as per 47 CFR 2.202, 22.917 and RSS-GEN, 6.6. The EUT was measured in Voice and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.140 MHz on all channels in Loopback mode, and 4.150 MHz on the high channel in HSUPA mode.
See APPENDIX 2A for test data.

The EUT met the requirements of the Occupied Bandwidth and channel mask in the WCDMA band II as per 47 CFR 2.202, 24.238 and RSS-GEN, 6.6. The EUT was measured in Voice and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.155 MHz on the middle channel in Loopback mode, and 4.155 MHz on the low and middle channel in HSUPA mode.
See APPENDIX 2A for test data.

The EUT met the requirements of the Occupied Bandwidth and channel mask in the WCDMA band IV as per 47 CFR 2.1051, 27.53 and RSS-GEN, 6.6. The EUT was measured in Voice and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.135 MHz on the low and high channel in Loopback mode, and 4.140 MHz on the all channels in HSUPA mode.
See APPENDIX 2A for test data.

The EUT met the requirements of the Tx Peak to Average Ratio in the WCDMA Band II as per 47 CFR Part 27.50 (d)(5) and RSS-139, 6.4. The EUT was measured on the low, middle and high channels. The worst case Peak to Average Ratio was 7.17 dB on middle channel.
See APPENDIX 2A for test data

The EUT met the requirements of the Tx Peak to Average Ratio in the WCDMA Band IV as per 47 CFR 24.232 (5)(d) and RSS-139, 6.4. The EUT was measured on the low, middle and high channels. The worst case Peak to Average Ratio was 6.99 dB on high channel.
See APPENDIX 2A for test data

The EUT met the requirements of the Frequency Stability in the WCDMA band V as per 47 CFR 2.1055 and RSS-132, 5.3. The EUT was measured in WCDMA band V 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 II as per 47 CFR 2.1055, 24.235 and RSS-133, 6.3. 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, 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 EUT met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 2 as per 47 CFR 2.1051, 24.238, 24.50(d), RSS-133, 6.5. 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. Resource Block allocations 100, 50, 25, 6, 3 and 1 were tested. The frequency range investigated was from 30 MHz to 20 GHz.
See APPENDIX 3A for test data.

The EUT met the requirements of the Occupied Bandwidth and Band Edge in the LTE Band 2 as per 47 CFR 2.202, 24.238 and RSS-GEN, 6.6. The EUT was measured on the low, middle and high channels in all bandwidths and both modulations. Resource Block allocations 100, 75, 50, 25, 15 and 6 were tested. The worst case occupied bandwidth was 17.93 MHz on the low and high channel in 20MHz BW, RB allocation 100 and QPSK modulation.
See Appendix 3A for test data

The EUT met the requirements of the Tx Peak to Average Ratio in the LTE Band 2 as per 47 CFR 24.232 (5)(d) and RSS-133, 6.4. The EUT was measured on the low, middle and high channels in all bandwidths with both modulations QPSK and 16-QAM. RB allocations 100, 50, 25, 6 and 3 were tested. The worst case Peak to Average Ratio was 10.70 dB on mid channel in 10MHz bandwidth with RB allocation 50.
See APPENDIX 3A for test data

The EUT met the requirements of the Frequency Stability in the LTE Band 2 as per 47 CFR 2.1055, 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 RB allocation 100 and QPSK modulation.
See APPENDIX 3B for test data.

- The EUT met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 5 as per 47 CFR 2.1051, 22.917, 22.901(d), RSS-132, 5.5. The EUT was measured on the low, middle and high channels in all bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Resource Block allocations 50, 25, 15, 6, 3 and 1 were tested. The frequency range investigated was from 30 MHz to 10 GHz.
See APPENDIX 4A for test data.

The EUT met the requirements of the Occupied Bandwidth and Band Edge in the LTE Band 5 as per 47 CFR 2.202, 22.917 and RSS-GEN, 6.6. The EUT was measured on the low, middle and high channels in 1.4MHz, 3MHz, and 5MHz and 10MHz bandwidths for LTE Band 5 with QPSK and 16-QAM modulations. Resource Block allocations 50, 25, 15 and 6 were tested. The worst case occupied bandwidth was 8.97 MHz on the low and high channel in 10MHz BW, RB allocation 50 and 16QAM modulation.
See APPENDIX 4A for test data.

The EUT met the requirements of the Frequency Stability in the LTE Band 5 as per 47 CFR 2.1055, 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. RB allocation 100 was tested.

See APPENDIX 4B for test data.

- The EUT met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 4 as per 47 CFR 2.1051, 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. Resource Block allocations 100, 50, 25, 6, 3 and 1 were tested. The frequency range investigated was from 30 MHz to 20 GHz.

The EUT met the requirements of the Occupied Bandwidth and Band Edge in the LTE Band 4 as per 47 CFR 2.1049, 27.53 and RSS-GEN, 6.6. The EUT was measured on the low, middle and high channels in all bandwidths and both modulations. Resource Block allocations 100, 75, 50, 15 and 6 were tested. The worst case occupied bandwidth was 17.98 MHz on the high channel in 20MHz BW, RB allocation 100 and 16QAM modulation.
See Appendix 5A for test data

The EUT 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. RB allocations 100, 50, 25, 6 and 3 were tested. The worst case Peak to Average Ratio was 9.96 dB on middle channel in 10MHz bandwidth with RB allocation 50.
See APPENDIX 5A for test data

The EUT met the requirements of the Frequency Stability in the LTE Band 4 as per 47 CFR 2.1055, 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 RB allocation 100 and QPSK modulation.
See APPENDIX 5B for test data.

- The EUT met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 12 as per 47 CFR 2.1051, 27.53 and RSS-130, 4.6. The EUT was measured on the low, middle and high channels in 5MHz and 10MHz, bandwidths for LTE Band 12 with QPSK and 16-QAM modulations. Resource Block Allocations 100, 50, 25 and 1 were tested. The frequency range investigated was from 30 MHz to 20 GHz.
See Appendix 6A for test data

The EUT met the requirements of the Occupied Bandwidth and Band Edge in the LTE Band 12 as per 47 CFR 2.1049, 27.53 and RSS-GEN, 6.6. The EUT was measured on the low, middle and high channels. Resource Block allocations 50 and 25 were tested. The worst case occupied bandwidth was 8.966 MHz on the middle channel in 10MHz BW, RB allocation 50 and QPSK modulation.

See Appendix 6A for test data

The EUT met the requirements of the Tx Peak to Average Ratio in the LTE Band 12 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 12 with QPSK and 16-QAM modulations. Resource Block allocation 50, 25 and 15 were tested. The worst case Peak to Average Ratio was 9.70 dB on middle channel in 10MHz bandwidth with RB allocation 25.
See APPENDIX 6A for test data

The EUT met the requirements of the Frequency Stability in the LTE Band 12 as per 47 CFR 2.1055, 27.54 and RSS-GEN, 4.3. The EUT was measured in LTE Band 12 mode on the low, middle and high channels in 20MHz BW with RB allocation 100 and QPSK modulation.
See APPENDIX 6B for test data.

- The EUT met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 17 as per 47 CFR 2.1051, 27.53, and RSS-130, 4.6. 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. Resource Block Allocations 100, 50, 25 and 1 were tested. The frequency range investigated was from 30 MHz to 20 GHz.
See Appendix 7A for test data

The EUT met the requirements of the Occupied Bandwidth and Band Edge in the LTE Band 17 as per 47 CFR 2.1049, 27.53 and RSS-GEN, 6.6. The EUT was measured on the low, middle and high channels. The worst case occupied bandwidth was 8.990MHz on the high channel in 10MHz BW, RB allocation 50 and QPSK modulation.
See Appendix 7A for test data

The EUT 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. Resource Block allocations 50, 25 and 15 were tested. The worst case Peak to Average Ratio was 9.93 dB on middle channel in 10MHz bandwidth with RB allocation 50.
See APPENDIX 7A for test data

The EUT met the requirements of the Frequency Stability in the LTE Band 17 as per 47 CFR 2.1055, 27.54 and RSS-130, 4.3. The EUT was measured in LTE Band 17 mode on the low, middle and high channels in 20MHz BW with RB allocation 100 and QPSK modulation.

See APPENDIX 7B for test data.

- The EUT met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 30 as per 47 CFR 2.1051, 27.53, and RSS-130, 4.6. The EUT was measured on the low, middle and high channels in 5MHz and 10MHz, bandwidths for LTE Band 30 with QPSK and 16-QAM modulations. Resource Block Allocations 100, 50, 25 and 1 were tested. The frequency range investigated was from 30 MHz to 20 GHz.
See Appendix 8A for test data

The EUT met the requirements of the Occupied Bandwidth and Band Edge in the LTE Band 30 as per 47 CFR 2.1049, 27.53 and RSS-GEN, 6.6. The EUT was measured on the low, middle and high channels. The worst case occupied bandwidth was 8.940MHz on the middle channel in 10MHz BW, RB allocation 50 and QPSK modulation.
See Appendix 8A for test data

The EUT met the requirements of the Tx Peak to Average Ratio in the LTE Band 30 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 30 with QPSK and 16-QAM modulations. Resource Block allocations 50, 25 and 15 were tested. The worst case Peak to Average Ratio was 9.93 dB on middle channel in 10MHz bandwidth with RB allocation 50.
See APPENDIX 8A for test data

The EUT met the requirements of the Frequency Stability in the LTE Band 30 as per 47 CFR 2.1055, 27.54 and RSS-130, 4.3. The EUT was measured in LTE Band 30 mode on the low, middle and high channels in 20MHz BW with RB allocation 100 and QPSK modulation.
See APPENDIX 8B for test data.

The following test configurations were measured on model RHT181LW (STV100-2):

LTE 13

- The EUT met the requirements of the Tx Conducted Spurious Emissions in the LTE Band 13 as per 47 CFR 2.1051, 27.53, and RSS-130, 4.6. 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. Resource Block Allocations 100, 50, 25 and 1 were tested. The frequency range investigated was from 30 MHz to 20 GHz.
See Appendix 9A for test data

The EUT met the requirements of the Occupied Bandwidth and Band Edge in the LTE Band 13 as per 47 CFR 2.1049, 27.53. The EUT was measured on the low, middle and high channels. The worst case occupied bandwidth was 8.942 MHz on the middle channel in 10MHz BW, RB allocation 50 and QPSK modulation.
See Appendix 9A for test data

The EUT 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. Resource Block allocations 50, 25 and 15 were tested. The worst case Peak to Average Ratio was 10.22 dB on middle channel in 10MHz bandwidth with RB allocation 50.
See APPENDIX 9A for test data

The EUT met the requirements of the Frequency Stability in the LTE Band 13 as per 47 CFR 2.1055, 27.54. The EUT was measured in LTE Band 13 mode on the low, middle and high channels in 10MHz BW with RB allocation 100 and QPSK modulation.
See APPENDIX 9B for test data.

- The EUT met the requirements of the Conducted Spurious Emissions in the CDMA Cellular band as per 47 CFR 2.1051, CFR 22.917 and RSS-Gen, 4.9. The EUT was measured in Loopback and 1xEVDO mode on the low, middle and high channels. The frequency range investigated was from 30 MHz to 10 GHz.
See APPENDIX 10A for the test data.

The BlackBerry® smartphone met the requirements of the Conducted Spurious Emissions in the CDMA PCS band as per 47 CFR 2.1051, CFR 24.238. The EUT was measured in Loopback and 1xEVDO mode on the low, middle and high channels. The frequency range investigated was from 30 MHz to 20 GHz
See APPENDIX 10A for the test data.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth in the CDMA Cellular band as per 47 CFR 2.1049, CFR 22.917. The EUT was measured in Loopback and 1xEVDO mode on the low, middle and high channels. The worst case occupied bandwidth was 1.286 MHz on low channel in Loopback mode and 1.274 MHz on low and middle channel in 1xEVDO mode.
See APPENDIX 10A for the test data.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask in the CDMA PCS band as per 47 CFR 2.1049, CFR 24.238. The EUT was measured in Loopback and 1xEVDO mode on the low, middle and high

channels. The worst case occupied bandwidth was 1.284 MHz on middle channel in Loopback mode and 1.282 MHz on low channel in 1xEVDO mode.
See APPENDIX 10A for the test data.

The BlackBerry® smartphone met the requirements of the Frequency Stability vs. Temperature and Voltage for CDMA Cellular band as per 47 CFR 2.1055. The EUT was measured in Cellular mode on the low, middle and high channels.
See APPENDIX 10B for test data.

The BlackBerry® smartphone met the requirements of the Frequency Stability vs. Temperature and Voltage requirements for the PCS band as per 47 CFR 2.1055, CFR 24.238. The EUT was measured in CDMA PCS mode on the low, middle and high channels.
See APPENDIX 10B 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.

The following measurements were done in a semi-anechoic chamber (SAC) below 1 GHz and a CISPR compliant modified Semi-anechoic Chamber (Mod 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.

The following test configurations were measured on model RHK211LW (STV100-1):

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

- The highest ERP in the 850 band Call mode measured was 30.18 dBm (1.04 W) at 848.80 MHz (channel 251)

- The highest ERP in the 850 band EDGE mode measured was 28.18 dBm (0.66 W) at 836.60 MHz (channel 190).

- The highest EIRP in the PCS band Call mode measured was 30.94 dBm (1.24 W) at 1880 MHz (channel 661).

- The highest EIRP in the PCS band EDGE mode measured was 30.01 dBm (1.00 W) at 1850.20 MHz (channel 512).

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

- The worst margin was 19.7 dB below the limit at 2509.72 MHz in Call mode in band GSM850.
- All margins in the GSM850 for harmonic emissions were at least 25 dB below the limit for all test frequencies in EDGE mode.
- 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 23.58 dBm (0.23 W) at 846.60 MHz (channel 4233).
- The highest ERP in the WCDMA band V, HSUPA mode was 21.43 dBm (0.14 W) at 846.60 MHz (channel 4233).
- The highest EIRP in the WCDMA band II, Call Service mode measured was 27.65 dBm (0.58 W) at 1852.4 MHz (channel 9262).
- The highest EIRP in the WCDMA band II, HSUPA mode measured was 25.95 dBm (0.39 W) at 1852.4 MHz (channel 9262).
- The highest EIRP in the WCDMA band IV, Call Service mode measured was 26.89 dBm (0.49 W) at 1752.6 MHz (channel 1513).
- The highest EIRP in the WCDMA band IV, HSUPA mode measured was 25.60 dBm (0.36 W) at 1712.4 MHz (channel 1312).

The radiated spurious emissions and 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. Resource Block Allocation 1 was measured.

- The highest EIRP in the LTE Band 2 measured was 24.92 dBm (0.31 W) at 1899.90 MHz (channel 19099) in 20 MHz BW, RB allocation 1 and QPSK modulation and
- The highest EIRP in the LTE Band 2 measured was 23.98 dBm (0.25 W) at 1880.00 MHz (channel 18900) in 20 MHz BW, RB allocation 1 and 16-QAM modulation.

The radiated spurious emissions and 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. Resource Block Allocation 1 was 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 3 and 10 MHz bandwidth for LTE Band 5 with QPSK and 16-QAM modulations. Resource Block Allocation 1 was measured.

- The highest EIRP in the LTE Band 5 measured was 20.43dBm (0.11 W) at 826.50 MHz (channel 20425) in 5 MHz BW, 1 RB and QPSK modulation.

- The highest EIRP in the LTE Band 5 measured was 19.72dBm (0.09 W) at 846.40 MHz (channel 20624) in 5 MHz BW, 1 RB and 16-QAM modulation.

The radiated spurious emission and 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. Resource Block Allocation 1 was 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. Resource Block Allocation 1 was measured.

- The highest EIRP in the LTE Band 4 measured was 25.94 dBm (0.39 W) at 1732.50 MHz (channel 20175) in 20MHz BW, RB allocation 1 and QPSK modulation.
- The highest EIRP in the LTE Band 4 measured was 25.11 dBm (0.32 W) at 1715.00 MHz (channel 20000) in 20MHz BW, RB allocation 1 and 16-QAM modulation.

The radiated spurious emission and 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. Resource Block Allocation 1 was 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 12.

The EUT was measured on the low, middle and high channels in 5MHz and 10MHz bandwidths for LTE Band 12 with QPSK and 16-QAM modulations. Resource Block Allocation 25 was measured.

- The highest EIRP in the LTE Band 12 measured was 22.17 dBm (0.16 W) at 713.40 MHz (channel 23154) in 5MHz BW, 25 RB and QPSK modulation.
- The highest EIRP in the LTE Band 12 measured was 21.14 dBm (0.13 W) at 713.40MHz (channel 23154) in 5MHz BW, 25 RB and 16-QAM modulation.

The radiated spurious emission and 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 12 with QPSK and 16-QAM modulations as per conducted power. Resource Block Allocation 25 was measured

- All margins in the LTE Band 12 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. Block Allocation 1 was measured.

- The highest EIRP in the LTE band 17 measured was 20.70 dBm (0.12 W) at 710.00 MHz (channel 23790) in 10MHz BW, RB allocation 1 and QPSK modulation.
- The highest EIRP in the LTE band 17 measured was 19.80 dBm (0.10 W) at 709.00 MHz (channel 23780) in 10MHz BW, RB allocation 1 and 16-QAM modulation.

The radiated spurious emission and harmonics were measured up to the 10th 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. Resource Block Allocation 1 was 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.

h) The radiated spurious emissions/harmonics and ERP were measured for LTE Band 30.

The EUT was measured on the low, middle and high channels in 5MHz and 10 MHz bandwidths for LTE band 30 with QPSK and 16-QAM modulations. Block Allocation 1 was measured.

- The highest EIRP in the LTE band 30 measured was 23.52 dBm (0.22 W) at 2312.40 MHz (channel 23154) in 5MHz BW, RB allocation 1 and QPSK modulation.
- The highest EIRP in the LTE band 30 measured was 22.95 dBm (0.20 W) at 2310 MHz (channel 27710) in 10MHz BW, RB allocation 1 and 16-QAM modulation.

The radiated spurious emission and harmonics were measured up to the 10th harmonic. The EUT was measured on the low, middle and high channels in the worst bandwidth 10 MHz bandwidth for LTE Band 30 with QPSK and 16-QAM modulations as per conducted power. Resource Block Allocation 1 was measured.

- All margins in the LTE Band 30 for harmonic emissions were at least 25 dB below the limit for all test frequencies.

See Appendix 8C for test data.

The following test configurations were measured on model RHT181LW (STV100-2):

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

- The highest ERP in the GSM 850 Call mode measured was 29.39 dBm (0.87 W) at 836.60 MHz (channel 190)

- The highest ERP in the GSM 850 EDGE mode measured was 29.59 dBm (0.91 W) at 848.80 MHz (channel 251).

The radiated spurious emission and harmonics were measured up to the 10th harmonic for low, middle, and high channels in the GSM 850. Each band was

measured in CALL and EDGE modes, with both the horizontal and vertical polarizations.

- All margins in the GSM850 for harmonic emissions were at least 25 dB below the limit for all test frequencies in Call mode.
- All margins in the GSM850 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 V.

- The highest ERP in the WCDMA band V, Call Service mode was 20.49 dBm (0.11 W) at 826.40 MHz (channel 4132).
- The highest ERP in the WCDMA band V, HSUPA mode was 18.80 dBm (0.08 W) at 826.40 MHz (channel 4132).

The radiated spurious emissions and harmonics were measured up to the 10th harmonic for low, middle and high channels in the WCDMA Band V. 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.

See Appendix 2C for test data.

c) 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 3 MHz bandwidth for LTE Band 5 with QPSK and 5 MHz bandwidth for LTE Band 5 with 16-QAM modulations. Resource Block Allocation 1 was measured.

- The highest ERP in the LTE Band 5 measured was 20.00 dBm (0.10 W) at 826.50 MHz (channel 20425) in 3 MHz BW, 1 RB and QPSK modulation.
- The highest ERP in the LTE Band 5 measured was 19.11 dBm (0.08 W) at 826.50 MHz (channel 20425) in 5 MHz BW, 1 RB and 16-QAM modulation.

The radiated spurious emission and 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. Resource Block Allocation 1 was 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.

d) 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 10 MHz bandwidths for LTE band 13 with QPSK and 16-QAM modulations. Block Allocation 1 was measured.

- The highest ERP in the LTE band 30 measured was 21.11 dBm (0.13 W) at 784.4 MHz (channel 23254) in 5MHz BW, RB allocation 1 and QPSK modulation.
- The highest ERP in the LTE band 13 measured was 20.45 dBm (0.11 W) at 782.0 MHz (channel 23230) in 10MHz BW, RB allocation 1 and 16-QAM modulation.

The radiated spurious emission and harmonics were measured up to the 10th harmonic. The EUT was measured on the low, middle and high channels in the worst bandwidth 10 MHz bandwidth for LTE Band 13 with QPSK and 16-QAM modulations as per conducted power. Resource Block Allocation 1 was 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 9C for test data.

i) The radiated spurious emissions/harmonics and ERP/EIRP were measured for CDMA Cellular and CDMA PCS. The results are within the limits.

- The highest ERP measured in the CDMA Cellular band, Loopback Service mode, was 24.34 dBm (0.27 W) at 824.70 MHz (channel 1013).

- The highest ERP measured in the CDMA Cellular band, 1xEVDO mode, was 22.48 dBm (0.18 W) at 824.70 MHz (channel 1013).

- The highest EIRP measured in the CDMA PCS band, Loopback Service mode, was 27.76 dBm (0.60 W) at 1908.75 MHz (channel 1175).

- The highest EIRP measured in the CDMA PCS band, 1xEVDO mode, was 26.47 dBm (0.44 W) at 1908.75 MHz (channel 1175).

The radiated carrier harmonics were measured up to the 10th harmonic for low, middle and high channels in the Cellular and PCS. Each band was measured in Loopback, Test Data and EVDO modes, with both the horizontal and vertical polarizations.

- All emissions were greater than 25 dB below the accepted limits for all test frequencies.

See Appendix 10C for test data.

3) Co-Location Radiated Measurements

The following test configurations were measured on model RHK211LW (STV100-1):

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.

The following test configurations were measured on model RHM181LW (STV100-4):

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
- WCDMA Band V + Bluetooth(2DH5) + 802.11g
- LTE B5 + Bluetooth(2DH5) + 802.11g
- LTE B12 + Bluetooth(3DH5) + 802.11n(2.4GHz)
- LTE B13 + Bluetooth(DH5) + 802.11n(2.4GHz)
- LTE B17 + Bluetooth(2DH5) + 802.11g
- LTE B25 + Bluetooth(2DH5) + 802.11a
- LTE B30 + Bluetooth(DH5) + 802.11ac
- LTE B41 + Bluetooth(DH5) + 802.11b

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.

The following test configurations were measured on model RHT181LW (STV100-2):

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
- CDMA BC0 + Bluetooth(DH5) + 802.11a
- CDMA BC1 + Bluetooth(2DH5) + 802.11ac
- WCDMA Band V + Bluetooth(2DH5) + 802.11g
- LTE B5 + Bluetooth(2DH5) + 802.11g
- LTE B13 + Bluetooth(DH5) + 802.11n(2.4GHz)

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	16-10-16	Radiated Emissions
Preamplifier system	TDK RF Solutions	PA-02	080010	16-10-16	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA4-SP	001	16-10-23	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	16-10-23	Radiated Emissions
Hybrid Log Antenna	EMC Automation	HLP-3003C	017301	16-08-13	Radiated Emissions
Horn Antenna	CMT	LHA0180	R52734-001	16-03-31	Radiated Emissions
Horn Antenna	Emco	3117	47563	17-08-07	Radiated Emissions
Horn Antenna	ETS	3116	2538	16-09-29	Radiated Emissions
Dipole Antenna	Schwarzbeck	UHAP	974	16-11-27	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	837493/073	15-11-24	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	112394	15-11-25	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	109747	15-11-25	RF Conducted Emissions
EMI Receiver	Rohde & Schwarz	ESIB-40	100255	15-12-11	Radiated Emissions
EMI Receiver	Rohde & Schwarz	ESU-40	100162	15-12-08	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	15-12-09	Radiated /RF Conducted Emission
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	109949	15-12-07	Radiated /RF Conducted Emission
Signal Generator	Agilent	E8257D	MY45140527	15-12-10	Radiated Emissions
Signal Generator	Agilent	83630B	3844A00927	15-11-23	Radiated Emissions
Spectrum Analyzer	Rohde & Schwarz	FSV	101820	15-11-21	RF Conducted Emissions
Spectrum Analyzer	Rohde & Schwarz	FSP	100884	15-11-21	RF Conducted Emissions

H. Test Software used

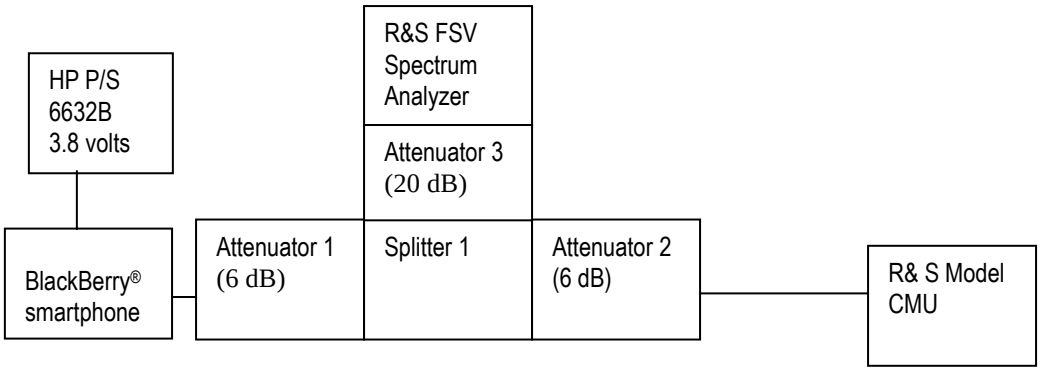
SOFTWARE	COMPANY	VERSION	USE
EMC32	Rohde & Schwarz	8.53.0	Radiated Emissions
TDK Standard Emission Test	TDK RF Solutions	8.53.1.62	Radiated Emissions

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: 26 ºC
Relative Humidity: 41.3 %

The following measurements were performed by Sijia Li.

GSM Conducted RF Emission Test Data cont'd

The following test configurations were measured on RHK211LW (STV100-1):

The conducted spurious emissions – As per 47 CFR 2.1051, 22.917, 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 265kHz, and for the PCS1900 band was measured to be 259kHz 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	265	**246**
837.6	250	244
848.8	253	243

PCS1900 band Frequency (MHz)	-26dBc Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
1850.2	258	244
1880.0	250	**247**
1909.8	259	244

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	243
837.6	245
848.8	**246**

PCS1900 band Frequency (MHz)	99% Occupied Bandwidth (kHz)
1850.2	244
1880.0	**245**
1909.8	244

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

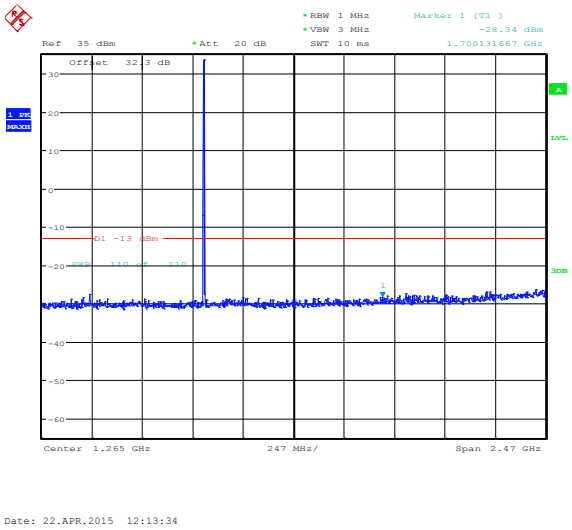


Figure 1-1a: GSM850 band, Spurious Conducted Emissions, Low channel

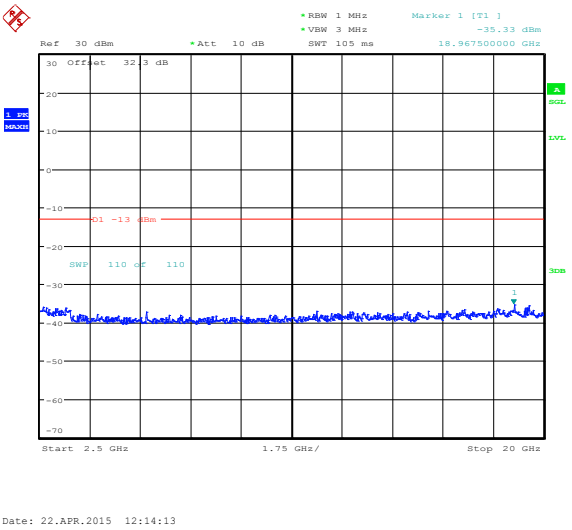


Figure 1-2a: GSM850 band, Spurious Conducted Emissions, Middle Channel

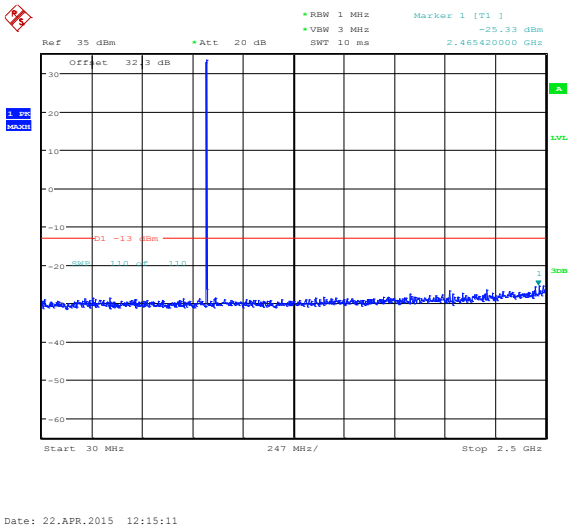
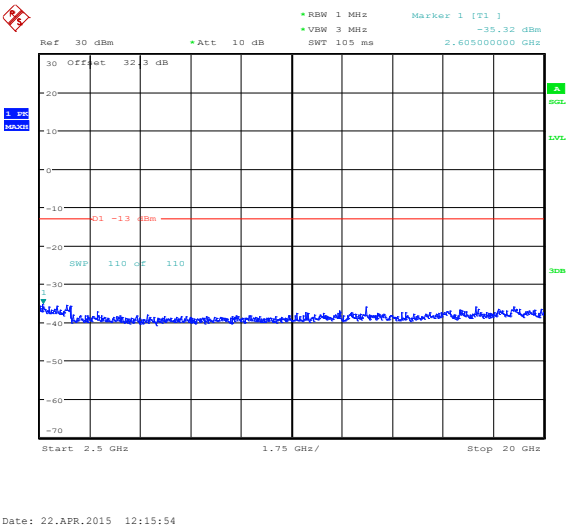


Figure 1-3a: GSM850 band, Spurious Conducted Emissions, Middle Channel



GSM Conducted RF Emission Test Data cont'd

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

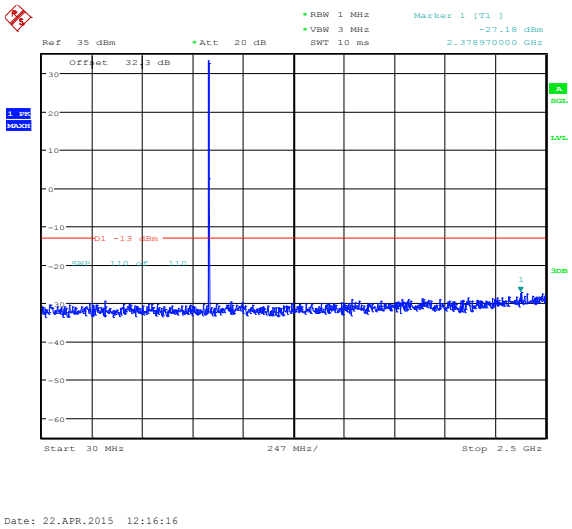


Figure 1-5a: GSM850 band, Spurious Conducted Emissions, High Channel

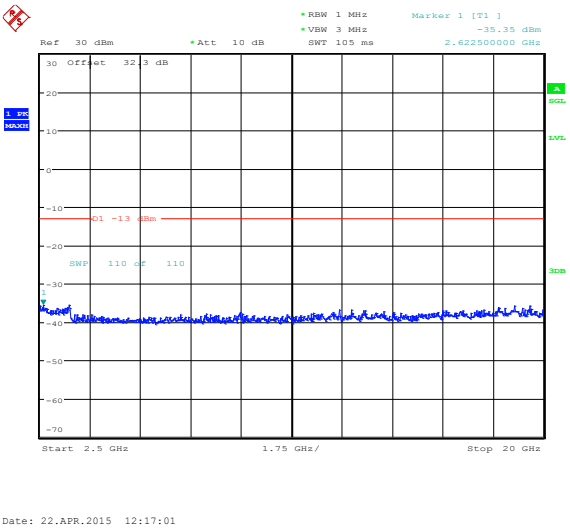


Figure 1-7a: PCS1900 band, Spurious Conducted Emissions, Low Channel

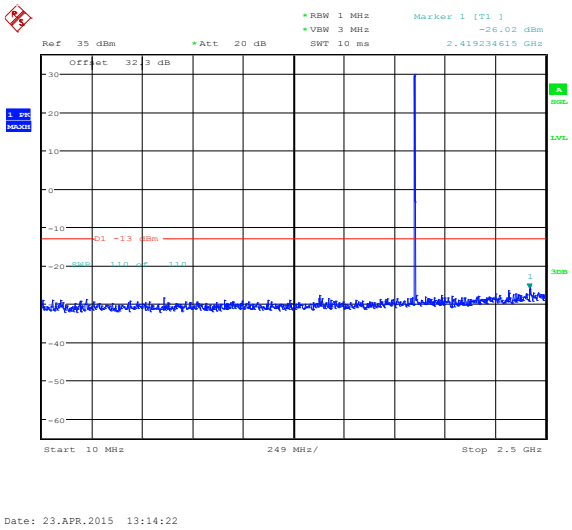
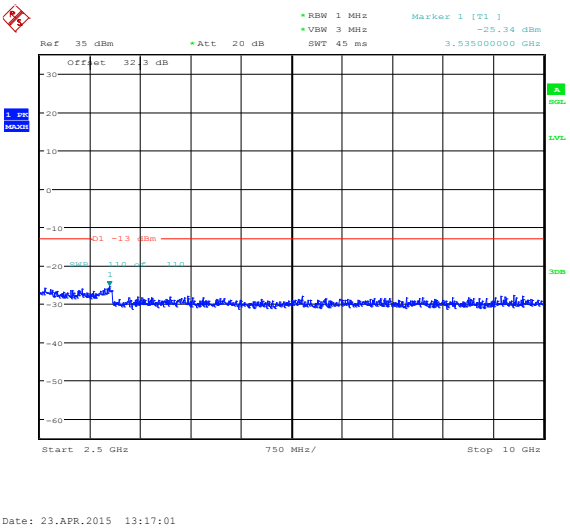


Figure 1-8a: PCS1900 band, Spurious Conducted Emissions, Low Channel



GSM Conducted RF Emission Test Data cont'd

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

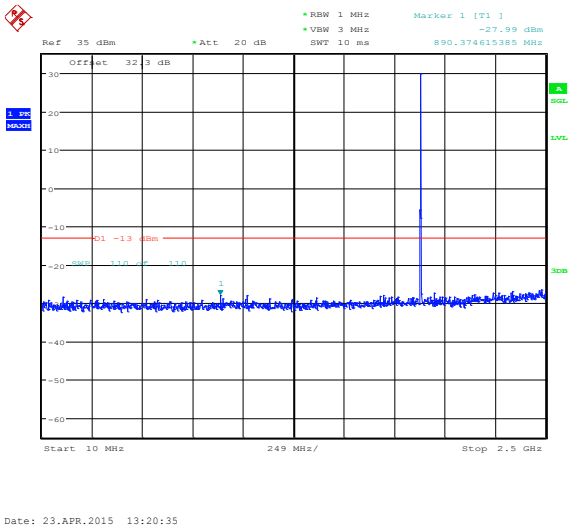


Figure 1-10a: PCS1900 band, Spurious Conducted Emissions, Middle Channel

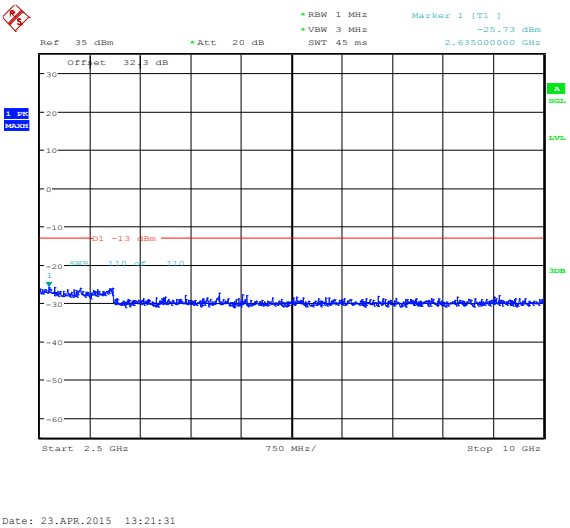


Figure 1-11a: PCS1900 band, Spurious Conducted Emissions, High Channel

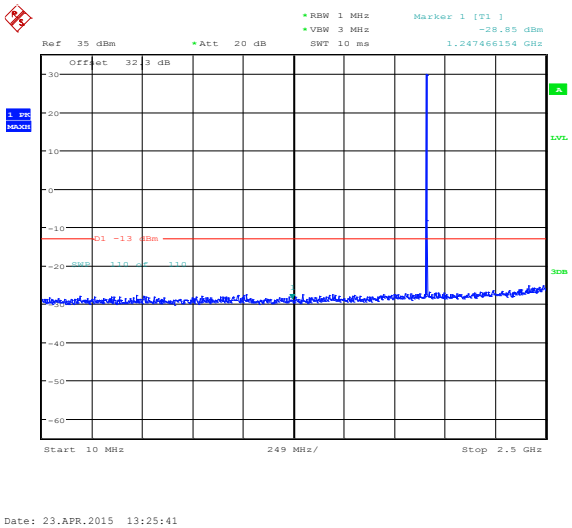
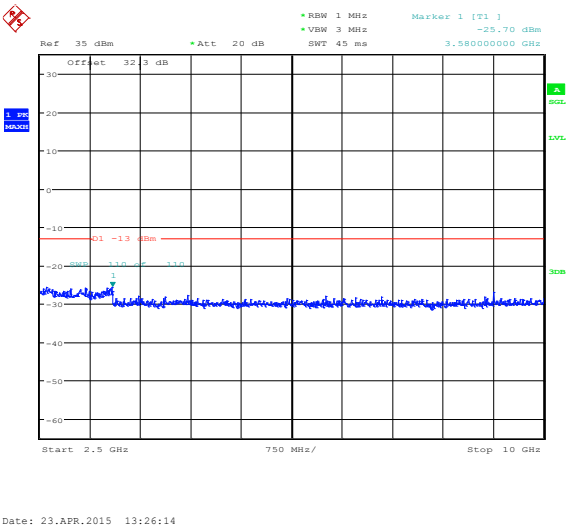
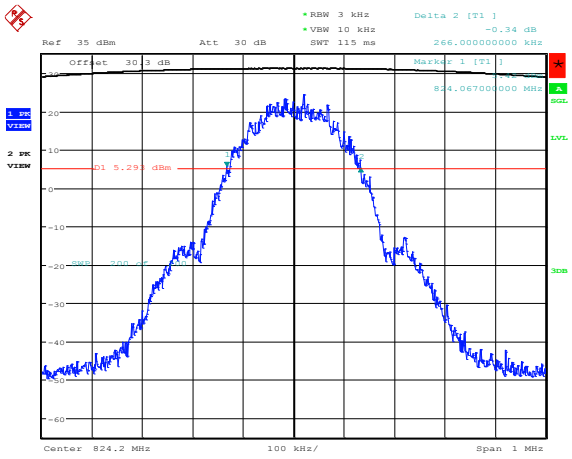


Figure 1-12a: PCS1900 band, Spurious Conducted Emissions, High Channel



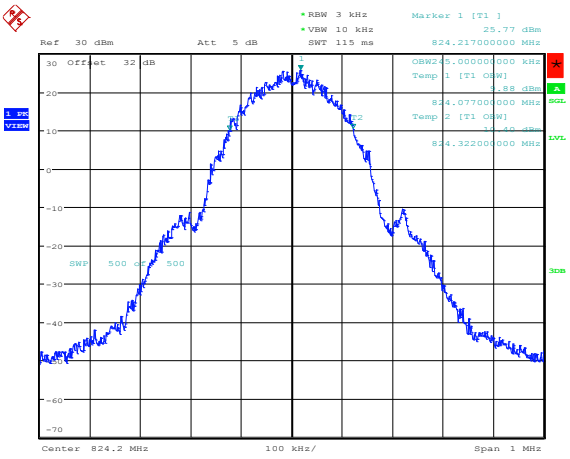
GSM Conducted RF Emission Test Data cont'd

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



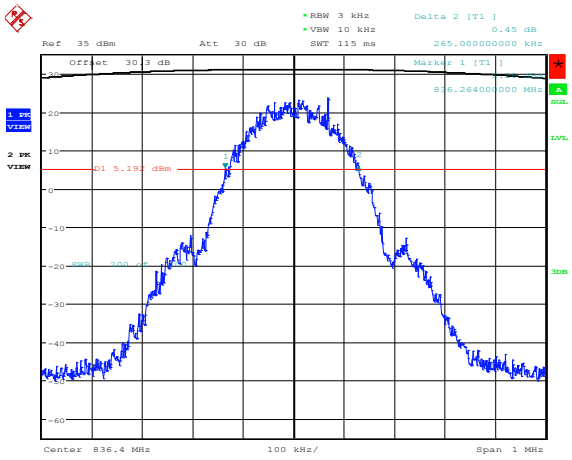
Date: 22.APR.2015 13:56:23

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



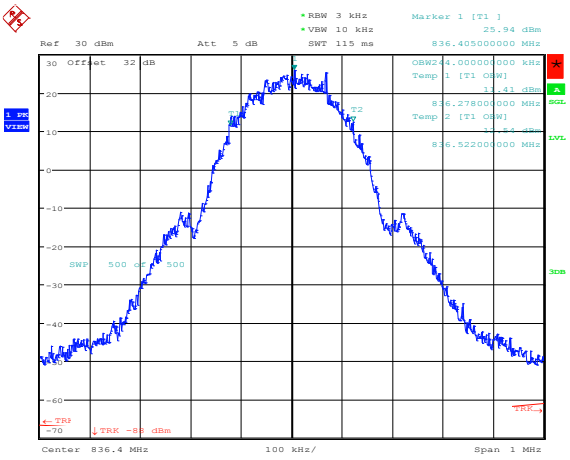
Date: 22.APR.2015 14:41:55

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



Date: 22.APR.2015 14:36:48

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



Date: 22.APR.2015 14:44:08

GSM Conducted RF Emission Test Data cont'd

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

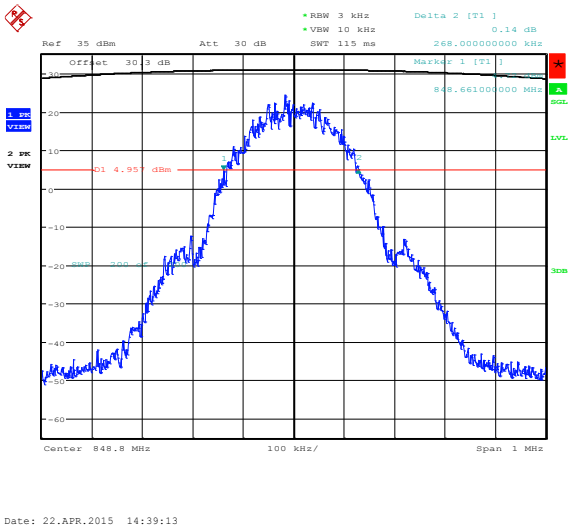


Figure 1-18a: Occupied Bandwidth, GSM850 band High Channel in GSM mode

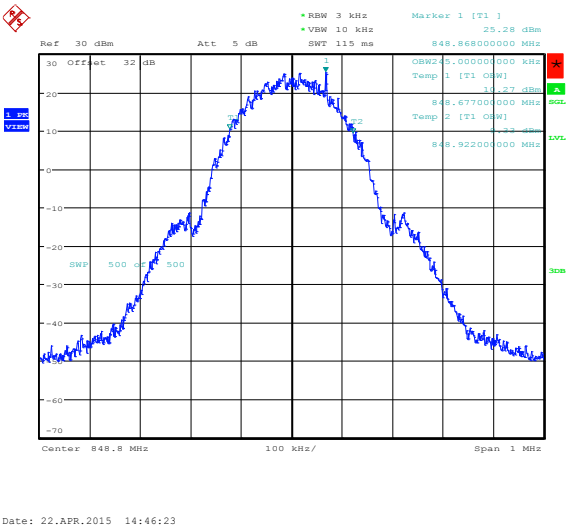


Figure 1-19a: -26dBc bandwidth, PCS1900 Low Channel in GSM mode

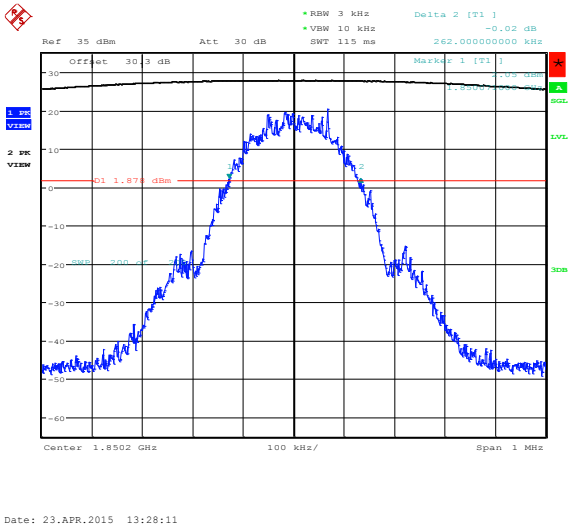
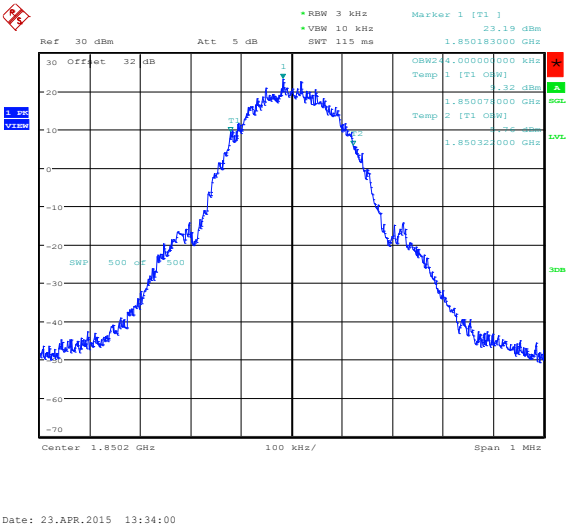


Figure 1-20a: Occupied Bandwidth, PCS1900 Low Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

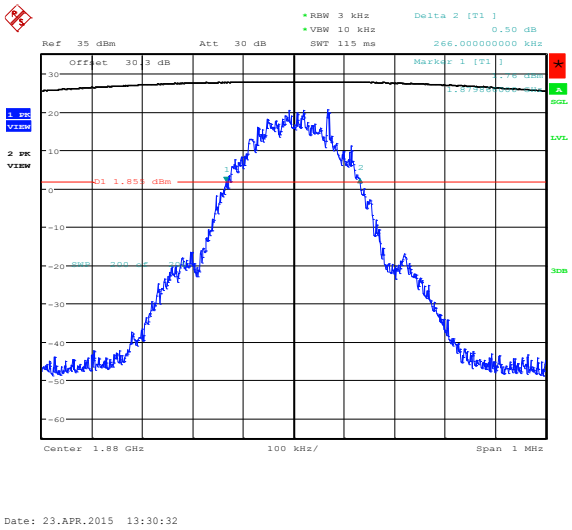


Figure 1-22a: Occupied Bandwidth, PCS1900 Middle Channel in GSM mode

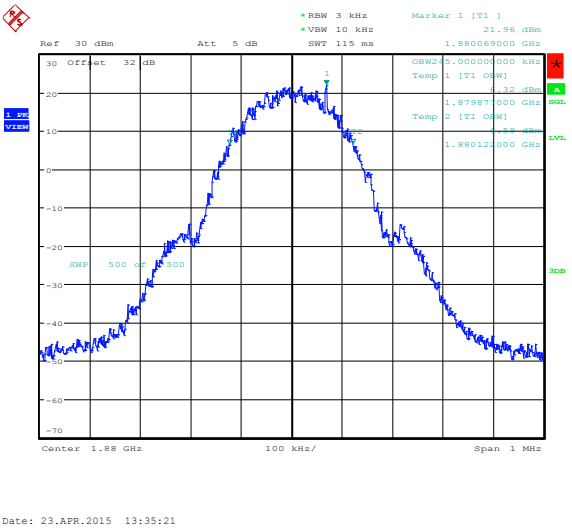


Figure 1-23a: -26dBc bandwidth, PCS1900 High Channel in GSM mode

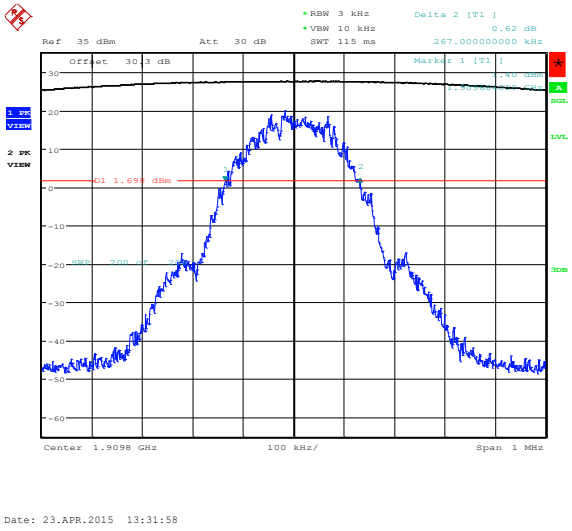
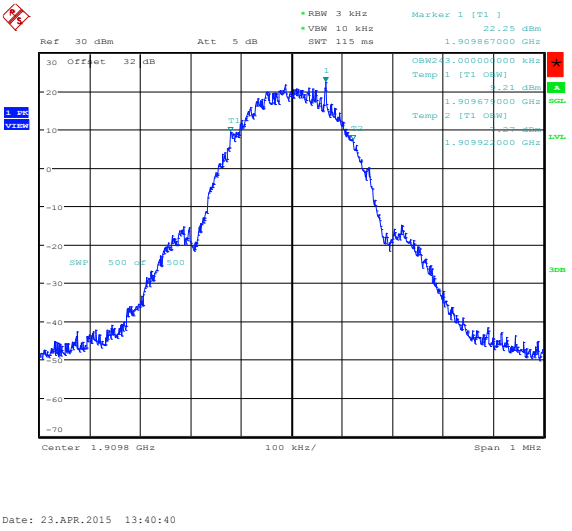


Figure 1-24a: Occupied Bandwidth, PCS1900 High Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

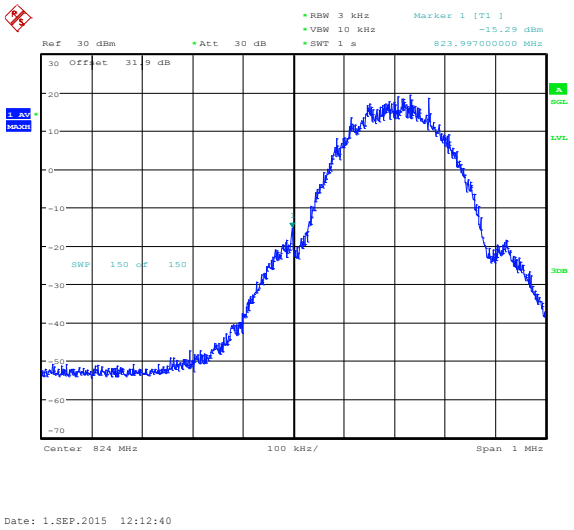


Figure 1-26a: GSM850 band High Channel Mask in GSM mode

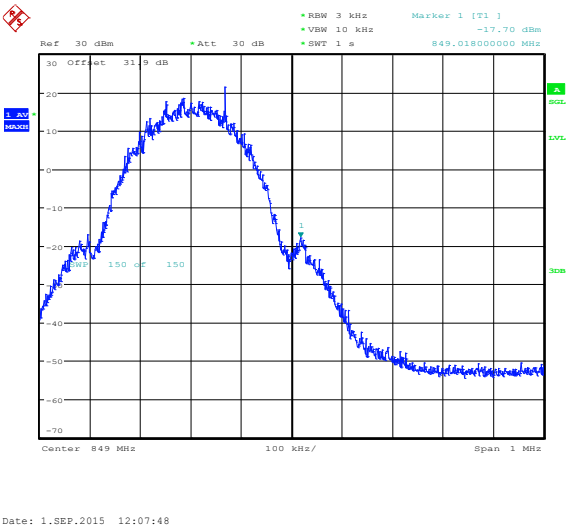


Figure 1-27a: PCS1900, Low Channel Mask in GSM mode

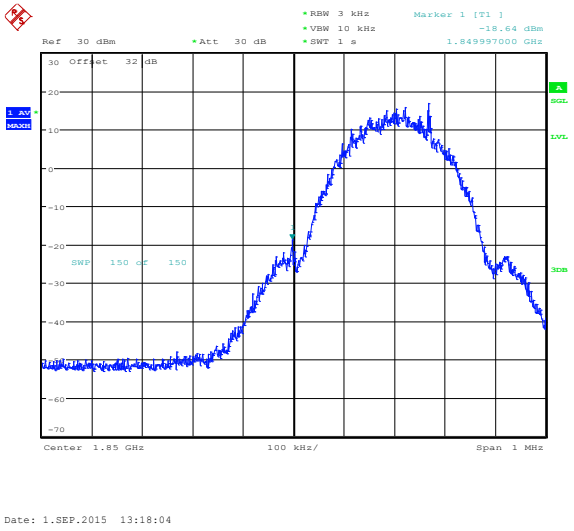
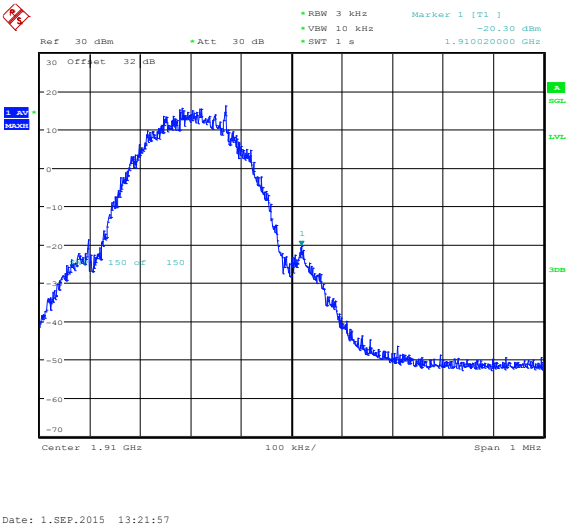
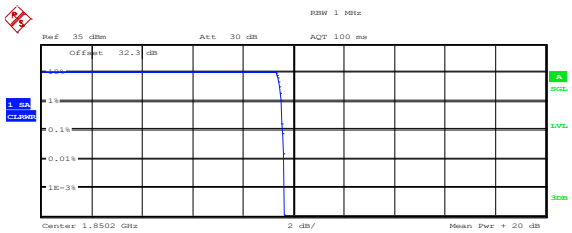


Figure 1-28a: PCS1900, High Channel Mask in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

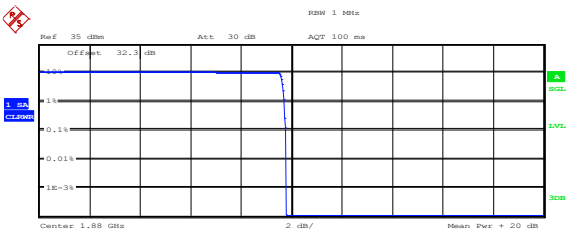


Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	20.11 dBm
Peak	29.71 dBm
Crest	9.61 dB
10 %	9.33 dB
1 %	9.52 dB
.1 %	9.58 dB
.01 %	9.62 dB

Date: 23.APR.2015 13:50:03

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

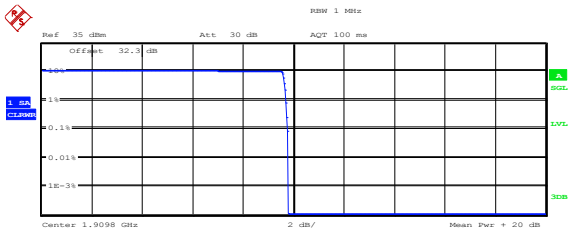


Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	19.86 dBm
Peak	29.64 dBm
Crest	9.79 dB
10 %	9.52 dB
1 %	9.71 dB
.1 %	9.78 dB
.01 %	9.81 dB

Date: 23.APR.2015 13:50:52

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



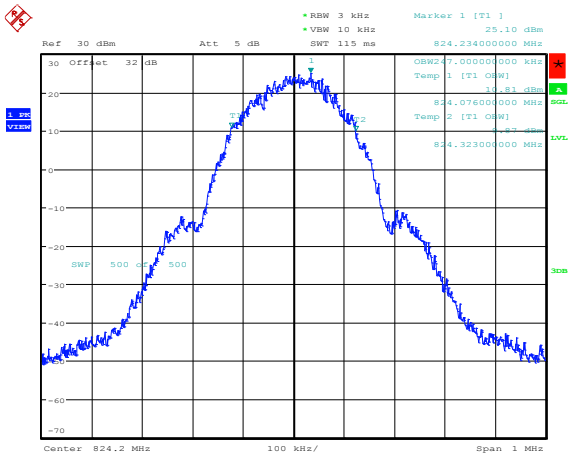
Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	19.73 dBm
Peak	29.50 dBm
Crest	9.78 dB
10 %	9.52 dB
1 %	9.71 dB
.1 %	9.78 dB
.01 %	9.81 dB

Date: 23.APR.2015 13:51:20

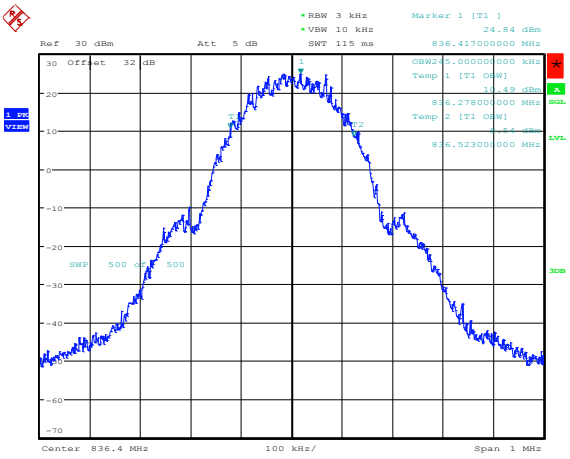
GSM Conducted RF Emission Test Data cont'd

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



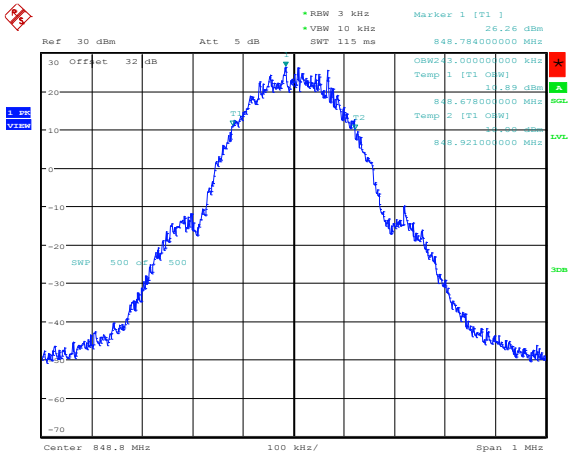
Date: 23.APR.2015 12:48:47

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



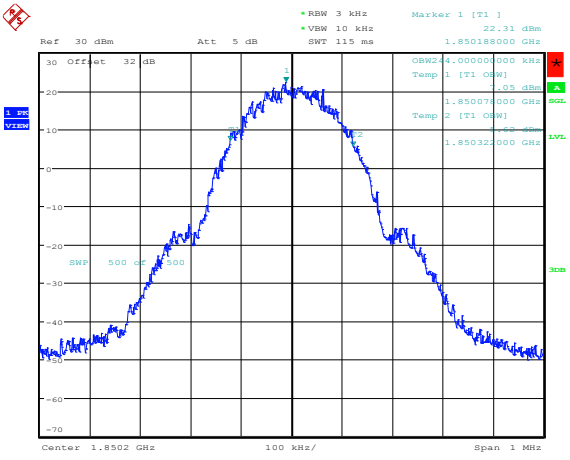
Date: 23.APR.2015 13:00:21

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



Date: 23.APR.2015 12:56:06

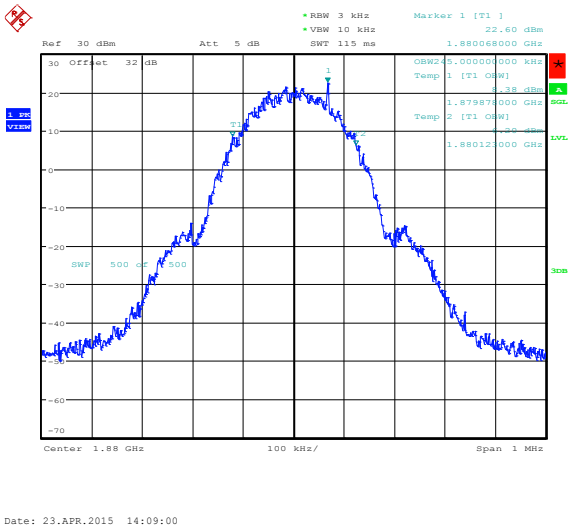
Figure 1-32a: Occupied Bandwidth, PCS1900 Band, Low Channel in EDGE mode



Date: 23.APR.2015 14:05:53

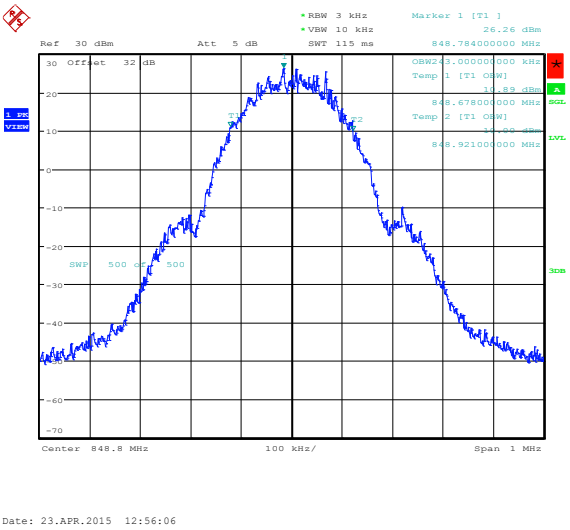
GSM Conducted RF Emission Test Data cont'd

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



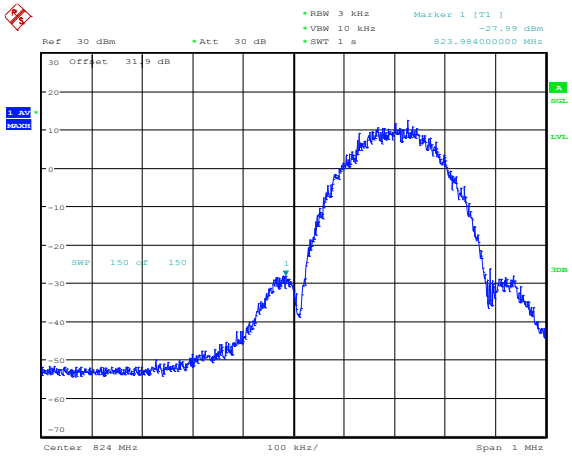
Date: 23.APR.2015 14:09:00

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



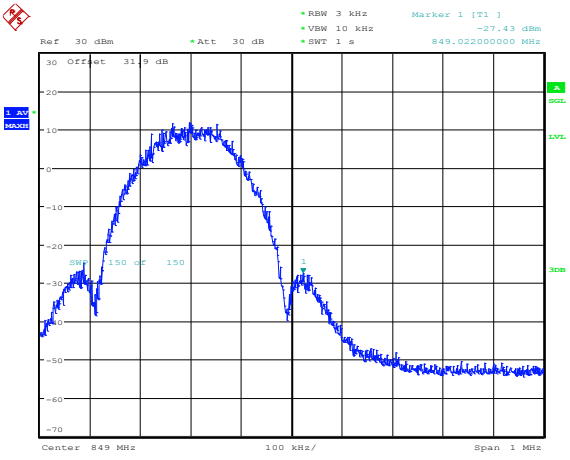
Date: 23.APR.2015 12:56:06

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



Date: 1.SEP.2015 12:17:51

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



Date: 1.SEP.2015 12:22:09

GSM Conducted RF Emission Test Data cont'd

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

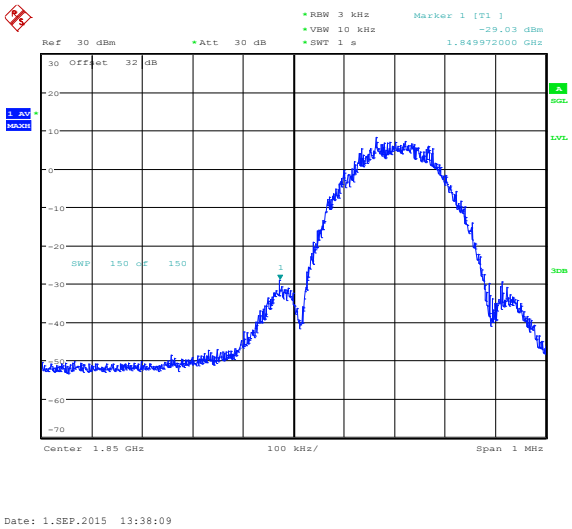
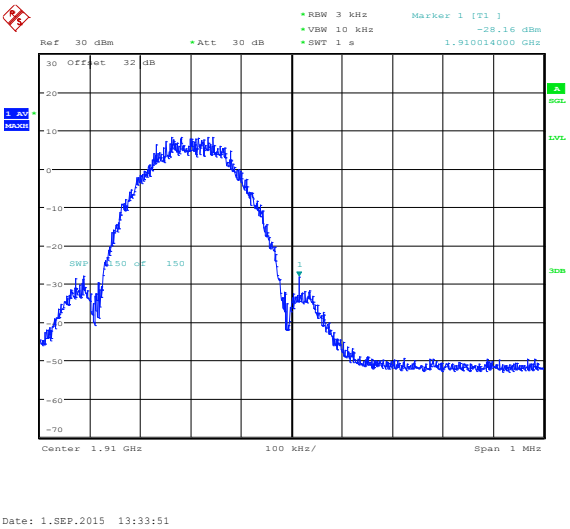


Figure 1-38a: PCS1900 Band, High Channel Mask in EDGE mode



GSM Conducted RF Emission Test Data cont'd

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

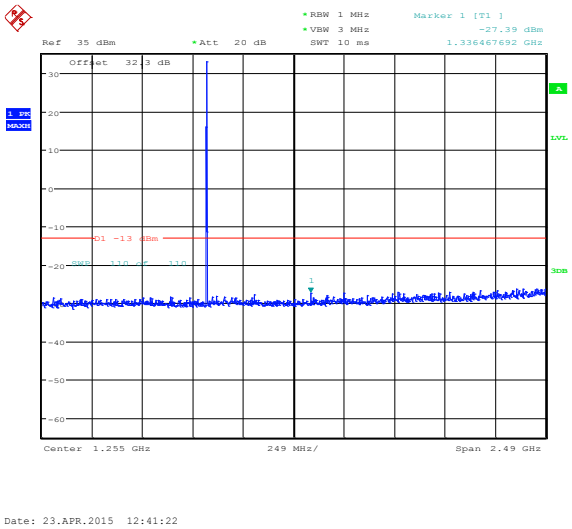


Figure 1-40a: GSM850 band, Spurious Conducted Emissions, Low channel in Edge Mode

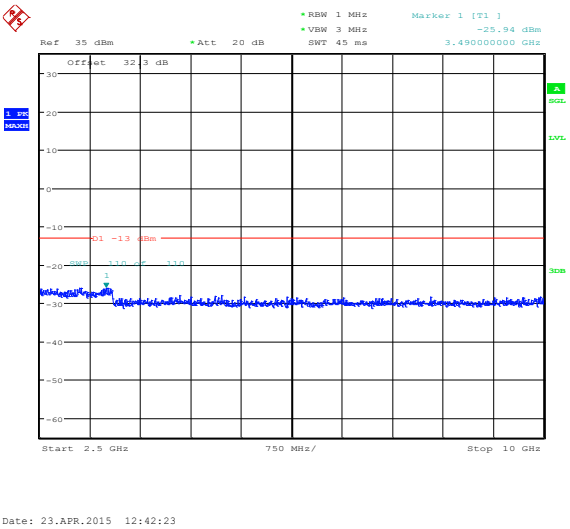


Figure 1-41a: GSM850 band, Spurious Conducted Emissions, Middle channel in Edge Mode

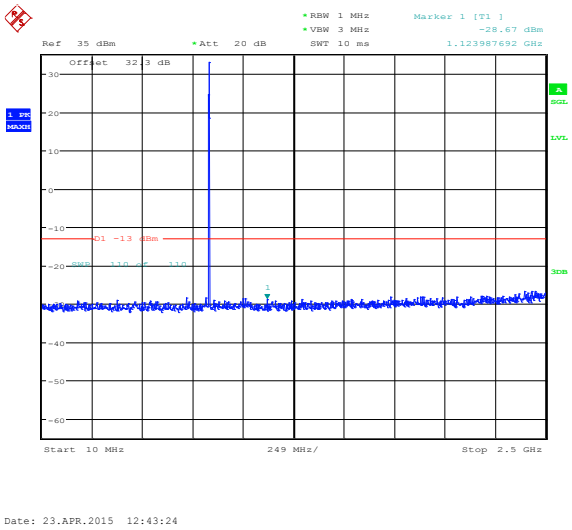
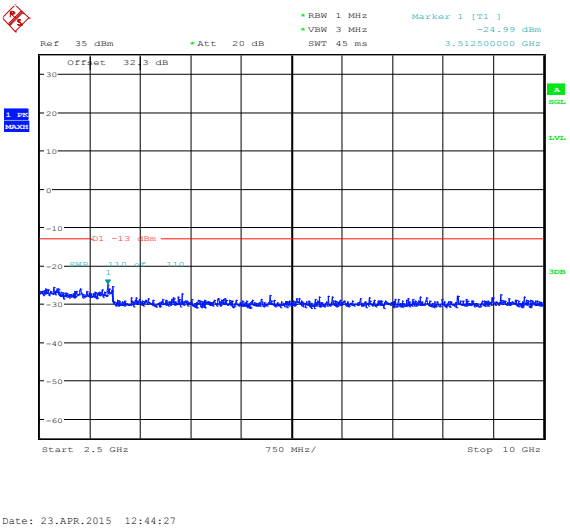


Figure 1-42a: GSM850 band, Spurious Conducted Emissions, Middle channel in Edge Mode



GSM Conducted RF Emission Test Data cont'd

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

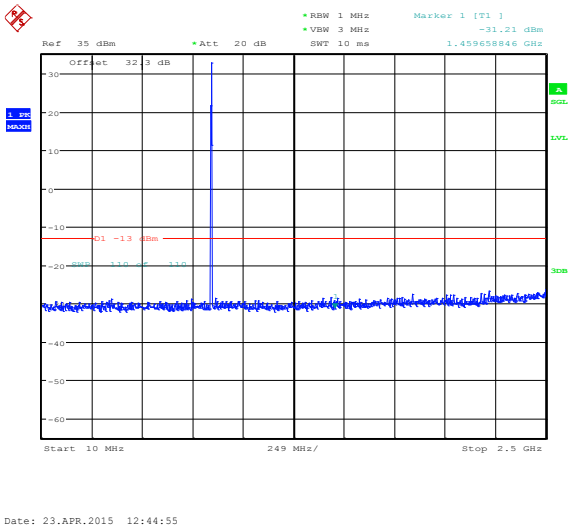


Figure 1-44a: GSM850 band, Spurious Conducted Emissions, High channel in Edge Mode

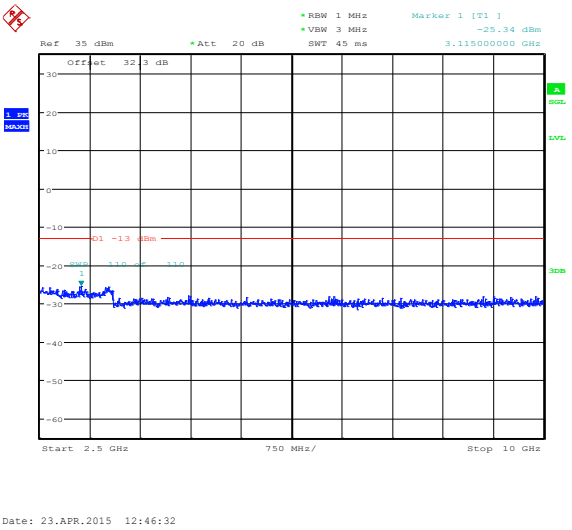


Figure 1-45a: PCS1900 band, Spurious Conducted Emissions, Low channel in Edge Mode

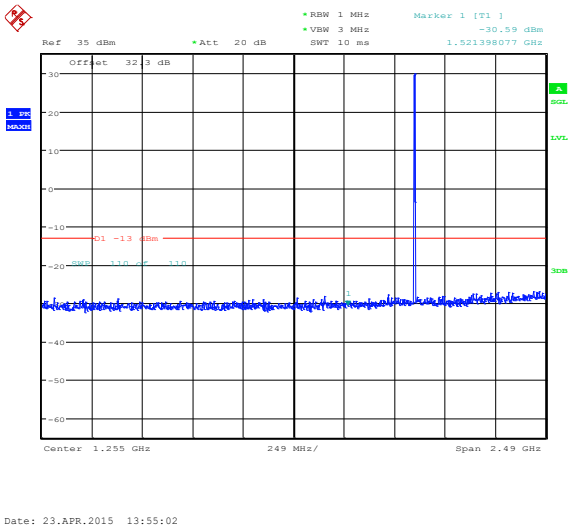
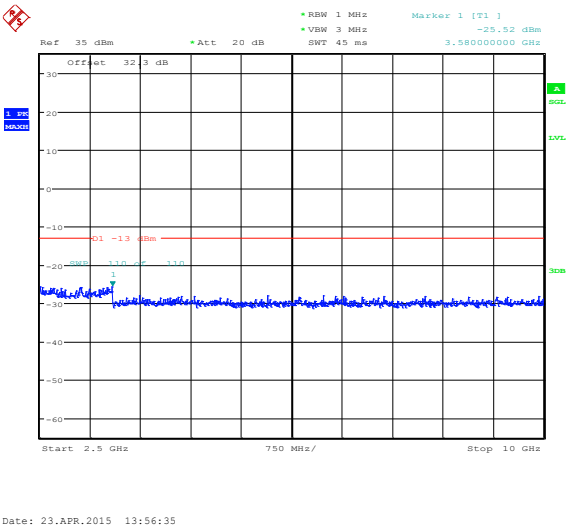


Figure 1-46a: PCS1900 band, Spurious Conducted Emissions, Low channel in Edge Mode



GSM Conducted RF Emission Test Data cont'd

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

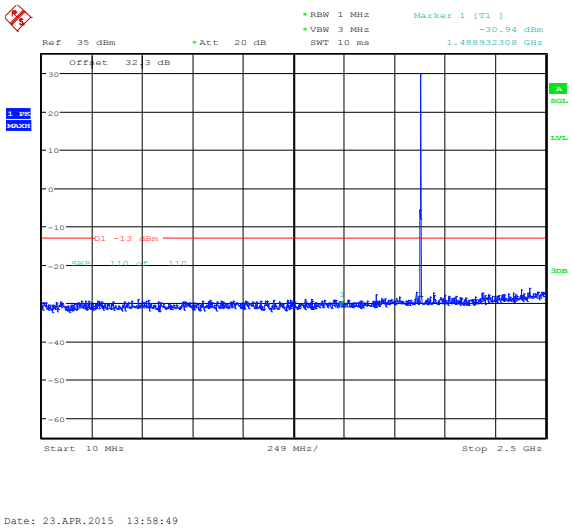


Figure 1-48a: PCS1900 band, Spurious Conducted Emissions, middle channel in Edge Mode

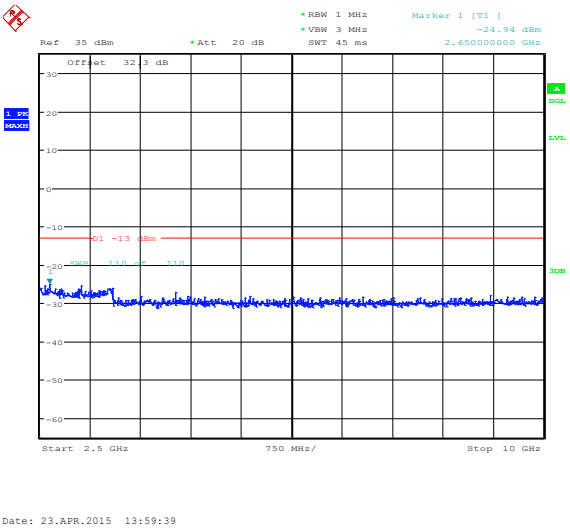


Figure 1-49a: PCS1900 band, Spurious Conducted Emissions, High channel in Edge Mode

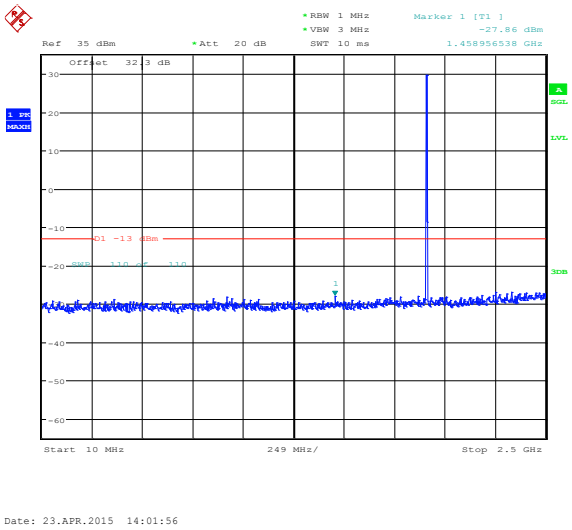
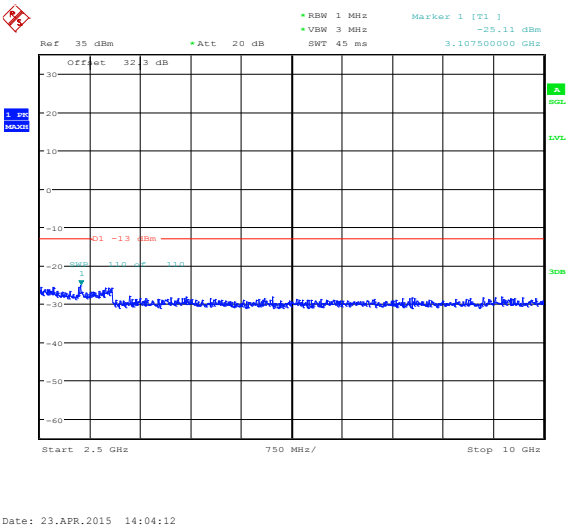
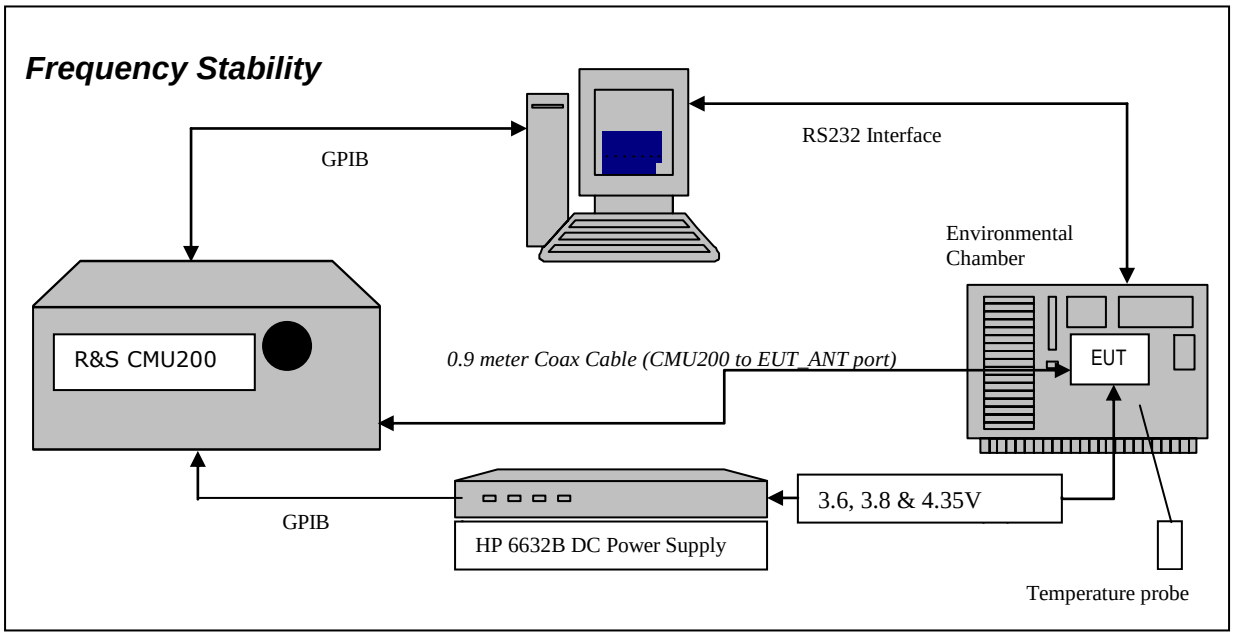


Figure 1-50a: PCS1900 band, Spurious Conducted Emissions, High channel in Edge Mode



APPENDIX 1B – GSM FREQUENCY STABILITY TEST DATA

GSM Frequency Stability Test Data



The measurements were performed by Sijia Li.

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 3.8 and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 3.8 and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 824.2, 836.4, and 848.8 MHz for the GSM850 band, 1850.2, 1880.0 and 1909.8 MHz for the PCS1900 band. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million.
After the initial one-hour soak at the beginning of the tests, a period of thirty minutes soak was initialized between each ascending temperature step, before proceeding to the next measurement test cycle.

Procedure:

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

1. Switch on the HP 6632B power supply; CMU 200 Communications test Set, and Environmental Chamber.
2. Start test program
3. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
4. Set power supply voltage to 3.6 volts.
5. Set up CMU 200 Radio Communication Tester.
6. Command the CMU 200 to switch to the low channel.
7. Enable the voltage to the EUT, and connect a link to the CMU 200 test set.
8. EUT is commanded to Transmit 100 Bursts.
9. Software logs the following data from the CMU 200, power supply and temperature chamber: Traffic Channel Number, Traffic Channel Frequency, Power Level, Chamber Temperature, Supply Voltage, Power and Frequency Error.
10. The CMU 200 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
11. Repeat steps 5 to 10 changing the supply voltage to 3.8 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, 3.8 and 4.35 volts.

The following configurations were measured for model RHK211LW (STV100-1):

The maximum frequency error in the GSM850 band measured was **0.0289 PPM**.
The maximum frequency error in the PCS1900 band measured was **0.0243 PPM**.

The following configurations were measured for model RHK211LW (STV100-1):

Date of Test: August 13, 2015

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	10.14	0.0123
189	836.40	3.6	20	16.40	0.0196
251	848.60	3.6	20	19.24	0.0227

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	3.8	20	10.59	0.0128
189	836.40	3.8	20	14.59	0.0174
251	848.60	3.8	20	12.66	0.0149

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.35	20	10.59	0.0128
189	836.40	4.35	20	9.23	0.0110
251	848.60	4.35	20	16.21	0.0191

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	6.20	0.0075
128	824.20	3.6	-20	10.01	0.0121
128	824.20	3.6	-10	8.59	0.0104
128	824.20	3.6	0	10.14	0.0123
128	824.20	3.6	10	-6.78	-0.0082
128	824.20	3.6	20	8.72	0.0106
128	824.20	3.6	30	14.27	0.0173
128	824.20	3.6	40	13.62	0.0165
128	824.20	3.6	50	13.24	0.0161
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
128	824.20	3.8	-30	9.49	0.0115
128	824.20	3.8	-20	13.50	0.0164
128	824.20	3.8	-10	6.97	0.0085
128	824.20	3.8	0	10.59	0.0128
128	824.20	3.8	10	-7.94	-0.0096
128	824.20	3.8	20	10.53	0.0128
128	824.20	3.8	30	-3.87	-0.0047
128	824.20	3.8	40	-6.72	-0.0082
128	824.20	3.8	50	-10.07	-0.0122
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
128	824.20	4.35	-30	-8.39	-0.0102
128	824.20	4.35	-20	-6.07	-0.0074
128	824.20	4.35	-10	-6.26	-0.0076
128	824.20	4.35	0	10.59	0.0128
128	824.20	4.35	10	-4.78	-0.0058
128	824.20	4.35	20	-9.49	-0.0115
128	824.20	4.35	30	-11.69	-0.0142
128	824.20	4.35	40	-11.24	-0.0136
128	824.20	4.35	50	-12.98	-0.0157

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	16.47	0.0197
189	836.40	3.6	-20	16.40	0.0196
189	836.40	3.6	-10	10.46	0.0125
189	836.40	3.6	0	16.40	0.0196
189	836.40	3.6	10	11.56	0.0138
189	836.40	3.6	20	11.24	0.0134
189	836.40	3.6	30	13.04	0.0156
189	836.40	3.6	40	15.17	0.0181
189	836.40	3.6	50	24.15	**0.0289**
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
189	836.40	3.8	-30	7.10	0.0085
189	836.40	3.8	-20	15.17	0.0181
189	836.40	3.8	-10	14.53	0.0174
189	836.40	3.8	0	14.59	0.0174
189	836.40	3.8	10	9.75	0.0117
189	836.40	3.8	20	15.88	0.0190
189	836.40	3.8	30	11.56	0.0138
189	836.40	3.8	40	11.69	0.0140
189	836.40	3.8	50	7.81	0.0093
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
189	836.40	4.35	-30	6.20	0.0074
189	836.40	4.35	-20	9.10	0.0109
189	836.40	4.35	-10	-9.36	-0.0112
189	836.40	4.35	0	9.23	0.0110
189	836.40	4.35	10	-13.82	-0.0165
189	836.40	4.35	20	4.58	0.0055
189	836.40	4.35	30	-15.11	-0.0181
189	836.40	4.35	40	-14.59	-0.0174
189	836.40	4.35	50	-15.43	-0.0184

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	13.75	0.0162
251	848.8	3.6	-20	18.92	0.0223
251	848.8	3.6	-10	14.01	0.0165
251	848.8	3.6	0	19.24	0.0227
251	848.8	3.6	10	16.34	0.0193
251	848.8	3.6	20	16.47	0.0194
251	848.8	3.6	30	17.50	0.0206
251	848.8	3.6	40	17.24	0.0203
251	848.8	3.6	50	18.79	0.0221
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
251	848.8	3.8	-30	10.01	0.0118
251	848.8	3.8	-20	18.27	0.0215
251	848.8	3.8	-10	13.24	0.0156
251	848.8	3.8	0	12.66	0.0149
251	848.8	3.8	10	15.63	0.0184
251	848.8	3.8	20	10.91	0.0129
251	848.8	3.8	30	18.73	0.0221
251	848.8	3.8	40	15.11	0.0178
251	848.8	3.8	50	8.39	0.0099
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
251	848.8	4.35	-30	-4.20	-0.0049
251	848.8	4.35	-20	16.27	0.0192
251	848.8	4.35	-10	12.91	0.0152
251	848.8	4.35	0	16.21	0.0191
251	848.8	4.35	10	10.27	0.0121
251	848.8	4.35	20	-20.02	-0.0236
251	848.8	4.35	30	-15.43	-0.0182
251	848.8	4.35	40	-5.55	-0.0065
251	848.8	4.35	50	-19.37	-0.0228

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	12.79	0.0069
661	1880.00	3.6	20	16.47	0.0088
810	1909.80	3.6	20	16.85	0.0088

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperatur e (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	3.8	20	-7.81	-0.0042
661	1880.00	3.8	20	16.14	0.0086
810	1909.80	3.8	20	-8.39	-0.0044

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperatur e (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.35	20	-11.43	-0.0062
661	1880.00	4.35	20	15.50	0.0082
810	1909.80	4.35	20	8.91	0.0047

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	12.98	0.0070
512	1850.20	3.6	-20	44.88	**0.0243**
512	1850.20	3.6	-10	30.74	0.0166
512	1850.20	3.6	0	37.13	0.0201
512	1850.20	3.6	10	24.34	0.0132
512	1850.20	3.6	20	12.79	0.0069
512	1850.20	3.6	30	40.23	0.0217
512	1850.20	3.6	40	19.50	0.0105
512	1850.20	3.6	50	17.56	0.0095
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
512	1850.20	3.8	-30	-10.53	-0.0057
512	1850.20	3.8	-20	43.46	0.0235
512	1850.20	3.8	-10	22.86	0.0124
512	1850.20	3.8	0	30.09	0.0163
512	1850.20	3.8	10	19.76	0.0107
512	1850.20	3.8	20	-7.81	-0.0042
512	1850.20	3.8	30	37.65	0.0203
512	1850.20	3.8	40	27.51	0.0149
512	1850.20	3.8	50	7.88	0.0043
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
512	1850.20	4.35	-30	-8.72	-0.0047
512	1850.20	4.35	-20	38.16	0.0206
512	1850.20	4.35	-10	22.54	0.0122
512	1850.20	4.35	0	26.35	0.0142
512	1850.20	4.35	10	9.62	0.0052
512	1850.20	4.35	20	-11.43	-0.0062
512	1850.20	4.35	30	26.60	0.0144
512	1850.20	4.35	40	-14.92	-0.0081
512	1850.20	4.35	50	-7.04	-0.0038

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	21.05	0.0112
661	1880.00	3.6	-20	19.63	0.0104
661	1880.00	3.6	-10	40.49	0.0215
661	1880.00	3.6	0	26.09	0.0139
661	1880.00	3.6	10	29.44	0.0157
661	1880.00	3.6	20	16.47	0.0088
661	1880.00	3.6	30	-7.81	-0.0042
661	1880.00	3.6	40	26.54	0.0141
661	1880.00	3.6	50	28.54	0.0152
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
661	1880.00	3.8	-30	14.79	0.0079
661	1880.00	3.8	-20	13.37	0.0071
661	1880.00	3.8	-10	18.79	0.0100
661	1880.00	3.8	0	17.43	0.0093
661	1880.00	3.8	10	24.60	0.0131
661	1880.00	3.8	20	16.14	0.0086
661	1880.00	3.8	30	-20.34	-0.0108
661	1880.00	3.8	40	16.79	0.0089
661	1880.00	3.8	50	9.30	0.0049
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
661	1880.00	4.35	-30	7.10	0.0038
661	1880.00	4.35	-20	6.65	0.0035
661	1880.00	4.35	-10	21.57	0.0115
661	1880.00	4.35	0	19.44	0.0103
661	1880.00	4.35	10	24.73	0.0132
661	1880.00	4.35	20	15.50	0.0082
661	1880.00	4.35	30	-25.05	-0.0133
661	1880.00	4.35	40	10.07	0.0054
661	1880.00	4.35	50	7.62	0.0041

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	22.15	0.0116
810	1909.80	3.6	-20	39.45	0.0207
810	1909.80	3.6	-10	33.90	0.0178
810	1909.80	3.6	0	26.86	0.0141
810	1909.80	3.6	10	29.64	0.0155
810	1909.80	3.6	20	16.85	0.0088
810	1909.80	3.6	30	19.37	0.0101
810	1909.80	3.6	40	28.35	0.0148
810	1909.80	3.6	50	19.69	0.0103
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
810	1909.80	3.8	-30	15.69	0.0082
810	1909.80	3.8	-20	35.00	0.0183
810	1909.80	3.8	-10	31.64	0.0166
810	1909.80	3.8	0	23.70	0.0124
810	1909.80	3.8	10	20.08	0.0105
810	1909.80	3.8	20	-8.39	-0.0044
810	1909.80	3.8	30	13.30	0.0070
810	1909.80	3.8	40	-25.18	-0.0132
810	1909.80	3.8	50	7.55	0.0040
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
810	1909.80	4.35	-30	10.91	0.0057
810	1909.80	4.35	-20	23.37	0.0122
810	1909.80	4.35	-10	25.89	0.0136
810	1909.80	4.35	0	14.08	0.0074
810	1909.80	4.35	10	19.89	0.0104
810	1909.80	4.35	20	8.91	0.0047
810	1909.80	4.35	30	-12.66	-0.0066
810	1909.80	4.35	40	21.37	0.0112
810	1909.80	4.35	50	-10.07	-0.0053

APPENDIX 1C – GSM RADIATED EMISSIONS TEST DATA

Radiated Power Test Data Results

The following test configurations were measured on model RHK211LW (STV100-1):

Date of test: August 11, 2015

The following measurements were performed by Savtej Sandhu.
The environmental tests conditions were: Temperature: 27 °C
Relative Humidity: 37 %

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	-33.79	-24.00	V-V	10.55	28.53	0.71	38.50	9.97
F0	128	824.20	850	Dipole	H	-24.00		H-H	9.41				
F0	190	836.60	850	Dipole	V	-33.05	-23.64	V-V	12.04	29.70	0.93	38.50	8.80
F0	190	836.60	850	Dipole	H	-23.64		H-H	11.32				
F0	251	848.80	850	Dipole	V	-33.11	-23.93	V-V	12.55	**30.18**	1.04	38.50	8.32
F0	251	848.80	850	Dipole	H	-23.93		H-H	11.91				

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	-34.56	-25.34	V-V	9.19	27.17	0.52	38.50	11.33
F0	128	824.20	850	Dipole	H	-25.34		H-H	8.02				
F0	190	836.60	850	Dipole	V	-34.12	-25.11	V-V	10.52	**28.18**	0.66	38.50	10.32
F0	190	836.60	850	Dipole	H	-25.11		H-H	9.84				
F0	251	848.80	850	Dipole	V	-34.55	-25.90	V-V	10.52	28.15	0.65	38.50	10.35
F0	251	848.80	850	Dipole	H	-25.90		H-H	9.88				

Radiated Power Test Data Results cont'd

Date of test: July 23, 2015
The following measurements were performed by Savtej Sandhu.

The environmental tests conditions were: Temperature: 27.6 °C
Relative Humidity: 44.7 %

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	-19.30	-19.30	V-V	-9.99	30.91	1.23	33	2.09
F0	512	1850.20	1900	Horn	H	-20.04		H-H	-8.77				
F0	661	1880.00	1900	Horn	V	-19.36	-19.36	V-V	-9.54	**30.94**	1.24	33	2.06
F0	661	1880.00	1900	Horn	H	-20.62		H-H	-8.46				
F0	810	1909.80	1900	Horn	V	-20.04	-20.04	V-V	-9.58	30.42	1.10	33	2.58
F0	810	1909.80	1900	Horn	H	-21.21		H-H	-9.02				

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	-20.28	-20.28	V-V	-10.40	**30.01**	1.00	33	2.99
F0	512	1850.20	1900	Horn	H	-21.61		H-H	-9.67				
F0	661	1880.00	1900	Horn	V	-20.92	-20.92	V-V	-10.42	29.47	0.89	33	3.53
F0	661	1880.00	1900	Horn	H	-22.38		H-H	-9.93				
F0	810	1909.80	1900	Horn	V	-21.88	-21.88	V-V	-10.64	29.28	0.85	33	3.72
F0	810	1909.80	1900	Horn	H	-23.03		H-H	-10.16				

Radiated Power Test Data Results cont'd

The following test configurations were measured on model RHT181LW (STV100-2):

Date of test: October 13, 2015

The following measurements were performed by Savtej Sandhu.
The environmental tests conditions were: Temperature: 26 °C
Relative Humidity: 36.4 %

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)	Corrected Reading (relative to Dipole) (W)	Limit (dBm)	Diff. To Limit (dB)
F0	128	824.20	850	Dipole	V	-34.80	-26.56	V-V	7.90	27.03	0.50	38.50	11.47
F0	128	824.20	850	Dipole	H	-26.56		H-H	9.05				
F0	190	836.60	850	Dipole	V	-33.41	-24.99	V-V	9.64	**29.39**	0.87	38.50	9.11
F0	190	836.60	850	Dipole	H	-24.99		H-H	11.73				
F0	251	848.80	850	Dipole	V	-32.37	-24.20	V-V	11.25	29.18	0.83	38.50	9.32
F0	251	848.80	850	Dipole	H	-24.20		H-H	11.55				

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)	Corrected Reading (relative to Dipole) (W)	Limit (dBm)	Diff. To Limit (dB)
F0	128	824.20	850	Dipole	V	-37.41	-29.04	V-V	5.37	25.05	0.32	38.50	13.45
F0	128	824.20	850	Dipole	H	-29.04		H-H	7.07				
F0	190	836.60	850	Dipole	V	-36.03	-27.32	V-V	7.28	27.17	0.52	38.50	11.33
F0	190	836.60	850	Dipole	H	-27.32		H-H	9.51				
F0	251	848.80	850	Dipole	V	-34.82	-27.01	V-V	8.48	**29.59**	0.91	38.50	8.91
F0	251	848.80	850	Dipole	H	-27.01		H-H	11.96				

Radiated Emissions Test Data Results cont'd

The following test configurations were measured on model RHK211LW (STV100-1):

GSM850 Call Mode

The following measurements were performed by Imran Kanji.

Date of Test: August 7, 2015
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: August 7, 2015

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		Test Angle (Deg.)	Detector (PK or QP)	Measured Level (dBµV)	Correction Factor for preamp/antenna/ cables/ filter (dB)	Field Strength Level (reading+corr) (dBm)	Limit @ 3.0 m (dBm)	Test Margin (dB)
		Pol. (V/H)	Height (meters)							
2509.72	190	H	2.60	175	PK	47.25	-87.972	-32.683	-13.00	-19.7

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: August 7, 2015

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: August 7, 2015

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.

All emissions were at least 25.0 dB below the limit.

Radiated Emissions Test Data Results cont'd

PCS1900 CALL Mode

Date of Test: July 22, 2015

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: July 21 and August 1, 2015

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: July 22, 2015

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: July 21 and August 1, 2015

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.

Radiated Emissions Test Data Results cont'd

The following test configurations were measured on model RHT181LW (STV100-2):

GSM850 Call Mode

The following measurements were performed by Savtej Sandhu.

Date of Test: October 6, 2015
The environmental test conditions were: Temperature: 36.3 ºC
Relative Humidity: 32.3 %

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 and Xing Fang.

Date of Test: October 6, 2015

The environmental test conditions were: Temperature: 24.1 ºC
Relative Humidity: 40.9 %

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.

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: October 6, 2015

The environmental test conditions were: Temperature: 36.3 ºC
Relative Humidity: 32.3 %

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: October 6, 2015

The environmental test conditions were: Temperature: 24.1 ºC
Relative Humidity: 40.9 %

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.

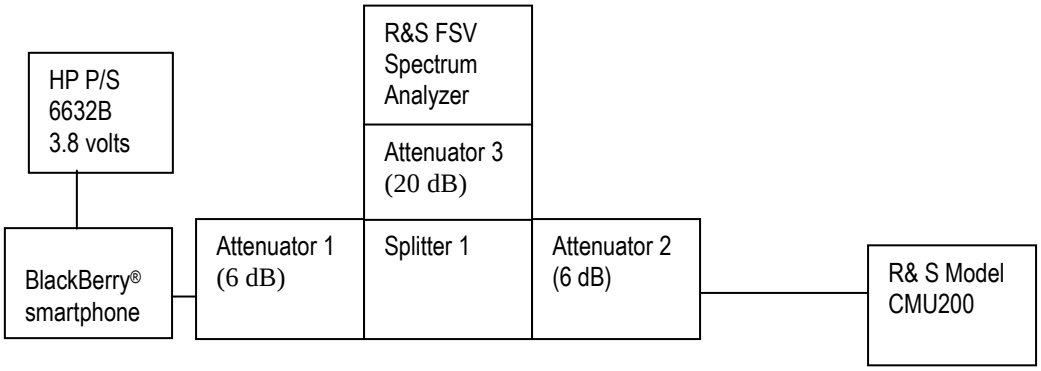
All emissions were at least 25.0 dB below the limit.

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

The following configurations were measured for model RHK211LW (STV100-1):

Date of Test: August 6 - 14, 2015

The environmental test conditions were: Temperature: 21.5ºC
Relative Humidity: 44.4%

The following measurements were performed by Sijia Li and Landon Martin.

WCDMA Conducted RF Emission Test Data cont'd

The conducted spurious emissions – As per 47 CFR 2.1051, 22.917, 24.238(a), 27.53, RSS-132, 5.5, RSS – 133, 6.5, 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 4.573 MHz, WCDMA Band II was measured to be 4.618 MHz and for the WCDMA Band IV it was measured to be 4.557 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

WCDMA Band V Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
826.400	**4.573**	**4.140**
836.400	4.550	**4.140**
846.600	4.548	**4.140**

WCDMA Band II Frequency (MHz)	26dBc Occupied Bandwidth (MHz	99% Occupied Bandwidth (MHz)
1852.400	4.588	4.150
1880.000	4.595	**4.155**
1907.600	**4.618**	4.140

WCDMA Band IV Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
1712.4	4.541	**4.135**
1732.6	4.553	4.125
1752.6	**4.557**	**4.135**

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	4.145
836.400	4.140
846.600	**4.150**

WCDMA Band II Frequency (MHz)	99% Occupied Bandwidth (MHz)
1852.400	**4.155**
1880.000	**4.155**
1907.600	4.145

WCDMA Band IV Frequency (MHz)	99% Occupied Bandwidth (MHz)
1712.4	**4.140**
1732.6	**4.140**
1752.6	**4.140**

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

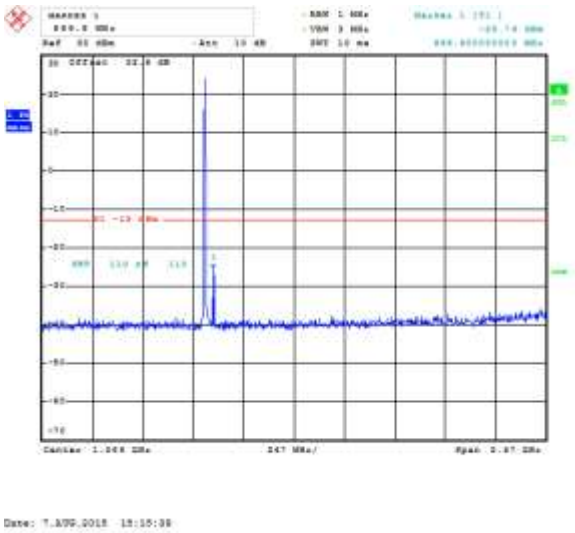


Figure 2-2a: Band V, Spurious Conducted Emissions, Low channel

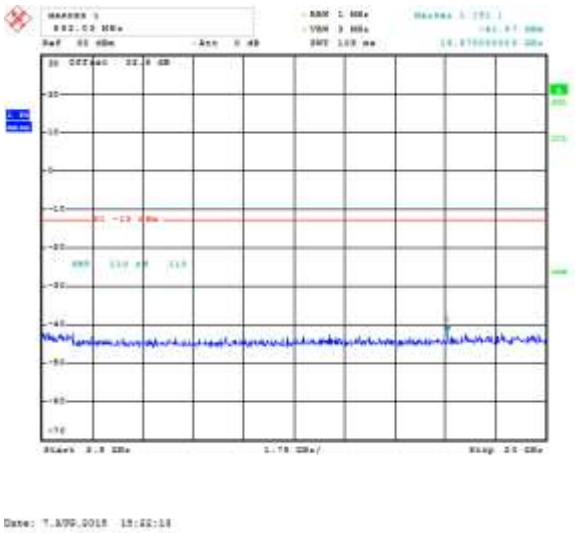


Figure 2-3a: Band V, Spurious Conducted Emissions, Middle channel

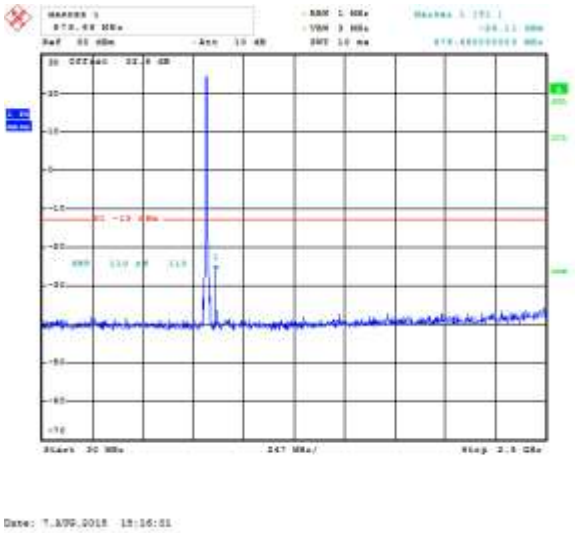
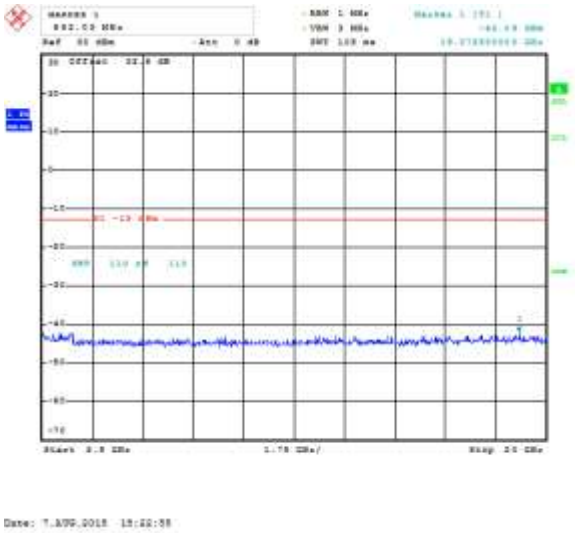


Figure 2-4a: Band V, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

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

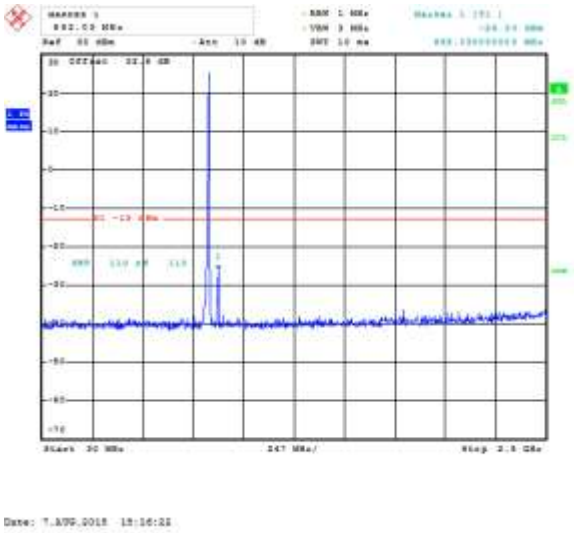


Figure 2-6a: Band V, Spurious Conducted Emissions, High Channel

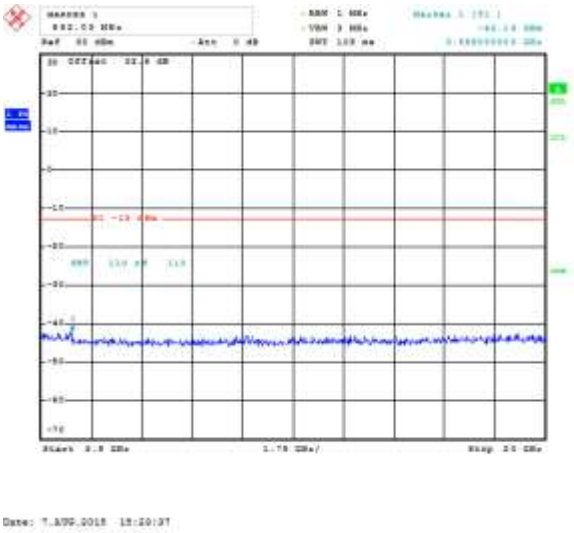


Figure 2-2a:, BAND II Spurious Conducted Emissions, Low Channel

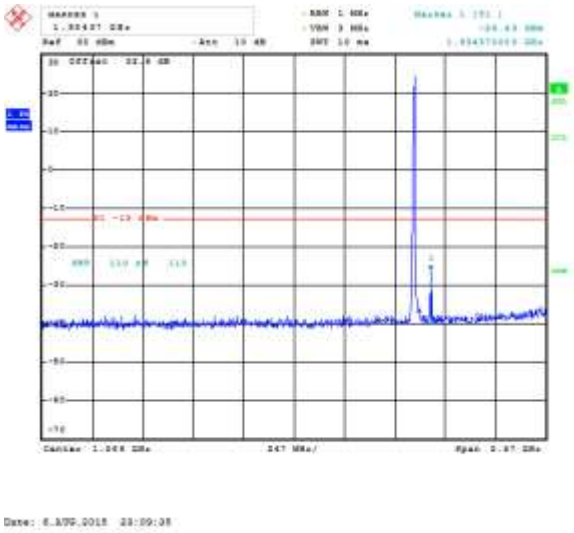
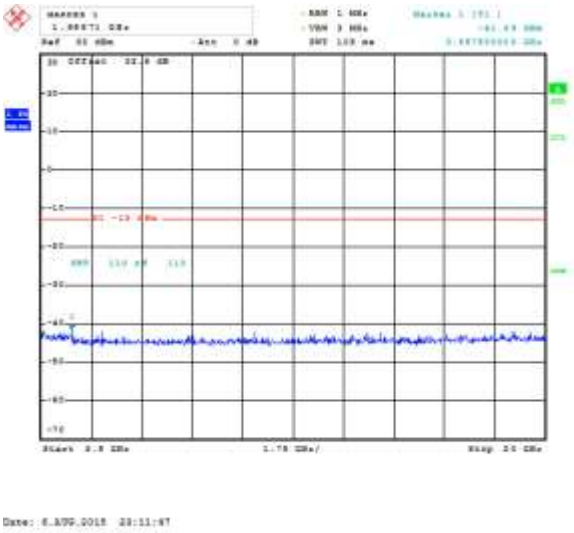


Figure 2-8a: BAND II, Spurious Conducted Emissions, Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

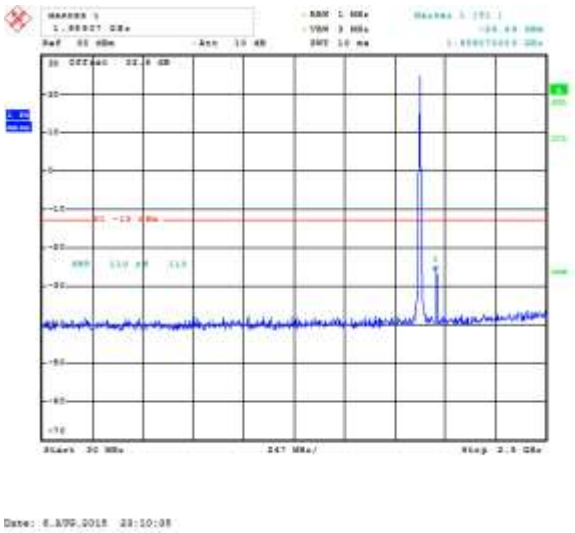


Figure 2-10a: BAND II, Spurious Conducted Emissions, Middle Channel

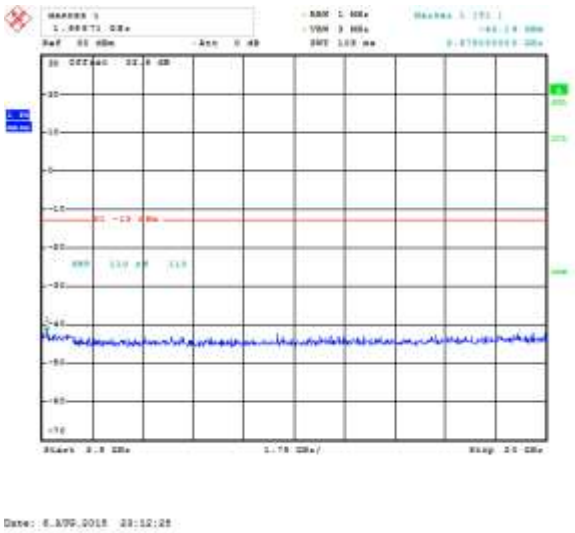


Figure 2-11a: BAND II, Spurious Conducted Emissions, High Channel

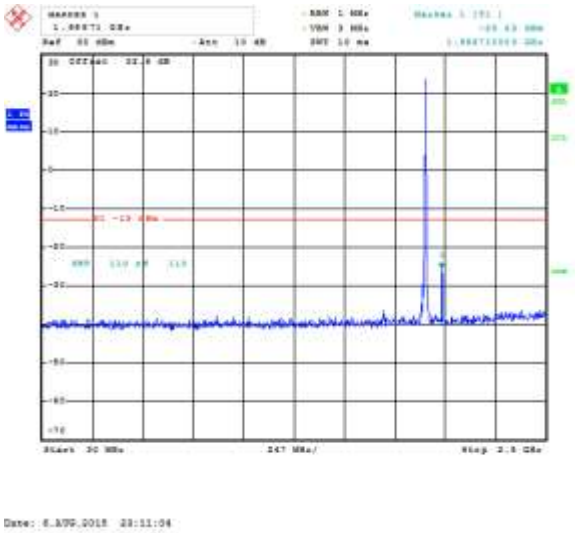
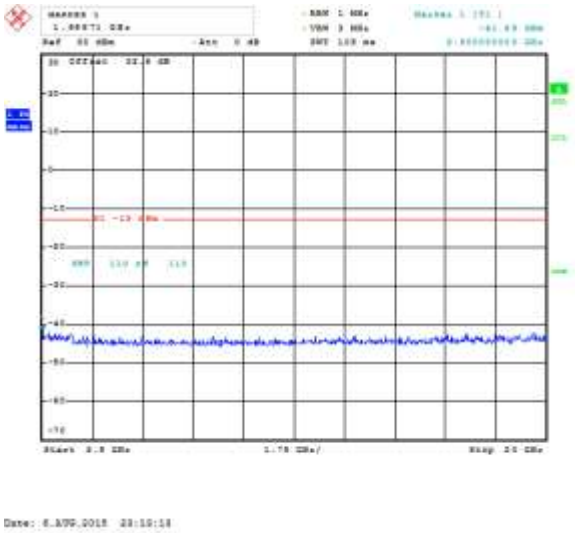


Figure 2-12a: BAND II, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

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

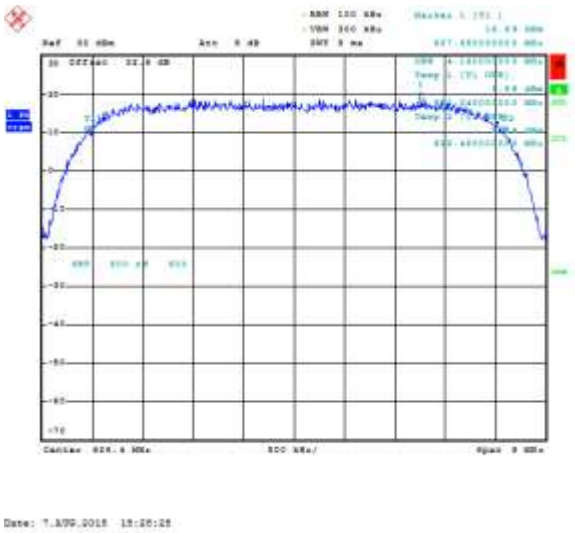


Figure 2-14a: Occupied Bandwidth, Band V Middle Channel

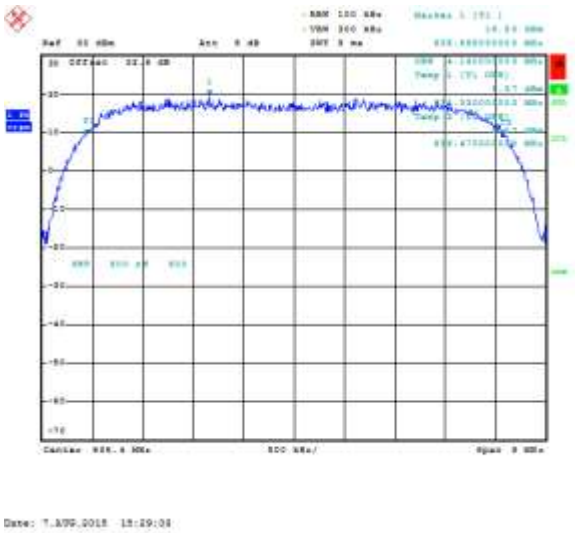


Figure 2-15a: Occupied Bandwidth, Band V High Channel

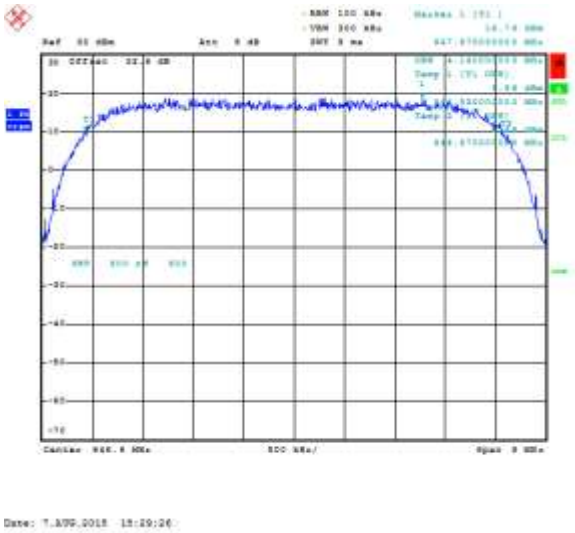
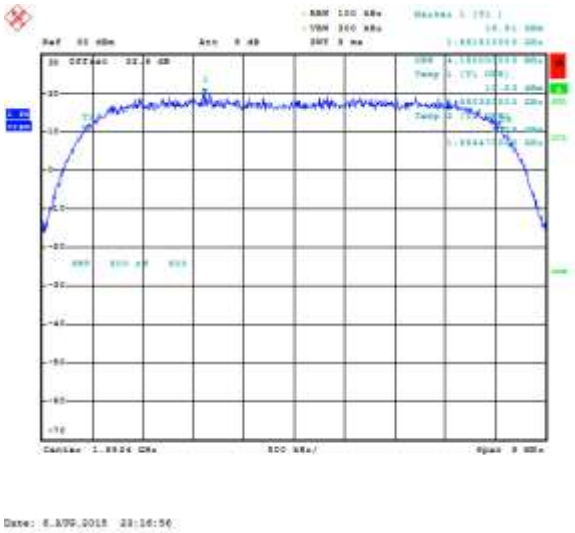


Figure 2-16a: Occupied Bandwidth, Band II Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

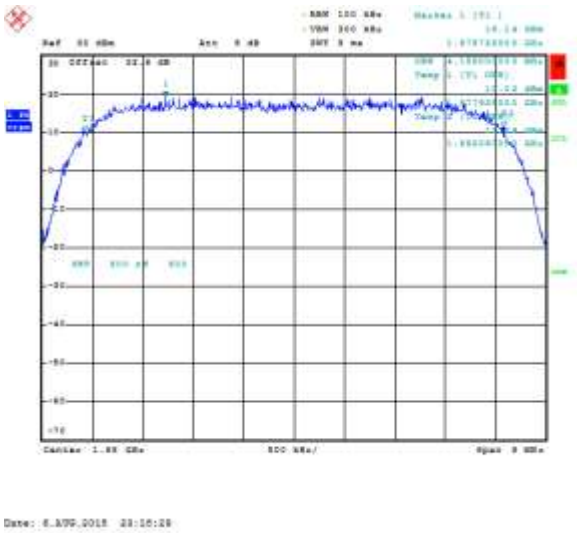


Figure 2-18a: Occupied Bandwidth, Band II High Channel

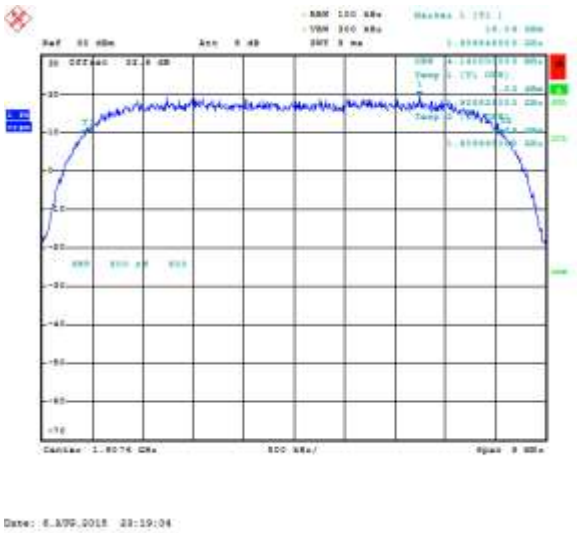


Figure 2-19a: -26 dBc Bandwidth, Band V Low Channel

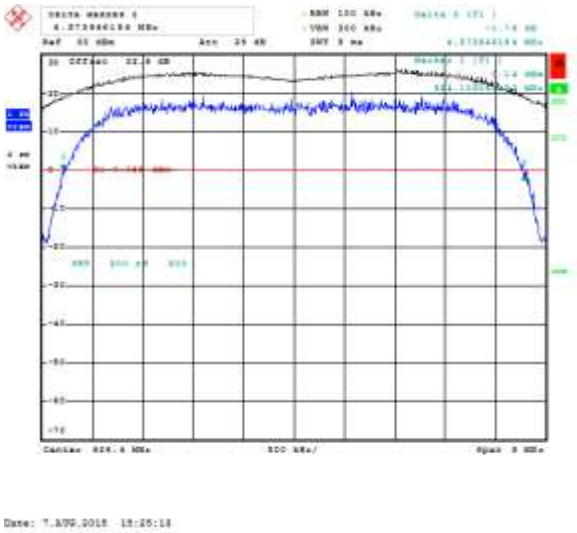
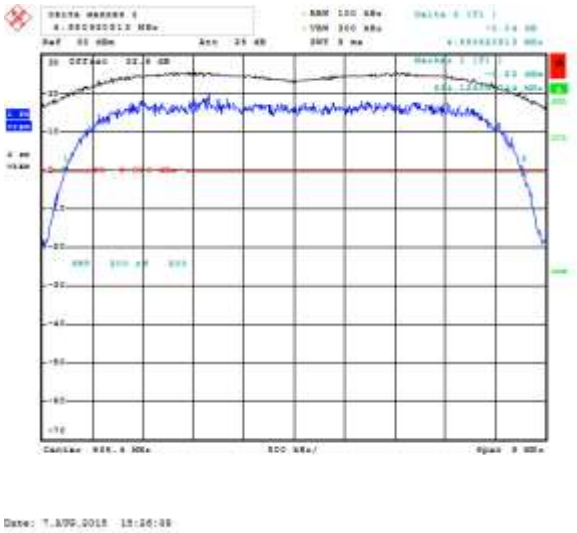


Figure 2-20a: -26 dBc Bandwidth, Band V Middle Channel



WCDMA Conducted RF Emission Test Data cont'd

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

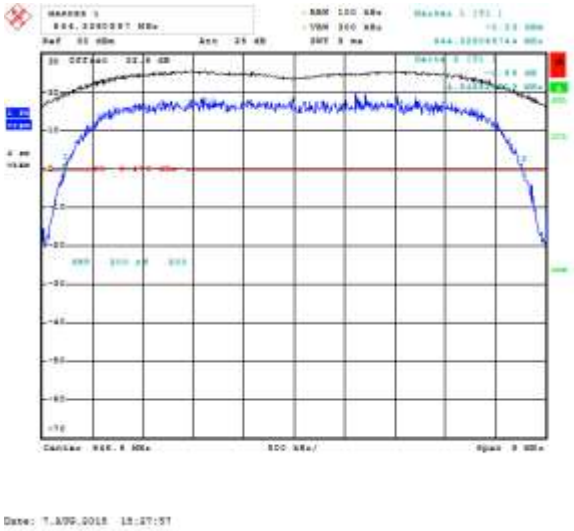


Figure 2-22a: -26 dBc Bandwidth, Band II Low Channel

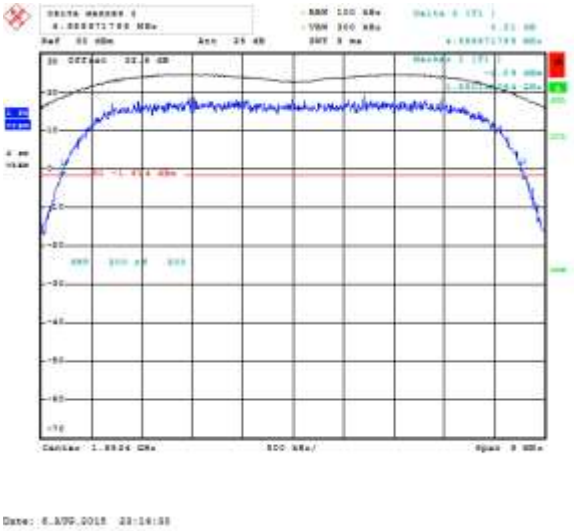


Figure 2-23a: -26 dBc Bandwidth, Band II Middle Channel

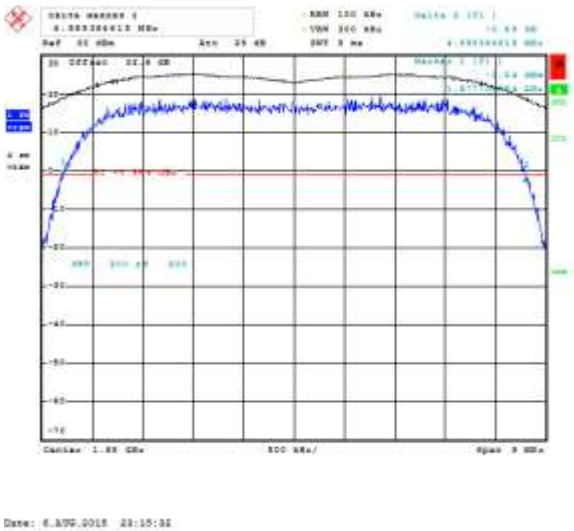
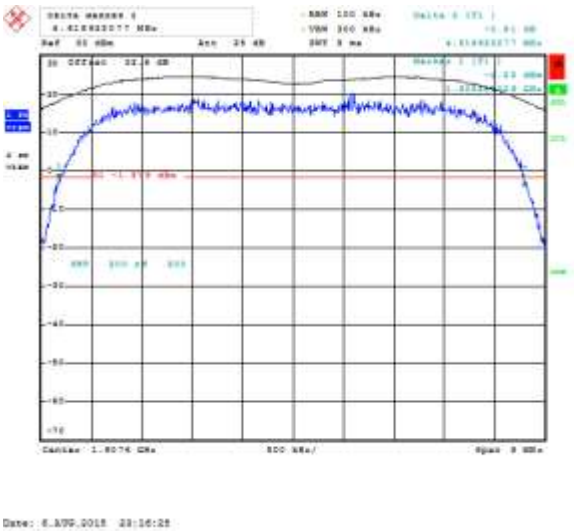


Figure 2-24a: -26 dBc Bandwidth, Band II High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 2-25a: Band V Low Channel Mask

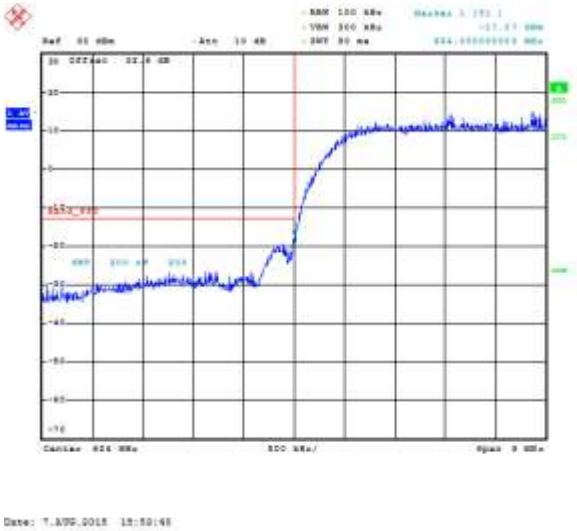


Figure 2-26a: Band V High Channel Mask

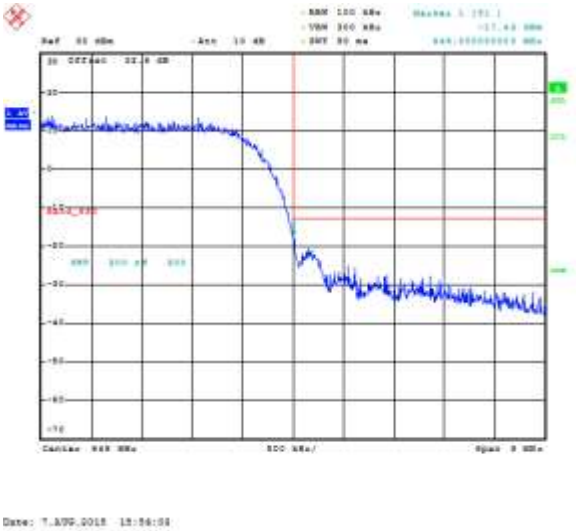


Figure 2-27a: Band II Low Channel Mask

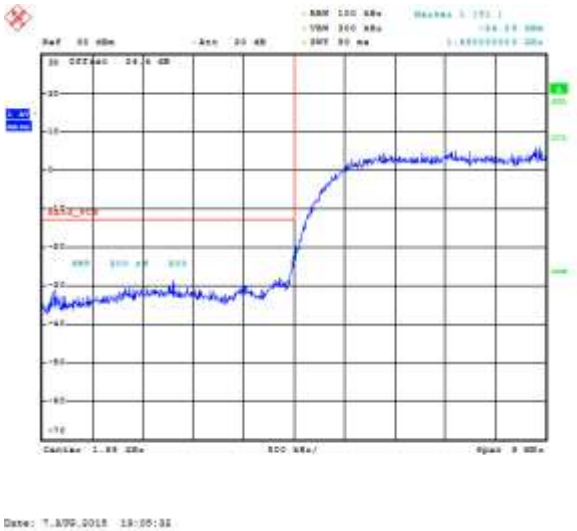
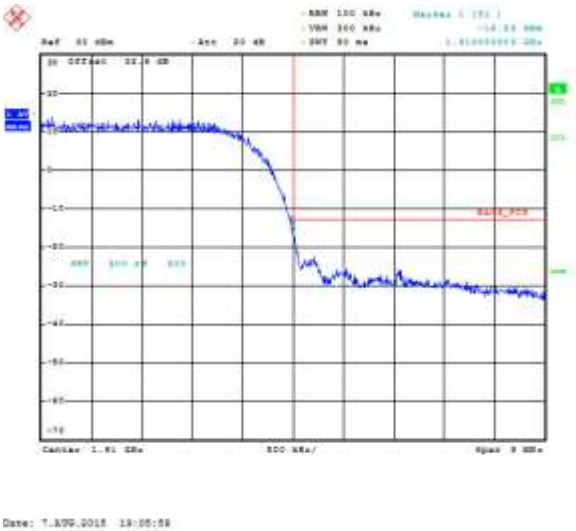


Figure 2-28a: Band II High Channel Mask

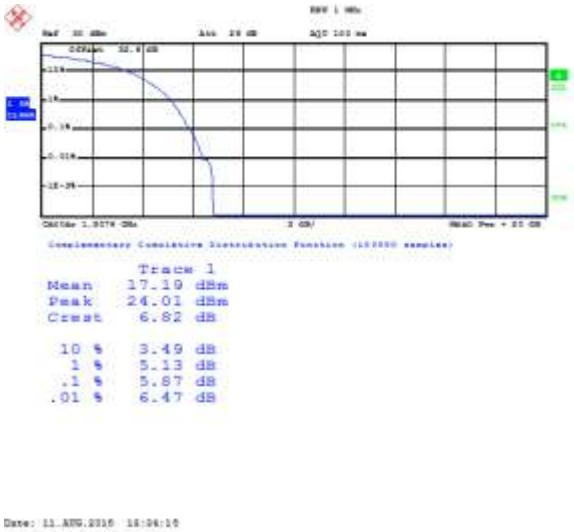


WCDMA Conducted RF Emission Test Data cont'd

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

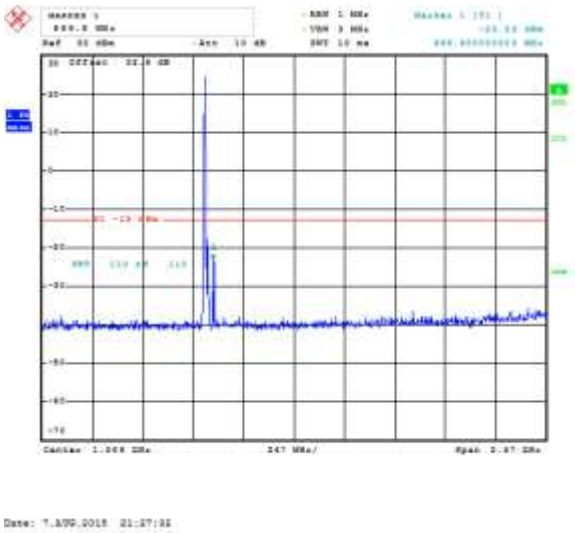


Figure 2-33a: Band V HSUPA, Spurious Conducted Emissions, Low channel

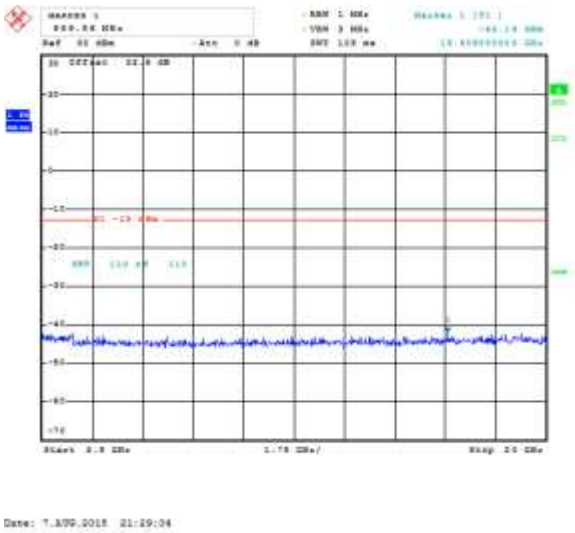


Figure 2-34a: Band V HSUPA, Spurious Conducted Emissions, Middle channel

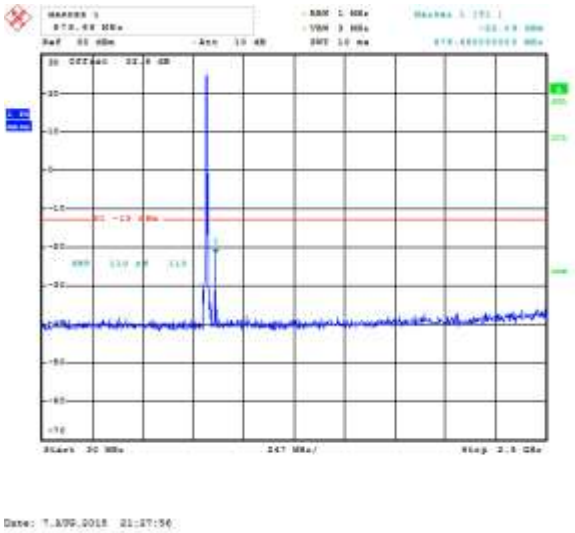
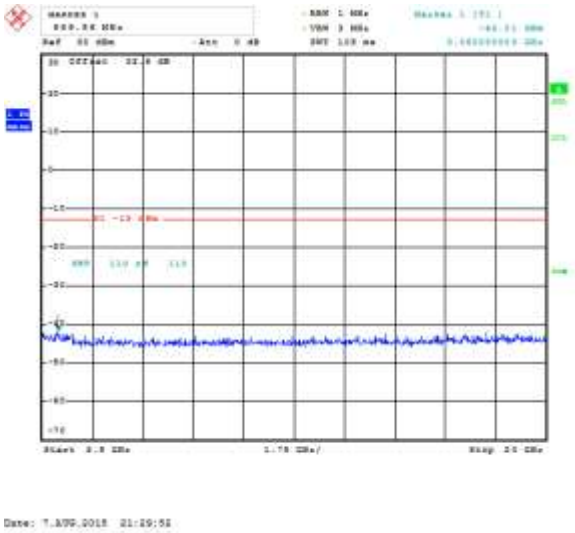


Figure 2-35a: Band V HSUPA, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

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

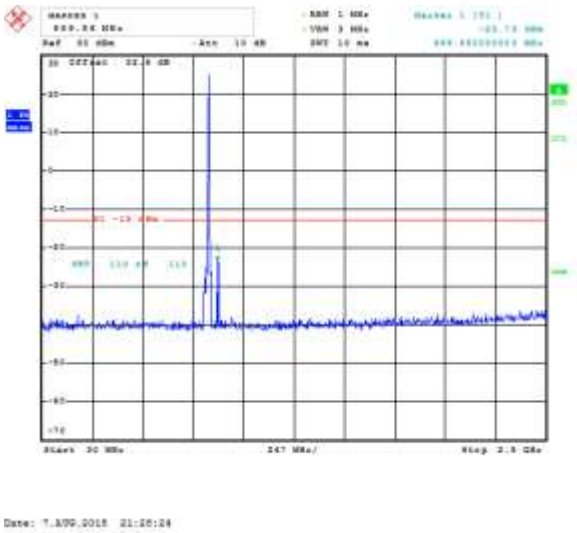


Figure 2-37a: Band V HSUPA, Spurious Conducted Emissions, High Channel

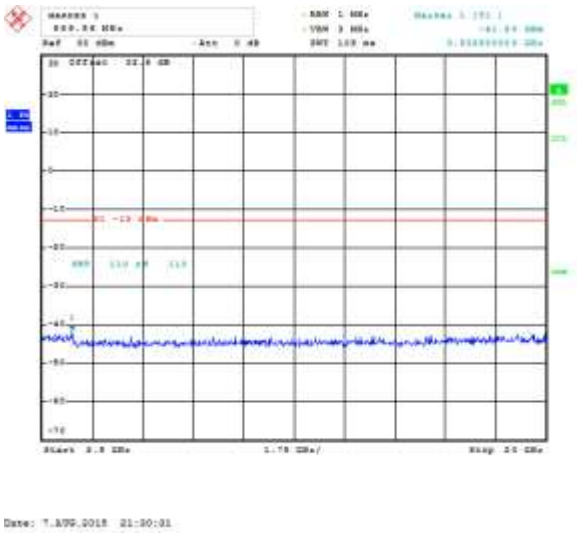


Figure 2-38a: Band II HSUPA, Spurious Conducted Emissions, Low Channel

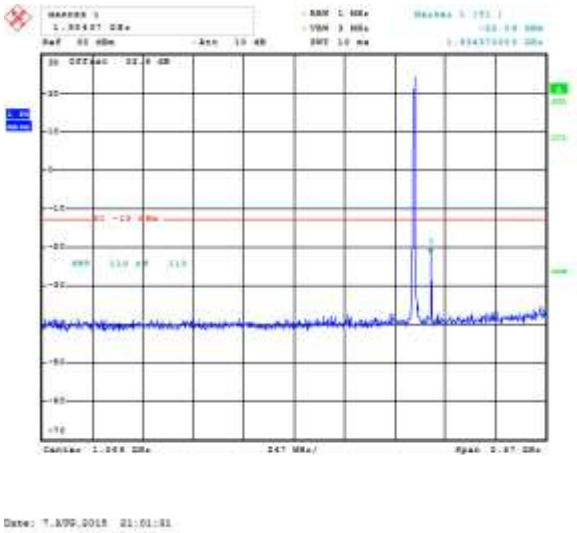
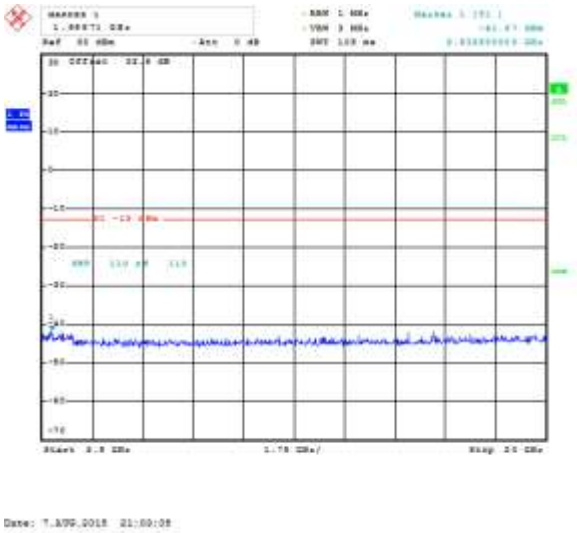


Figure 2-39a: Band II HSUPA, Spurious Conducted Emissions, Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

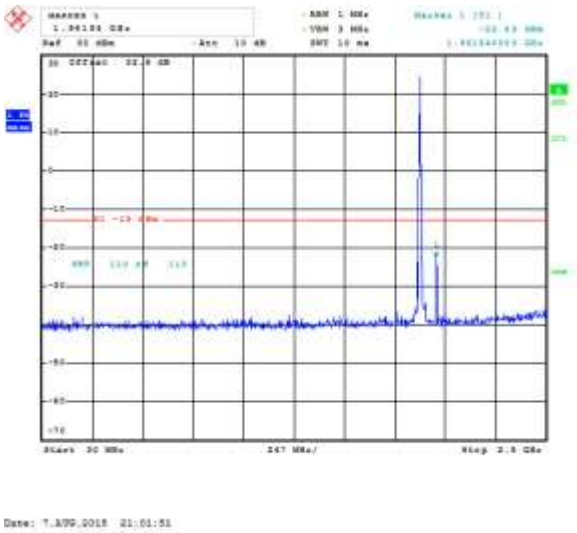


Figure 2-41a: Band II HSUPA, Spurious Conducted Emissions, Middle Channel

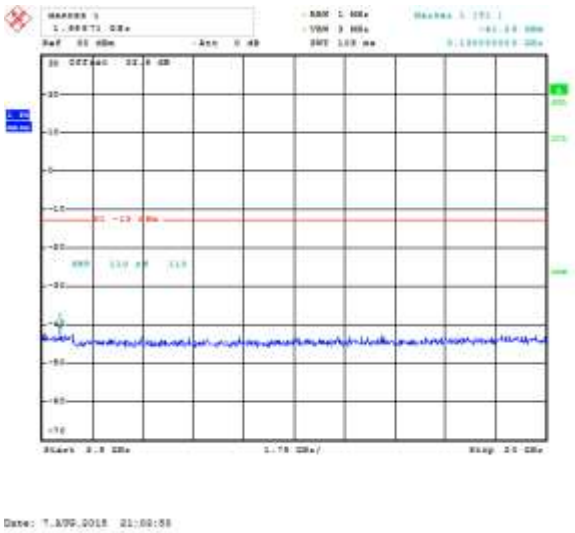


Figure 2-42a: Band II HSUPA, Spurious Conducted Emissions, High Channel

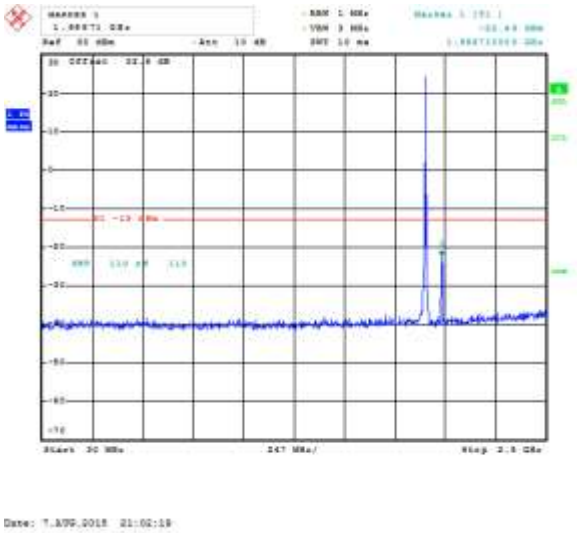
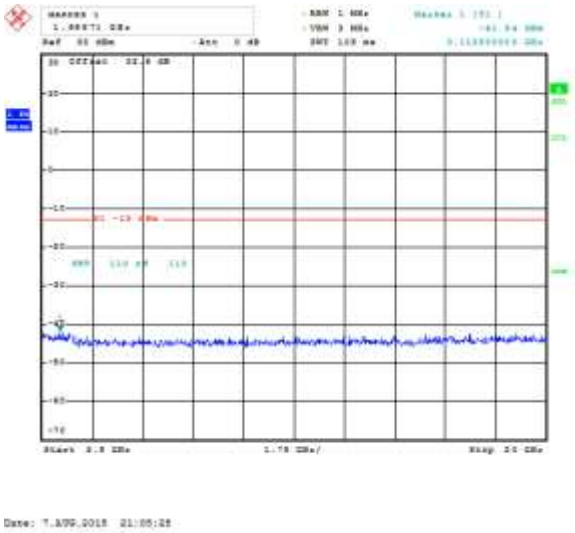


Figure 2-43a: Band II HSUPA, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

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

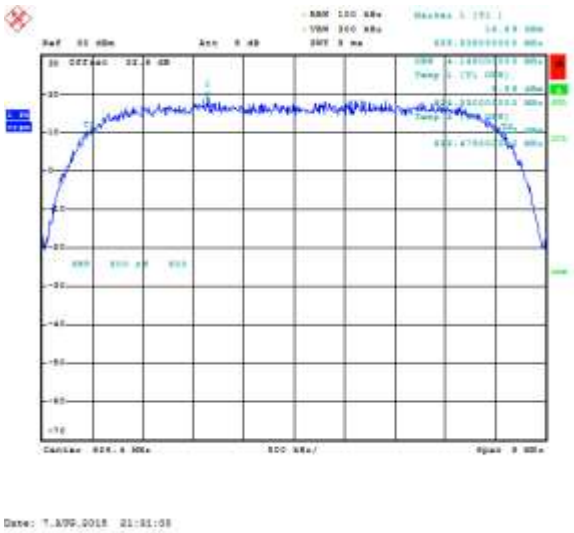


Figure 2-45a: Occupied Bandwidth, Band V HSUPA Middle Channel

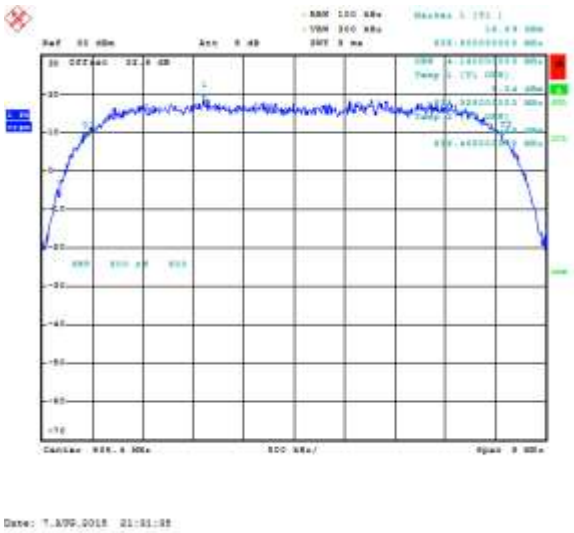


Figure 2-46a: Occupied Bandwidth, Band V HSUPA High Channel

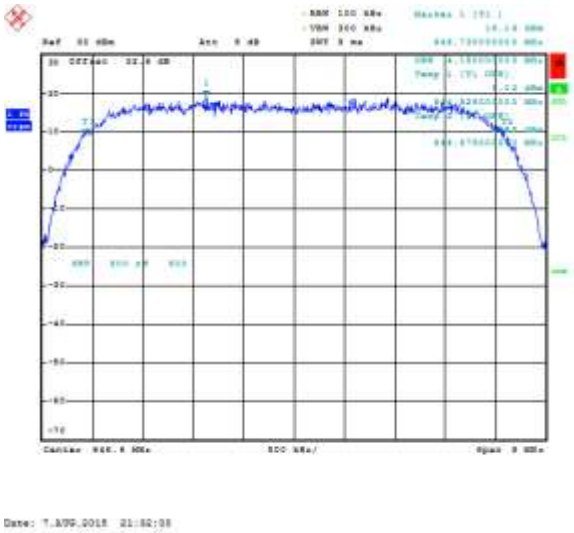
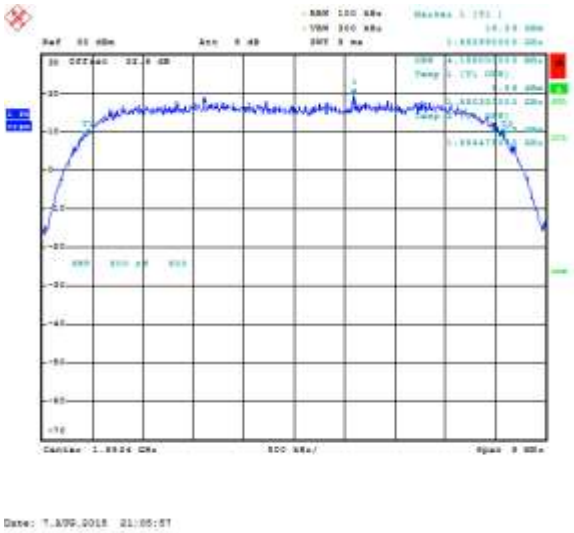


Figure 2-47a: Occupied Bandwidth, Band II HSUPA Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

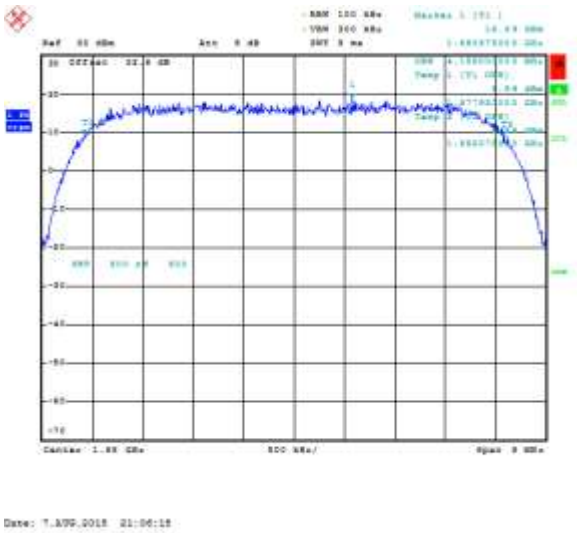


Figure 2-49a: Occupied Bandwidth, Band II HSUPA High Channel

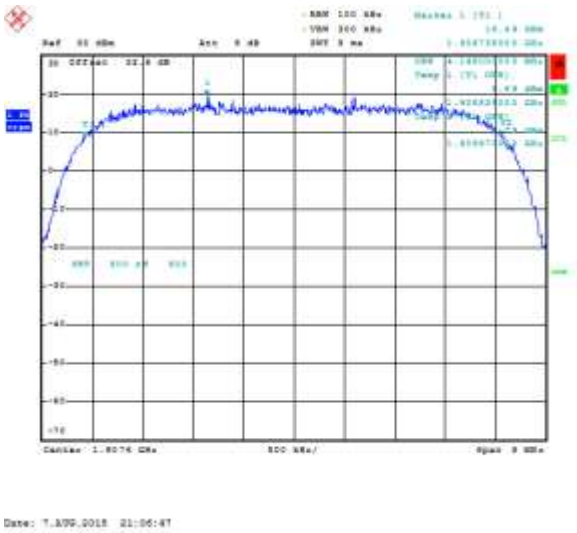


Figure 2-50a: Band V , HSUPA Low Channel Mask

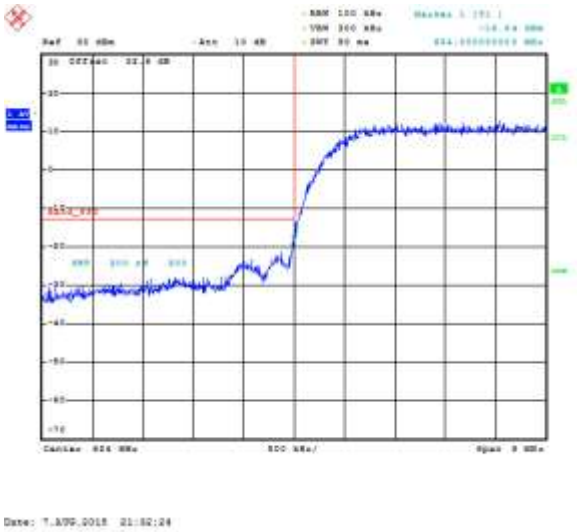
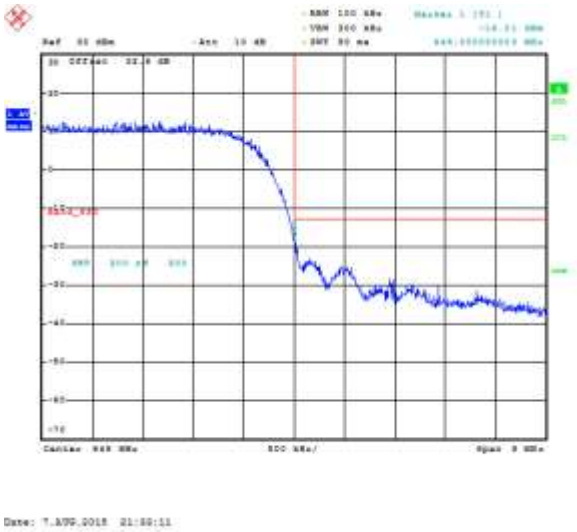


Figure 2-51a: Band V , HSUPA High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

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

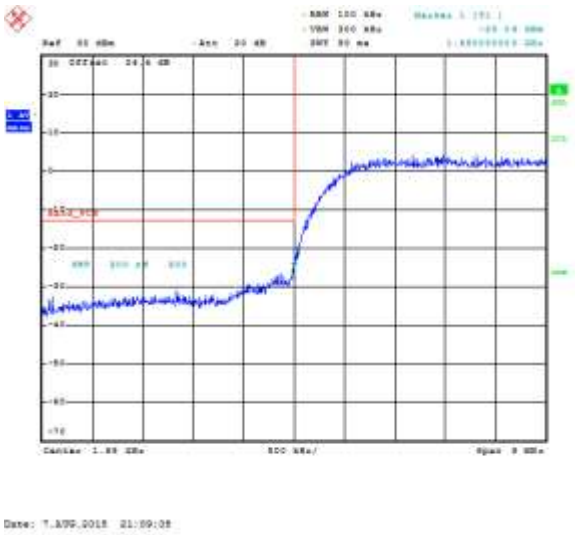
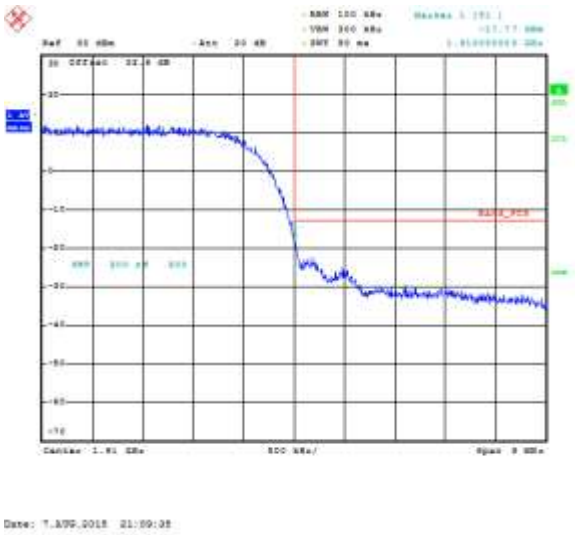


Figure 2-53a: Band II, HSUPA High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

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

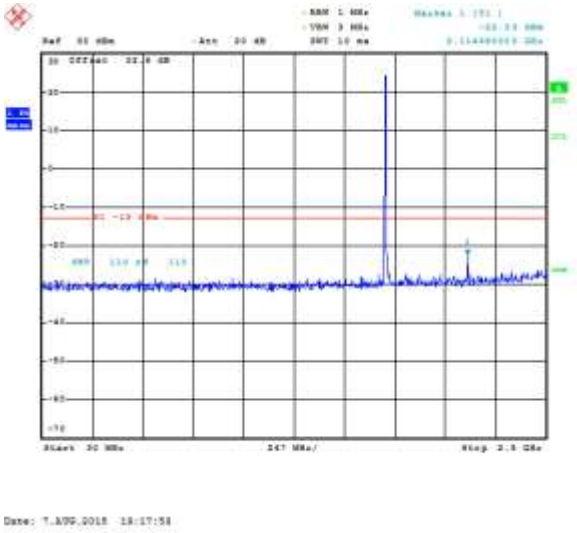


Figure 2-2b: Band IV, Spurious Conducted Emissions, Low channel

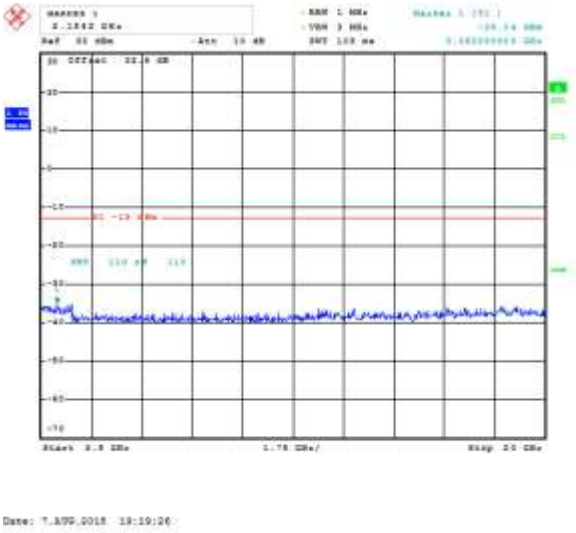


Figure 2-3b: Band IV, Spurious Conducted Emissions, Middle channel

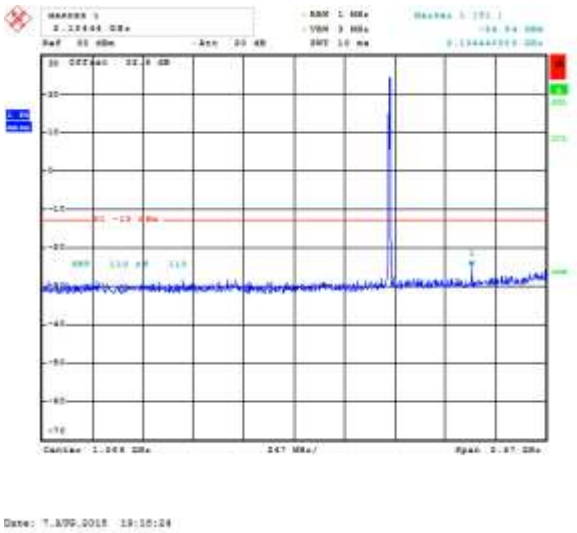
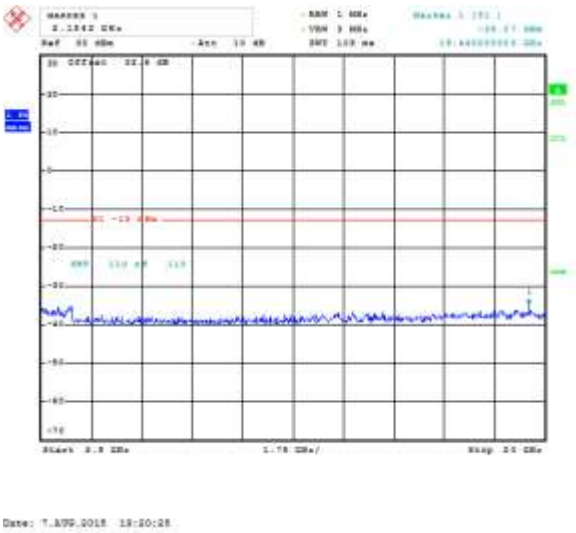


Figure 2-4b: Band IV, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

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

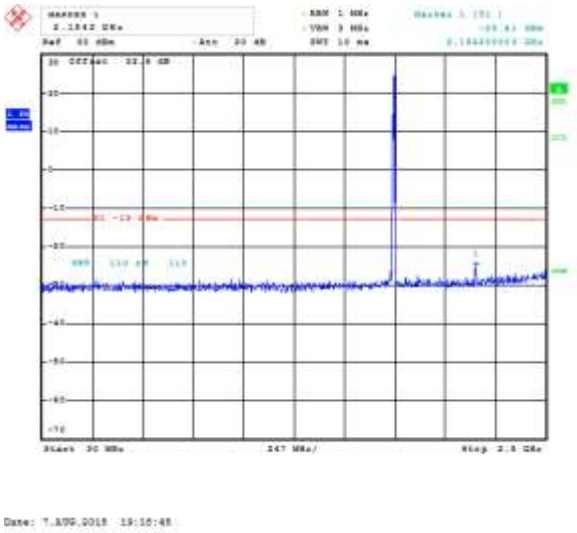
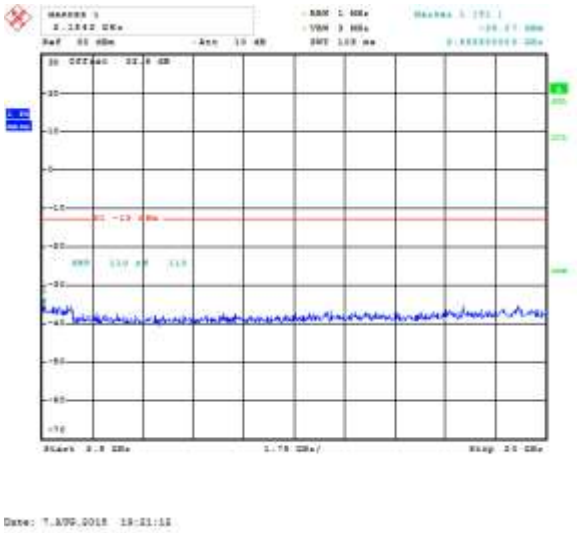


Figure 2-6b: Band IV, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

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

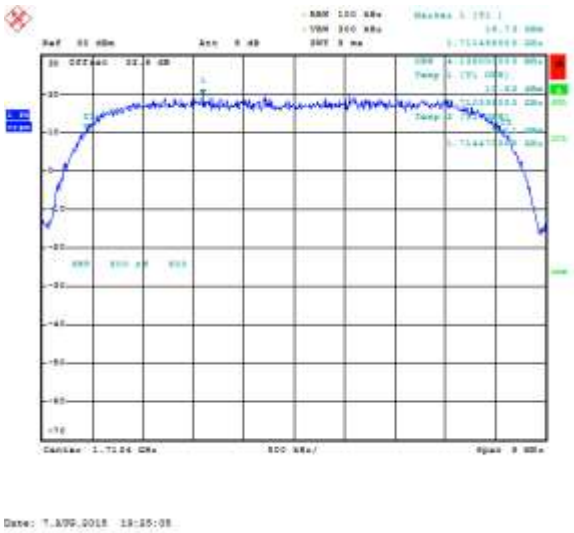


Figure 2-8b: Occupied Bandwidth, Band IV Middle Channel

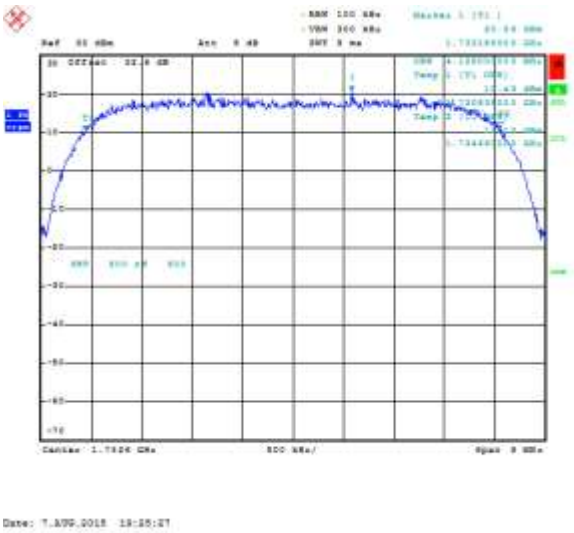


Figure 2-9b: Occupied Bandwidth, Band IV High Channel

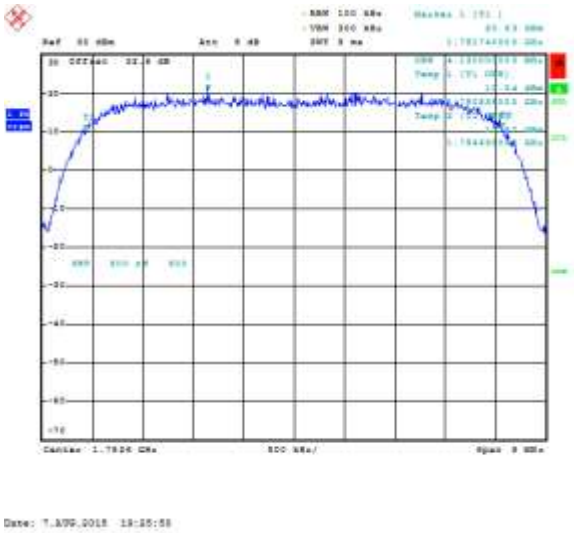


Figure 2-10b: -26 dBc Bandwidth, Band IV Low Channel

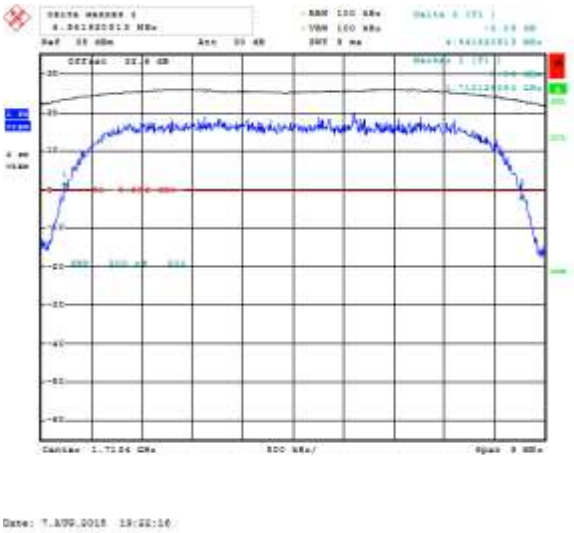


Figure 2-11b: -26 dBc Bandwidth, Band IV Middle Channel

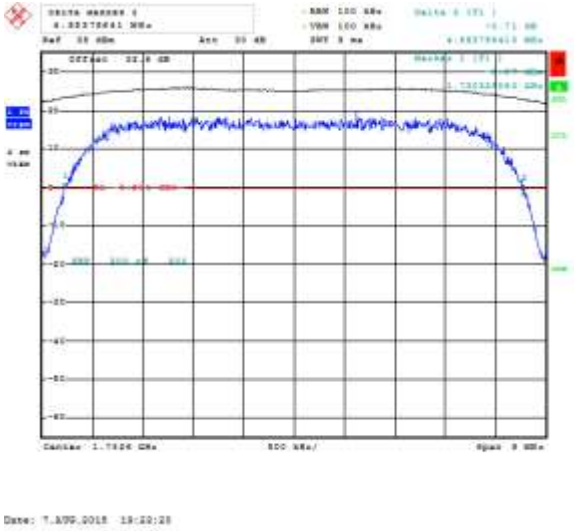


Figure 2-12b: -26 dBc Bandwidth, Band IV High Channel

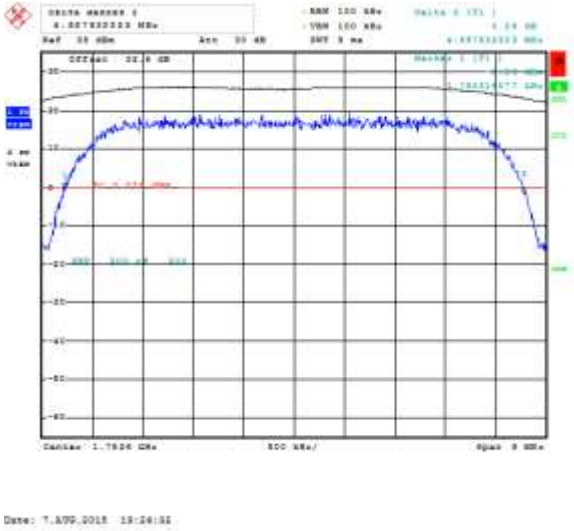


Figure 2-13b: Band IV Low Channel Mask

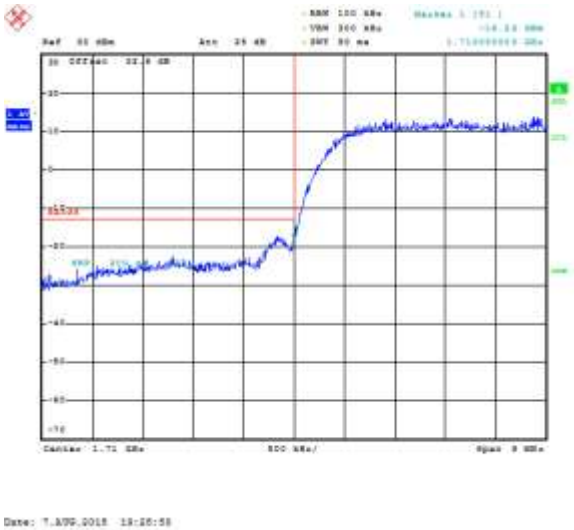
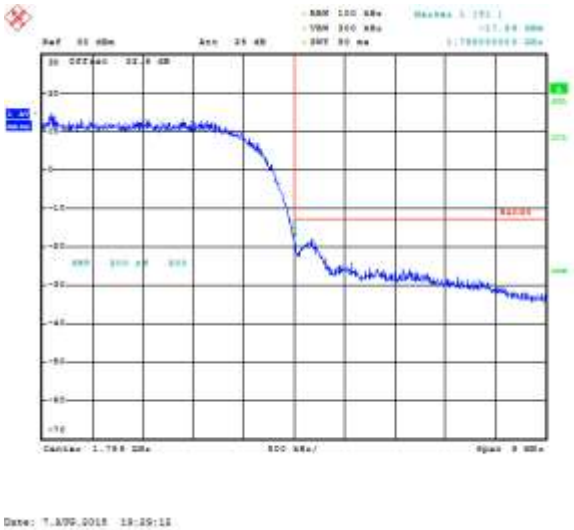


Figure 2-14b: Band IV High Channel Mask



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

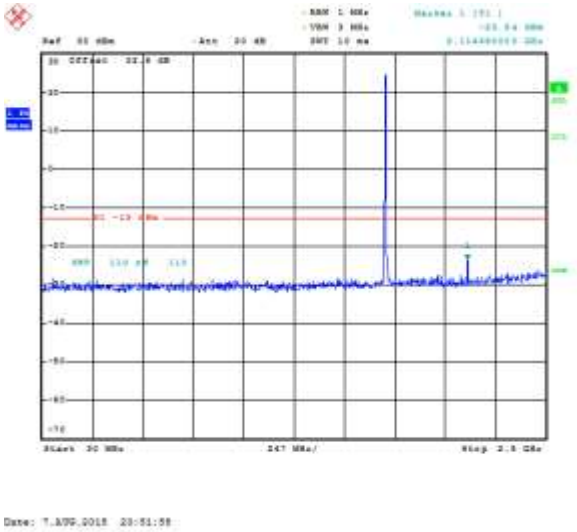


Figure 2-19b: Band IV HSUPA, Spurious Conducted Emissions, Low channel

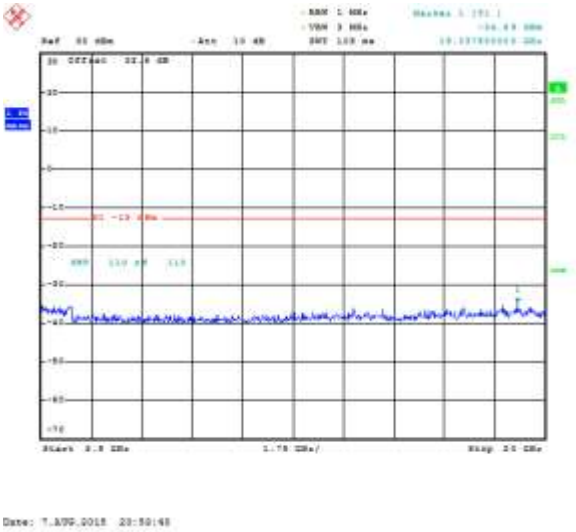


Figure 2-20b: Band IV HSUPA, Spurious Conducted Emissions, Middle channel

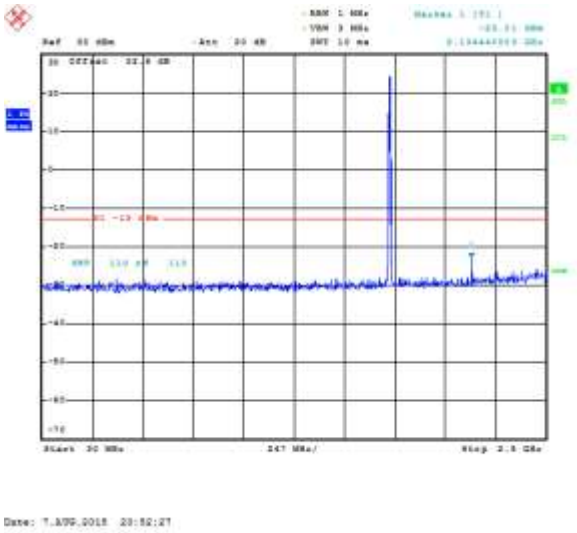
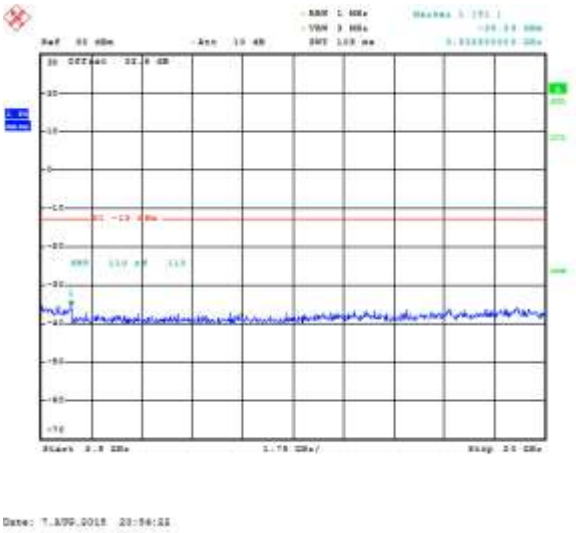


Figure 2-21b: Band IV HSUPA, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

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

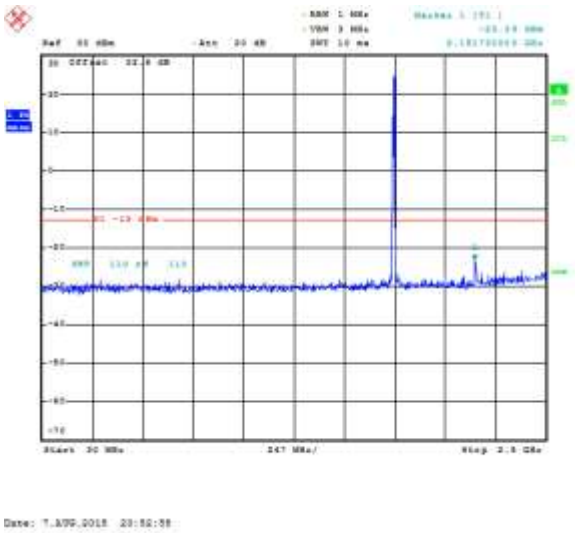


Figure 2-23b: Band IV HSUPA, Spurious Conducted Emissions, High Channel

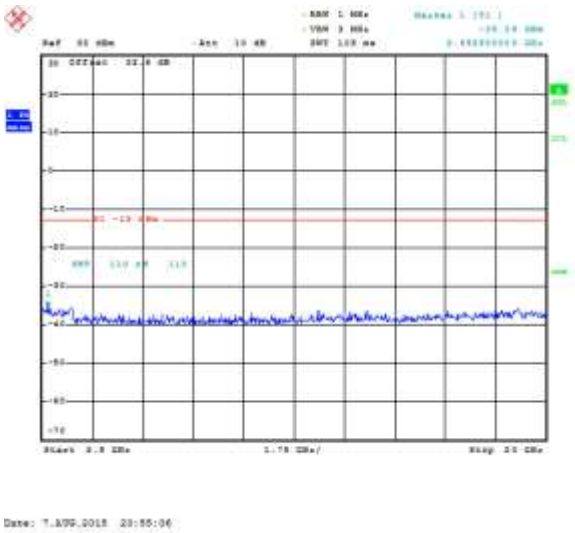


Figure 2-24b: Occupied Bandwidth, Band IV HSUPA Low Channel

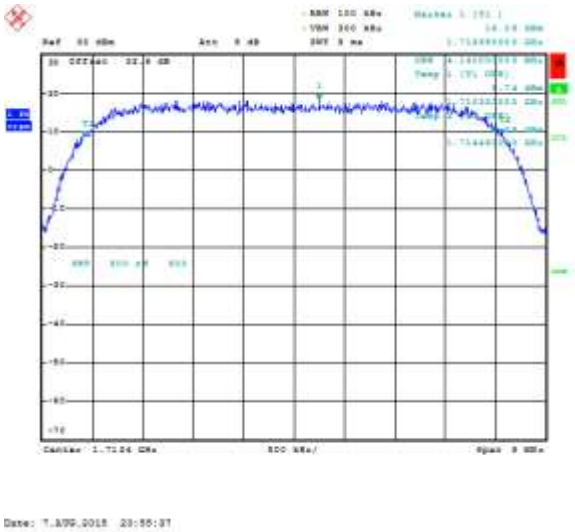
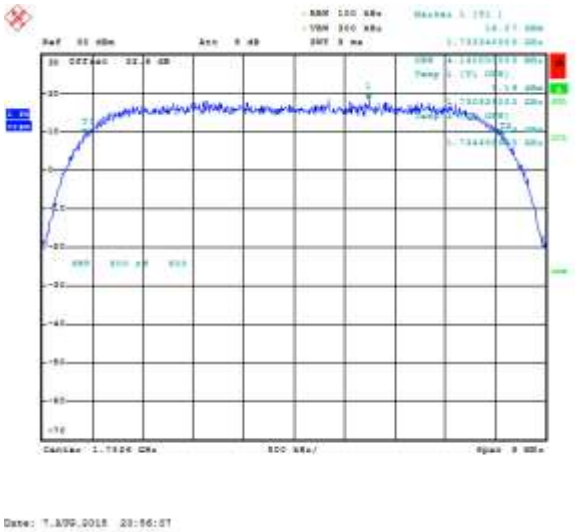


Figure 2-25b: Occupied Bandwidth, Band IV HSUPA Middle Channel



WCDMA Conducted RF Emission Test Data cont'd

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

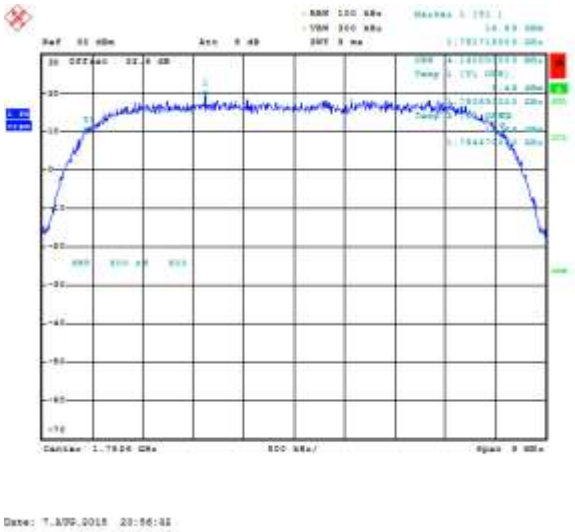


Figure 2-27b: Band IV , HSUPA Low Channel Mask

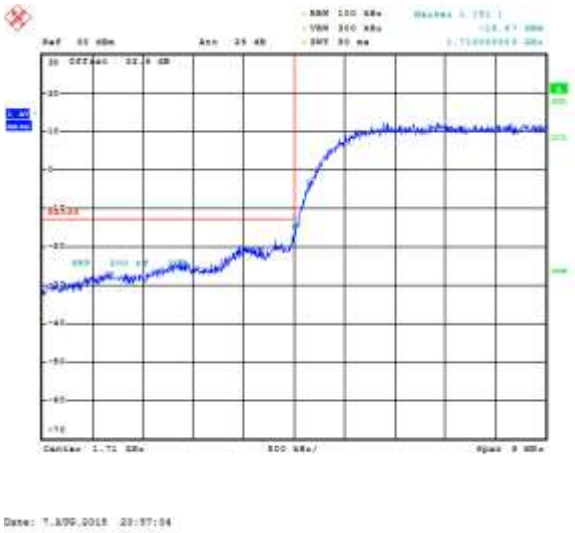
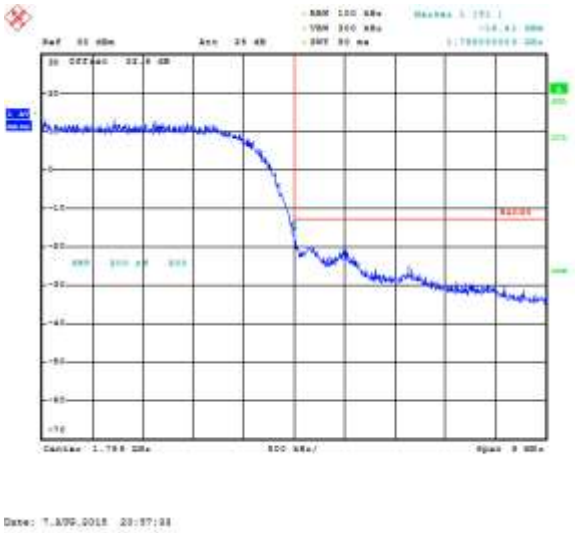
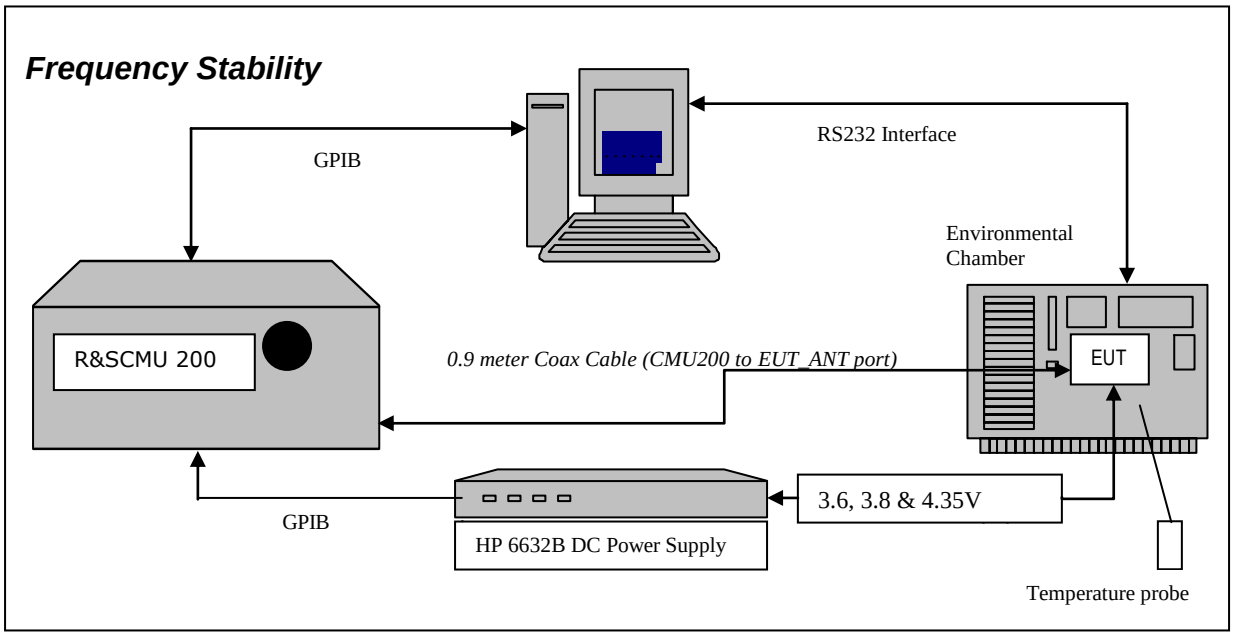


Figure 2-28b: Band IV , HSUPA High Channel Mask



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

WCDMA Frequency Stability Test Data



The following measurements were performed by Sijia Li and Landon Martin.

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, 3.8 volts and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 3.8 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 3.8 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, 3.8 and 4.35 volts

The following configurations were measured for model RHK211LW (STV100-1):

The maximum frequency error in the WCDMA band V measured was **0.0114 PPM**.
The maximum frequency error in the WCDMA band II measured was **0.0082 PPM**.
The maximum frequency error in the WCDMA Band IV measured was **0.0141 PPM**.

The following configurations were measured for model RHK211LW (STV100-1):

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	-5.16	-0.0062
4182	836.4	3.6	20	5.19	0.0062
4233	846.6	3.6	20	3.31	0.0039

Traffic Channel Number	WCDMA Band V Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	3.8	20	-5.25	-0.0064
4182	836.4	3.8	20	5.39	0.0064
4233	846.6	3.8	20	9.61	**0.0114**

Traffic Channel Number	WCDMA Band V Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.35	20	-5.71	-0.0069
4182	836.4	4.35	20	-3.72	-0.0045
4233	846.6	4.35	20	-3.77	-0.0045

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	-4.44	-0.0054
4132	826.4	3.6	-20	5.52	0.0067
4132	826.4	3.6	-10	-6.42	-0.0078
4132	826.4	3.6	0	-6.65	-0.0081
4132	826.4	3.6	10	-6.93	-0.0084
4132	826.4	3.6	20	-5.16	-0.0062
4132	826.4	3.6	30	-5.16	-0.0062
4132	826.4	3.6	40	7.81	0.0095
4132	826.4	3.6	50	-3.88	-0.0047
4132	826.4	3.6	60	-4.23	-0.0051
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4132	826.4	3.8	-30	-3.85	-0.0047
4132	826.4	3.8	-20	8.59	0.0104
4132	826.4	3.8	-10	-6.61	-0.0080
4132	826.4	3.8	0	-6.82	-0.0083
4132	826.4	3.8	10	-6.03	-0.0073
4132	826.4	3.8	20	-5.25	-0.0064
4132	826.4	3.8	30	5.51	0.0067
4132	826.4	3.8	40	-4.09	-0.0049
4132	826.4	3.8	50	3.43	0.0042
4132	826.4	3.8	60	-3.36	-0.0041
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4132	826.4	4.35	-30	5.43	0.0066
4132	826.4	4.35	-20	-4.47	-0.0054
4132	826.4	4.35	-10	-5.91	-0.0071
4132	826.4	4.35	0	-7.60	-0.0092
4132	826.4	4.35	10	-6.76	-0.0082
4132	826.4	4.35	20	-5.71	-0.0069
4132	826.4	4.35	30	-4.55	-0.0055
4132	826.4	4.35	40	7.63	0.0092
4132	826.4	4.35	50	-5.68	-0.0069
4132	826.4	4.35	60	4.46	0.0054

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	-6.09	-0.0073
4182	836.4	3.6	-20	-4.76	-0.0057
4182	836.4	3.6	-10	-5.26	-0.0063
4182	836.4	3.6	0	-4.84	-0.0058
4182	836.4	3.6	10	-4.38	-0.0052
4182	836.4	3.6	20	5.19	0.0062
4182	836.4	3.6	30	-4.32	-0.0052
4182	836.4	3.6	40	-5.28	-0.0063
4182	836.4	3.6	50	-4.70	-0.0056
4182	836.4	3.6	60	-4.30	-0.0051
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4182	836.4	3.8	-30	-5.05	-0.0060
4182	836.4	3.8	-20	7.51	0.0090
4182	836.4	3.8	-10	-5.91	-0.0071
4182	836.4	3.8	0	7.75	0.0093
4182	836.4	3.8	10	-4.07	-0.0049
4182	836.4	3.8	20	5.39	0.0064
4182	836.4	3.8	30	-4.56	-0.0055
4182	836.4	3.8	40	3.11	0.0037
4182	836.4	3.8	50	-4.18	-0.0050
4182	836.4	3.8	60	-4.36	-0.0052
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4182	836.4	4.35	-30	-5.52	-0.0066
4182	836.4	4.35	-20	5.07	0.0061
4182	836.4	4.35	-10	-5.80	-0.0069
4182	836.4	4.35	0	-3.45	-0.0041
4182	836.4	4.35	10	-2.99	-0.0036
4182	836.4	4.35	20	-3.72	-0.0045
4182	836.4	4.35	30	-4.49	-0.0054
4182	836.4	4.35	40	-3.63	-0.0043
4182	836.4	4.35	50	-6.01	-0.0072
4182	836.4	4.35	60	9.03	0.0108

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	-6.30	-0.0074
4233	846.6	3.6	-20	-5.54	-0.0065
4233	846.6	3.6	-10	8.99	0.0106
4233	846.6	3.6	0	4.53	0.0054
4233	846.6	3.6	10	5.83	0.0069
4233	846.6	3.6	20	3.31	0.0039
4233	846.6	3.6	30	-5.62	-0.0066
4233	846.6	3.6	40	-4.97	-0.0059
4233	846.6	3.6	50	-6.59	-0.0078
4233	846.6	3.6	60	-5.40	-0.0064
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4233	846.6	3.8	-30	-5.92	-0.0070
4233	846.6	3.8	-20	-5.65	-0.0067
4233	846.6	3.8	-10	4.90	0.0058
4233	846.6	3.8	0	4.76	0.0056
4233	846.6	3.8	10	4.43	0.0052
4233	846.6	3.8	20	9.61	0.0114
4233	846.6	3.8	30	-5.05	-0.0060
4233	846.6	3.8	40	-5.39	-0.0064
4233	846.6	3.8	50	-5.48	-0.0065
4233	846.6	3.8	60	-6.39	-0.0076
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4233	846.6	4.35	-30	-9.52	-0.0112
4233	846.6	4.35	-20	-4.47	-0.0053
4233	846.6	4.35	-10	4.78	0.0056
4233	846.6	4.35	0	5.68	0.0067
4233	846.6	4.35	10	5.11	0.0060
4233	846.6	4.35	20	-3.77	-0.0045
4233	846.6	4.35	30	-6.24	-0.0074
4233	846.6	4.35	40	-5.49	-0.0065
4233	846.6	4.35	50	-5.54	-0.0065
4233	846.6	4.35	60	-5.08	-0.0060

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	-7.64	-0.0041
9400	1880.00	3.6	20	-7.28	-0.0039
9538	1907.60	3.6	20	-5.72	-0.0030

Traffic Channel Number	WCDMA1900 Frequency (MHz	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	3.8	20	-7.03	-0.0038
9400	1880.00	3.8	20	-7.51	-0.0040
9538	1907.60	3.8	20	-7.58	-0.0040

Traffic Channel Number	WCDMA1900 Frequency (MHz	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.35	20	-7.92	-0.0043
9400	1880.00	4.35	20	-6.96	-0.0037
9538	1907.60	4.35	20	-7.31	-0.0038

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	12.44	0.0067
9262	1852.40	3.6	-20	-8.42	-0.0045
9262	1852.40	3.6	-10	-9.60	-0.0052
9262	1852.40	3.6	0	-10.12	-0.0055
9262	1852.40	3.6	10	-8.61	-0.0046
9262	1852.40	3.6	20	-7.64	-0.0041
9262	1852.40	3.6	30	-3.27	-0.0018
9262	1852.40	3.6	40	-3.62	-0.0020
9262	1852.40	3.6	50	-4.18	-0.0023
9262	1852.40	3.6	60	-6.50	-0.0035
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9262	1852.40	3.8	-30	-6.18	-0.0033
9262	1852.40	3.8	-20	-6.84	-0.0037
9262	1852.40	3.8	-10	-9.00	-0.0049
9262	1852.40	3.8	0	-10.71	-0.0058
9262	1852.40	3.8	10	-9.98	-0.0054
9262	1852.40	3.8	20	-7.03	-0.0038
9262	1852.40	3.8	30	-6.24	-0.0034
9262	1852.40	3.8	40	3.36	0.0018
9262	1852.40	3.8	50	-4.46	-0.0024
9262	1852.40	3.8	60	-5.13	-0.0028
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9262	1852.40	4.35	-30	4.67	0.0025
9262	1852.40	4.35	-20	-5.68	-0.0031
9262	1852.40	4.35	-10	-9.58	-0.0052
9262	1852.40	4.35	0	-12.85	-0.0069
9262	1852.40	4.35	10	-9.20	-0.0050
9262	1852.40	4.35	20	-7.92	-0.0043
9262	1852.40	4.35	30	-6.71	-0.0036
9262	1852.40	4.35	40	-4.33	-0.0023
9262	1852.40	4.35	50	-6.41	-0.0035
9262	1852.40	4.35	60	-5.72	-0.0031

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	-11.70	-0.0062
9400	1880.00	3.6	-20	-7.81	-0.0042
9400	1880.00	3.6	-10	-7.80	-0.0041
9400	1880.00	3.6	0	-6.70	-0.0036
9400	1880.00	3.6	10	-6.94	-0.0037
9400	1880.00	3.6	20	-7.28	-0.0039
9400	1880.00	3.6	30	-6.94	-0.0037
9400	1880.00	3.6	40	-7.97	-0.0042
9400	1880.00	3.6	50	-8.53	-0.0045
9400	1880.00	3.6	60	-8.01	-0.0043
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9400	1880.00	3.8	-30	-12.48	0.0066
9400	1880.00	3.8	-20	-6.94	-0.0037
9400	1880.00	3.8	-10	-8.51	-0.0045
9400	1880.00	3.8	0	-7.72	-0.0041
9400	1880.00	3.8	10	-7.31	-0.0039
9400	1880.00	3.8	20	-7.51	-0.0040
9400	1880.00	3.8	30	-8.36	-0.0044
9400	1880.00	3.8	40	-7.95	-0.0042
9400	1880.00	3.8	50	-7.89	-0.0042
9400	1880.00	3.8	60	-7.69	-0.0041
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9400	1880.00	4.35	-30	-8.47	-0.0045
9400	1880.00	4.35	-20	-7.48	-0.0040
9400	1880.00	4.35	-10	-6.87	-0.0037
9400	1880.00	4.35	0	-7.06	-0.0038
9400	1880.00	4.35	10	-8.87	-0.0047
9400	1880.00	4.35	20	-6.96	-0.0037
9400	1880.00	4.35	30	-8.15	-0.0043
9400	1880.00	4.35	40	-8.29	-0.0044
9400	1880.00	4.35	50	-7.20	-0.0038
9400	1880.00	4.35	60	-7.26	-0.0039

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	-15.61	**-0.0082**
9538	1907.60	3.6	-20	-10.24	-0.0054
9538	1907.60	3.6	-10	-5.68	-0.0030
9538	1907.60	3.6	0	-4.91	-0.0026
9538	1907.60	3.6	10	-5.37	-0.0028
9538	1907.60	3.6	20	-5.72	-0.0030
9538	1907.60	3.6	30	-8.04	-0.0042
9538	1907.60	3.6	40	-9.92	-0.0052
9538	1907.60	3.6	50	-12.94	-0.0068
9538	1907.60	3.6	60	-9.52	-0.0050
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9538	1907.60	3.8	-30	-13.69	-0.0072
9538	1907.60	3.8	-20	-8.80	-0.0046
9538	1907.60	3.8	-10	-4.96	-0.0026
9538	1907.60	3.8	0	-4.38	-0.0023
9538	1907.60	3.8	10	-4.36	-0.0023
9538	1907.60	3.8	20	-7.58	-0.0040
9538	1907.60	3.8	30	-8.94	-0.0047
9538	1907.60	3.8	40	-11.09	-0.0058
9538	1907.60	3.8	50	-10.77	-0.0056
9538	1907.60	3.8	60	-11.18	-0.0059
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9538	1907.60	4.35	-30	-12.04	-0.0063
9538	1907.60	4.35	-20	-7.80	-0.0041
9538	1907.60	4.35	-10	-4.39	-0.0023
9538	1907.60	4.35	0	-6.01	-0.0032
9538	1907.60	4.35	10	-4.71	-0.0025
9538	1907.60	4.35	20	-7.31	-0.0038
9538	1907.60	4.35	30	-9.95	-0.0052
9538	1907.60	4.35	40	-10.28	-0.0054
9538	1907.60	4.35	50	-12.30	-0.0064
9538	1907.60	4.35	60	-9.78	-0.0051

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	9.05	0.0053
1413	1732.6	3.6	20	7.63	0.0044
1513	1752.6	3.6	20	6.06	0.0040

Traffic Channel Number	WCDMA Band IV Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
1312	1712.4	3.8	20	-7.05	-0.0041
1413	1732.6	3.8	20	-6.71	-0.0039
1513	1752.6	3.8	20	4.90	0.0032

Traffic Channel Number	WCDMA Band IV Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
1312	1712.4	4.35	20	-8.12	-0.0047
1413	1732.6	4.35	20	-7.34	-0.0042
1513	1752.6	4.35	20	3.92	0.0026

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	12.33	0.0072
1312.00	1712.40	3.6	-20	5.02	0.0029
1312.00	1712.40	3.6	-10	-14.27	-0.0083
1312.00	1712.40	3.6	0	-15.64	-0.0091
1312.00	1712.40	3.6	10	-13.34	-0.0078
1312.00	1712.40	3.6	20	9.05	0.0053
1312.00	1712.40	3.6	30	8.42	0.0049
1312.00	1712.40	3.6	40	13.58	0.0079
1312.00	1712.40	3.6	50	12.44	0.0073
1312.00	1712.40	3.6	60	10.99	0.0064
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1312.00	1712.40	3.8	-30	15.18	0.0089
1312.00	1712.40	3.8	-20	5.94	0.0035
1312.00	1712.40	3.8	-10	-13.31	-0.0078
1312.00	1712.40	3.8	0	-16.51	-0.0096
1312.00	1712.40	3.8	10	-13.18	-0.0077
1312.00	1712.40	3.8	20	-7.05	-0.0041
1312.00	1712.40	3.8	30	6.94	0.0041
1312.00	1712.40	3.8	40	12.57	0.0073
1312.00	1712.40	3.8	50	13.90	0.0081
1312.00	1712.40	3.8	60	9.74	0.0057
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1312.00	1712.40	4.35	-30	17.47	0.0102
1312.00	1712.40	4.35	-20	6.68	0.0039
1312.00	1712.40	4.35	-10	-12.28	-0.0072
1312.00	1712.40	4.35	0	-15.12	-0.0088
1312.00	1712.40	4.35	10	-13.73	-0.0080
1312.00	1712.40	4.35	20	-8.12	-0.0047
1312.00	1712.40	4.35	30	6.61	0.0039
1312.00	1712.40	4.35	40	12.27	0.0072
1312.00	1712.40	4.35	50	15.66	0.0091
1312.00	1712.40	4.35	60	9.34	0.0055

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	-11.66	-0.0067
1413.00	1732.60	3.6	-20	-9.05	-0.0052
1413.00	1732.60	3.6	-10	-7.71	-0.0044
1413.00	1732.60	3.6	0	-7.61	-0.0044
1413.00	1732.60	3.6	10	-7.16	-0.0041
1413.00	1732.60	3.6	20	7.63	0.0044
1413.00	1732.60	3.6	30	-6.71	-0.0039
1413.00	1732.60	3.6	40	-6.84	-0.0039
1413.00	1732.60	3.6	50	-8.70	-0.0050
1413.00	1732.60	3.6	60	-9.74	-0.0056
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1413.00	1732.60	3.8	-30	-9.77	-0.0056
1413.00	1732.60	3.8	-20	-8.67	-0.0050
1413.00	1732.60	3.8	-10	-7.43	-0.0043
1413.00	1732.60	3.8	0	-8.03	-0.0046
1413.00	1732.60	3.8	10	-7.90	-0.0046
1413.00	1732.60	3.8	20	-6.71	-0.0039
1413.00	1732.60	3.8	30	-5.91	-0.0034
1413.00	1732.60	3.8	40	-6.59	-0.0038
1413.00	1732.60	3.8	50	-7.20	-0.0042
1413.00	1732.60	3.8	60	-9.22	-0.0053
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1413.00	1732.60	4.35	-30	-8.90	-0.0051
1413.00	1732.60	4.35	-20	-7.08	-0.0041
1413.00	1732.60	4.35	-10	-8.10	-0.0047
1413.00	1732.60	4.35	0	-6.82	-0.0039
1413.00	1732.60	4.35	10	-6.58	-0.0038
1413.00	1732.60	4.35	20	-7.34	-0.0042
1413.00	1732.60	4.35	30	-6.84	-0.0039
1413.00	1732.60	4.35	40	-7.69	-0.0044
1413.00	1732.60	4.35	50	-8.26	-0.0048
1413.00	1732.60	4.35	60	-10.13	-0.0058

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	-20.52	-0.0136
1513.00	1752.6	3.6	-20	-8.13	-0.0054
1513.00	1752.6	3.6	-10	9.81	0.0065
1513.00	1752.6	3.6	0	14.11	0.0093
1513.00	1752.6	3.6	10	12.22	0.0081
1513.00	1752.6	3.6	20	6.06	0.0040
1513.00	1752.6	3.6	30	-9.51	-0.0063
1513.00	1752.6	3.6	40	-16.14	-0.0107
1513.00	1752.6	3.6	50	-18.94	-0.0125
1513.00	1752.6	3.6	60	-14.74	-0.0097
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1513.00	1752.6	3.8	-30	-21.19	-0.0140
1513.00	1752.6	3.8	-20	-8.30	-0.0055
1513.00	1752.6	3.8	-10	11.09	0.0073
1513.00	1752.6	3.8	0	12.80	0.0085
1513.00	1752.6	3.8	10	9.58	0.0063
1513.00	1752.6	3.8	20	4.90	0.0032
1513.00	1752.6	3.8	30	-9.43	-0.0062
1513.00	1752.6	3.8	40	-15.96	-0.0105
1513.00	1752.6	3.8	50	-16.91	-0.0112
1513.00	1752.6	3.8	60	-11.90	-0.0079
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
1513.00	1752.6	4.35	-30	-21.38	**-0.0141**
1513.00	1752.6	4.35	-20	-8.03	-0.0053
1513.00	1752.6	4.35	-10	10.51	0.0069
1513.00	1752.6	4.35	0	14.04	0.0093
1513.00	1752.6	4.35	10	11.46	0.0076
1513.00	1752.6	4.35	20	3.92	0.0026
1513.00	1752.6	4.35	30	-10.01	-0.0066
1513.00	1752.6	4.35	40	-16.22	-0.0107
1513.00	1752.6	4.35	50	-16.77	-0.0111
1513.00	1752.6	4.35	60	-13.32	-0.0088

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

Radiated Power Test Data Results

The following configurations were measured for model RHK211LW (STV100-1):

The following measurements were performed by Shiva Kumbham.

Date of Test: August 8, 2015

The environmental tests conditions were: Temperature: 25.6 °C
Relative Humidity: 31.3 %

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	-38.49	-30.59	V-V	3.32	21.34	0.14	38.50	17.16
F0	4132	826.40	V	Dipole	H	-30.59		H-H	2.78				
F0	4182	836.40	V	Dipole	V	-38.42	-30.03	V-V	5.61	23.24	0.21	38.50	15.26
F0	4182	836.40	V	Dipole	H	-30.03		H-H	4.55				
F0	4233	846.60	V	Dipole	V	-38.86	-30.34	V-V	5.91	**23.58**	0.23	38.50	14.92
F0	4233	846.60	V	Dipole	H	-30.34		H-H	4.04				

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	-40.47	-32.70	V-V	1.20	19.22	0.08	38.50	19.28
F0	4132	826.40	V	Dipole	H	-32.70		H-H	0.61				
F0	4182	836.40	V	Dipole	V	-40.46	-32.14	V-V	3.47	21.10	0.13	38.50	17.40
F0	4182	836.40	V	Dipole	H	-32.14		H-H	2.37				
F0	4233	846.60	V	Dipole	V	-40.90	-32.42	V-V	3.76	**21.43**	0.14	38.50	17.07
F0	4233	846.60	V	Dipole	H	-32.42		H-H	1.78				

Radiated Power Test Data Results cont'd

Date of Test: July 23, 2015

The environmental test conditions were: Temperature: 24.6 ºC
Relative Humidity: 32.2 %

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	-23.51	-23.51	V-V	-13.41	**27.65**	0.58	33.00	5.35
F0	9262	1852.40	II	Horn	H	-24.63		H-H	-11.97				
F0	9400	1880.00	II	Horn	V	-23.57	-23.57	V-V	-13.00	27.51	0.56	33.00	5.49
F0	9400	1880.00	II	Horn	H	-24.99		H-H	-11.89				
F0	9538	1907.60	II	Horn	V	-24.76	-24.76	V-V	-13.82	26.17	0.41	33.00	6.83
F0	9538	1907.60	II	Horn	H	-25.35		H-H	-13.23				

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	-25.16	-25.16	V-V	-15.12	**25.95**	0.39	33.00	7.05
F0	9262	1852.40	II	Horn	H	-25.53		H-H	-13.67				
F0	9400	1880.00	II	Horn	V	-25.10	-25.10	V-V	-14.95	25.91	0.39	33.00	7.09
F0	9400	1880.00	II	Horn	H	-26.19		H-H	-13.49				
F0	9538	1907.60	II	Horn	V	-26.06	-26.06	V-V	-15.17	24.77	0.30	33.00	8.23
F0	9538	1907.60	II	Horn	H	-26.69		H-H	-14.63				

Radiated Power Test Data Results

The following measurements were performed by Savtej Sandhu.

Date of Test: July 23, 2015

The environmental tests conditions were: Temperature: 24.2 °C
Relative Humidity: 34.0 %

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	-20.83	-20.83	V-V	-12.47	26.65	0.46	30.00	3.35
F0	1312	1712.4	IV	Dipole	H	-22.43		H-H	-12.05				
F0	1413	1732.6	IV	Dipole	V	-21.02	-21.02	V-V	-12.86	26.77	0.48	30.00	3.23
F0	1413	1732.6	IV	Dipole	H	-23.14		H-H	-12.02				
F0	1513	1752.6	IV	Dipole	V	-21.31	-21.31	V-V	-12.71	**26.89**	0.49	30.00	3.11
F0	1513	1752.6	IV	Dipole	H	-22.25		H-H	-11.78				

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	-21.94	-21.94	V-V	-13.61	**25.60**	0.36	30.00	4.40
F0	1312	1712.4	IV	Dipole	H	-24.04		H-H	-13.10				
F0	1413	1732.6	IV	Dipole	V	-22.25	-22.25	V-V	-14.11	25.56	0.36	30.00	4.44
F0	1413	1732.6	IV	Dipole	H	-24.30		H-H	-13.23				
F0	1513	1752.6	IV	Dipole	V	-22.74	-22.74	V-V	-14.17	25.40	0.35	30.00	4.60
F0	1513	1752.6	IV	Dipole	H	-23.50		H-H	-13.27				

Radiated Emissions Test Data Results cont'd

The following configurations were measured for model RHT181LW (STV100-2):

The following measurements were performed by Imran Kanji.

Date of Test: October 13, 2015

The environmental tests conditions were: Temperature: 24.9 °C
Relative Humidity: 25.7 %

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	-39.50	-32.16	V-V	2.47	**20.49**	0.11	38.50	18.01
F0	4132	826.40	V	Dipole	H	-32.16		H-H	1.67				
F0	4182	836.40	V	Dipole	V	-39.35	-32.32	V-V	2.30	19.93	0.10	38.50	18.57
F0	4182	836.40	V	Dipole	H	-32.32		H-H	1.21				
F0	4233	846.60	V	Dipole	V	-38.35	-33.36	V-V	0.53	18.98	0.08	38.50	19.52
F0	4233	846.60	V	Dipole	H	-33.36		H-H	1.31				

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	-41.46	-33.83	V-V	0.78	**18.80**	0.08	38.50	19.70
F0	4132	826.40	V	Dipole	H	-33.83		H-H	-0.03				
F0	4182	836.40	V	Dipole	V	-41.72	-34.07	V-V	0.47	18.10	0.06	38.50	20.40
F0	4182	836.40	V	Dipole	H	-34.07		H-H	-0.59				
F0	4233	846.60	V	Dipole	V	-40.70	-35.35	V-V	-0.45	17.22	0.05	38.50	21.28
F0	4233	846.60	V	Dipole	H	-35.35		H-H	-0.68				

Radiated Emissions Test Data Results cont'd

The following configurations were measured for model RHK211LW (STV100-1):

WCDMA Band V Call Service Mode

The following measurements were performed by Shiva Kumbham.

Date of Test: August 8, 2015

The environmental test conditions were: Temperature: 26.3 ºC
Relative Humidity: 29.1 %

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 Winston Vernon.

Date of Test: August 10, 2015

The environmental test conditions were: Temperature: 27.5 ºC
Relative Humidity: 33.9 %

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: August 8, 2015

The environmental test conditions were: Temperature: 26.3 ºC
Relative Humidity: 29.1 %

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: August 10, 2015

The environmental test conditions were: Temperature: 27.5 ºC
Relative Humidity: 33.9 %

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: July 21, 2015

The environmental test conditions were: Temperature: 25.7 ºC
Relative Humidity: 40.2 %

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: July 21 – August 1, 2015

The environmental test conditions were: Temperature: 25.5 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 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: July 21, 2015

The environmental test conditions were: Temperature: 25.7 ºC
Relative Humidity: 40.2 %

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: July 21 – August 1, 2015

The environmental test conditions were: Temperature: 25.5 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 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: July 21, 2015

The environmental test conditions were: Temperature: 26.4 ºC
Relative Humidity: 37.6 %

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: July 21, 2015

The environmental test conditions were: Temperature: 25.5 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 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: July 21, 2015

The environmental test conditions were: Temperature: 26.4 ºC
Relative Humidity: 37.6 %

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: July 21, 2015

The environmental test conditions were: Temperature: 25.5 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 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

The following configurations were measured for model RHT181LW (STV100-2):

WCDMA Band V Call Service Mode

The following measurements were performed by Savtej Sandhu.

Date of Test: October 9, 2015

The environmental test conditions were: Temperature: 26.1 ºC
Relative Humidity: 32.4 %

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 Xing Fang.

Date of Test: October 9, 2015

The environmental test conditions were: Temperature: 27.5 ºC
Relative Humidity: 33.9 %

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: October 9, 2015

The environmental test conditions were: Temperature: 26.1 ºC
Relative Humidity: 32.4 %

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: October 9, 2015

The environmental test conditions were: Temperature: 27.5 ºC
Relative Humidity: 33.9 %

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.

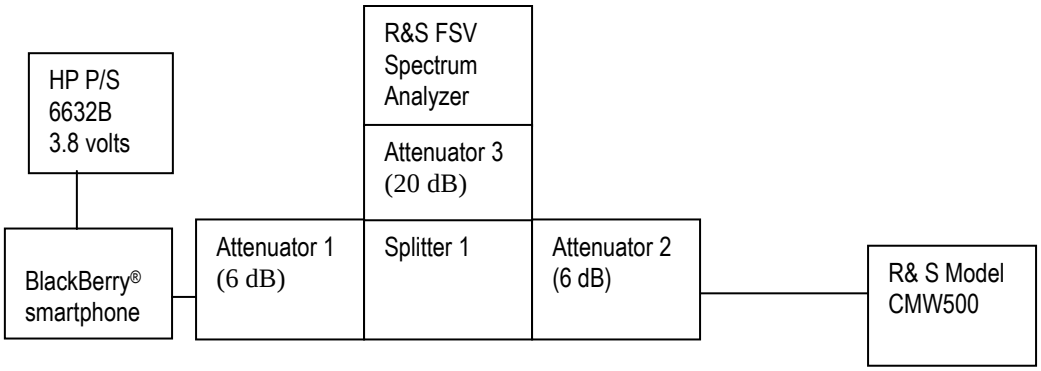
All emissions were at least 25.0 dB below the limit.

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

The following configurations were measured for model RHK211LW (STV100-1):

Date of Test: July 22 to September 3, 2015

The environmental test conditions were: Temperature: 26.8ºC
Relative Humidity: 44.70 %

The following measurements were performed by Landon Martin and Sijia Li.

LTE Band 2 Conducted RF Emission Test Data cont'd

Emission Designator Table

Frequency Rane (MHz)	Conducted Output Power (dBm)	Conducted Output Power (W)	Emission Designator	Band	Bandwidth (MHz)	Modulation
1850.7-1909.3	25.69	0.37	1M09G7D	LTE B2	1.4	QPSK
1850.7-1909.3	24.95	0.31	1M09D7W	LTE B2	1.4	16QAM
1851.5-1908.5	25.61	0.36	2M69G7D	LTE B2	3	QPSK
1851.5-1908.5	24.89	0.31	2M69D7W	LTE B2	3	16QAM
1852.5-1907.5	25.81	0.38	4M49G7D	LTE B2	5	QPSK
1852.5-1907.5	25.07	0.32	4M48D7W	LTE B2	5	16QAM
1855-1905	25.79	0.38	8M96G7D	LTE B2	10	QPSK
1855-1905	25.20	0.33	8M94D7W	LTE B2	10	16QAM
1857.5-1902.5	25.77	0.38	13M4G7D	LTE B2	15	QPSK
1857.5-1902.5	24.98	0.31	13M4D7W	LTE B2	15	16QAM
1860-1900	**25.92**	**0.39**	17M9G7D	LTE B2	20	QPSK
1860-1900	25.40	0.35	17M9D7W	LTE B2	20	16QAM

The conducted spurious emissions – As per 47 CFR 2.1051, 24.232(d), 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 Resource Block allocations 100,50 and 6 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.

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 18.6MHz 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	18.44	**17.93**	17.88
1880.000	**18.60**	17.88	17.88
1907.600	18.46	**17.93**	**17.93**

Test Data for LTE Band 2 selected Frequencies in 15MHz bandwidth (RB = 75)

LTE Band 2 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16QAM
1857.5	13.41	13.41
1880	13.41	13.41
1902.5	13.45	13.41

Test Data for LTE Band 2 selected Frequencies in 10MHz bandwidth (RB = 50)

LTE Band 2 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16QAM
1855	8.94	8.94
1880	8.94	8.94
1905	8.97	8.94

Test Data for LTE Band 2 selected Frequencies in 5MHz bandwidth (RB = 25)

LTE Band 2 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16QAM
1852.5	4.50	4.48
1880	4.48	4.48
1907.5	4.50	4.48

Test Data for LTE Band 2 selected Frequencies in 3MHz bandwidth (RB = 15)

LTE Band 2 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16QAM
1851.5	2.69	2.69
1880	2.70	2.69
1908.5	2.70	2.69

Test Data for LTE Band 2 selected Frequencies in 1.4MHz bandwidth (RB = 6)

LTE Band 2 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16QAM
1850.7	1.09	1.09
1880	1.10	1.09
1909.3	1.09	1.09

Peak to Average Ratio (PAR)

For each 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20 MHz with Resource Block allocations 100,50,25,6 and 3 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 10.75 dB on middle channel in 10MHz bandwidth with 50 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= 1)

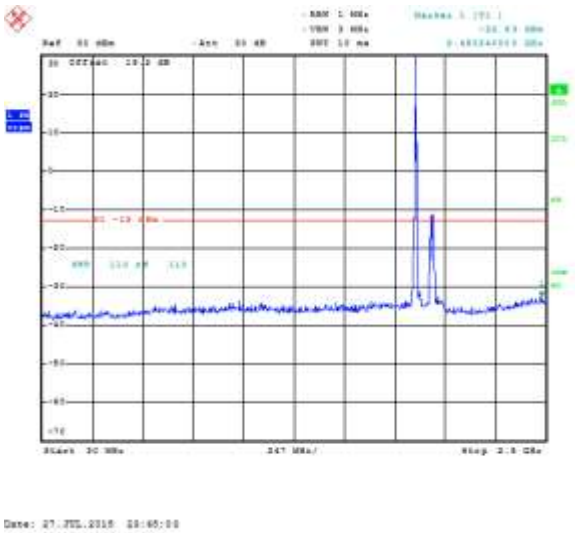


Figure 3-2a: Band 2, Spurious Conducted Emissions, Low channel, 20MHz BW (RB= 1)

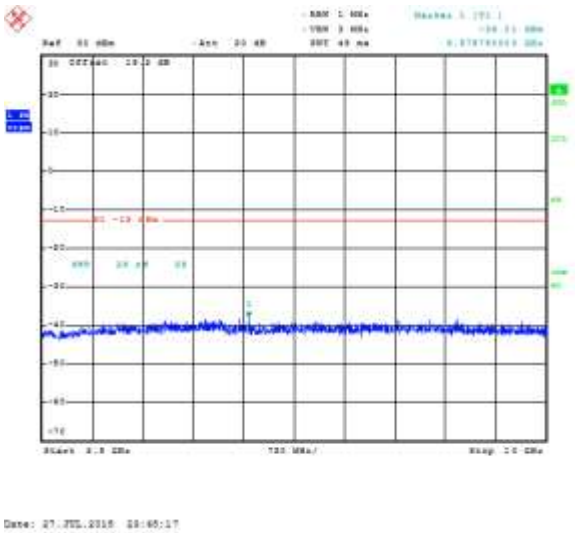


Figure 3-3a: Band 2, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 50)

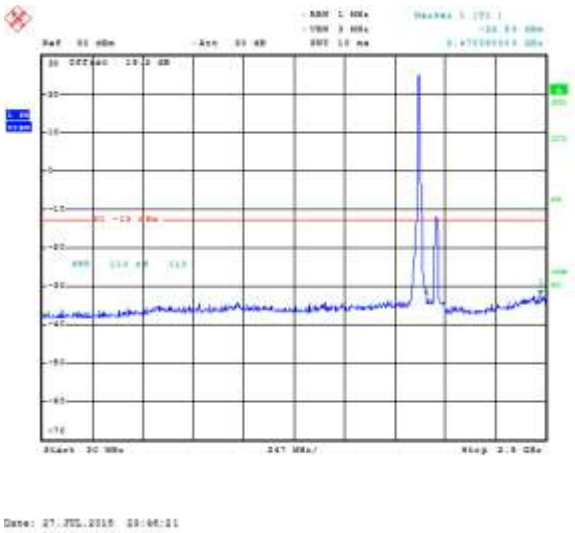
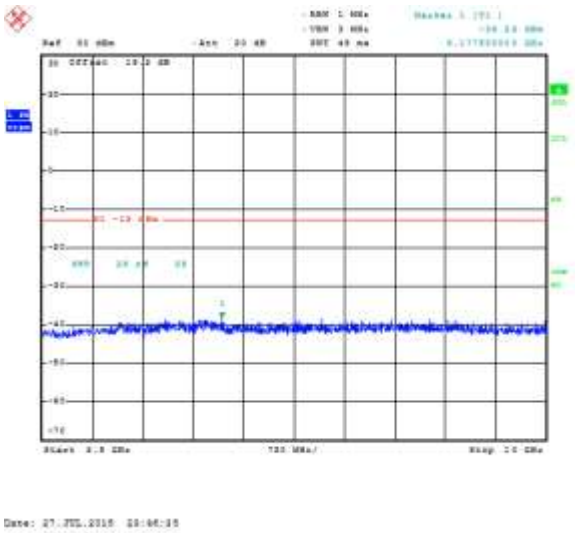


Figure 3-4a: Band 2, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 50)



LTE Band 2 Conducted RF Emission Test Data cont'd

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

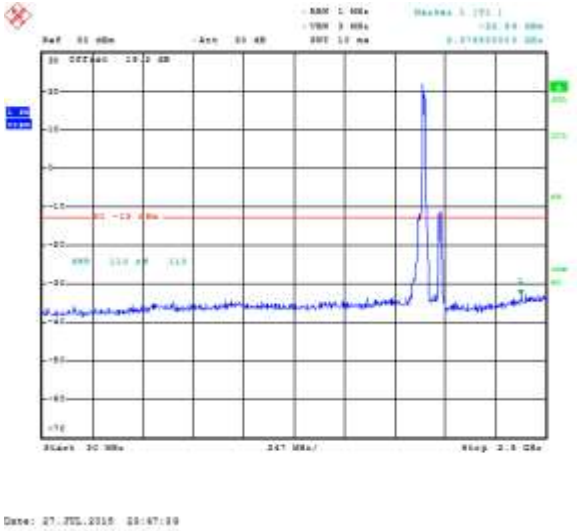


Figure 3-6a: Band 2, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)

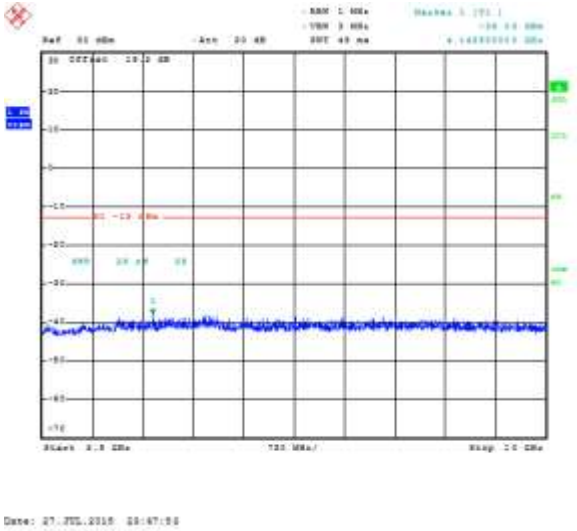


Figure 3-7a: Band 2, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)

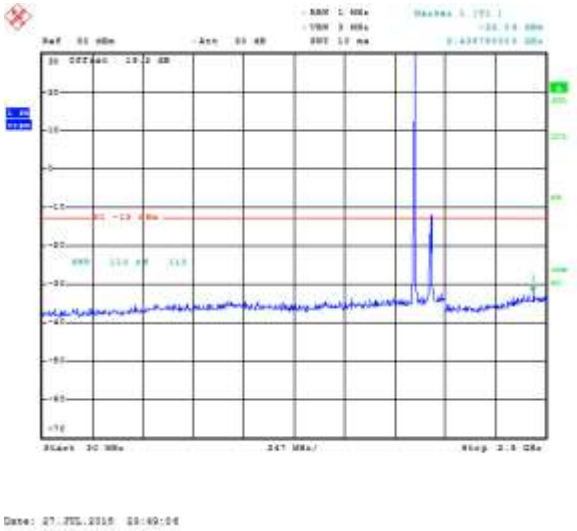
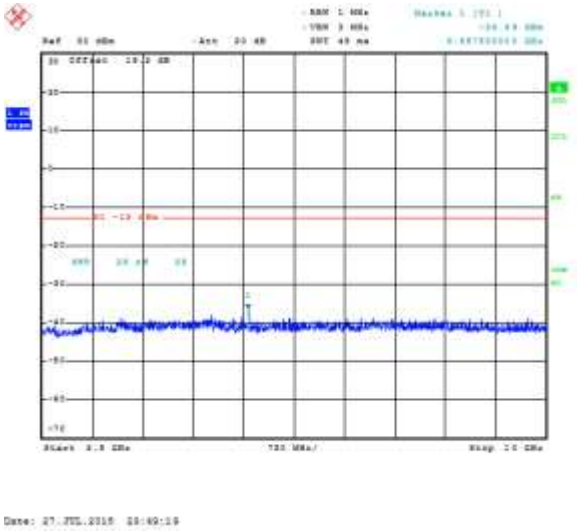


Figure 3-8a: Band 2, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)



LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 3-9a: Band 2, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 25)

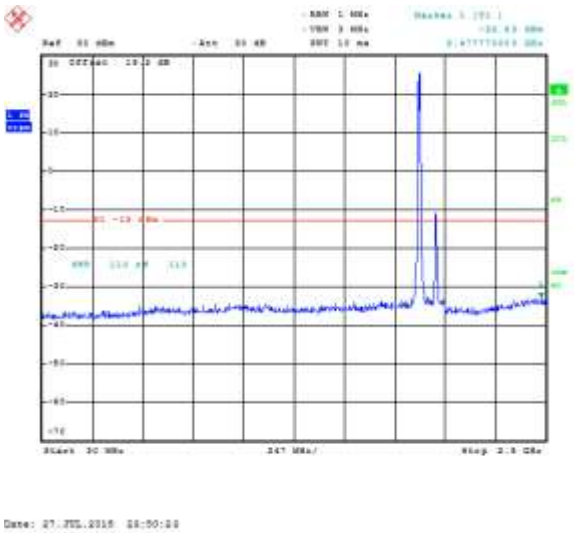


Figure 3-10a: Band 2, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 25)

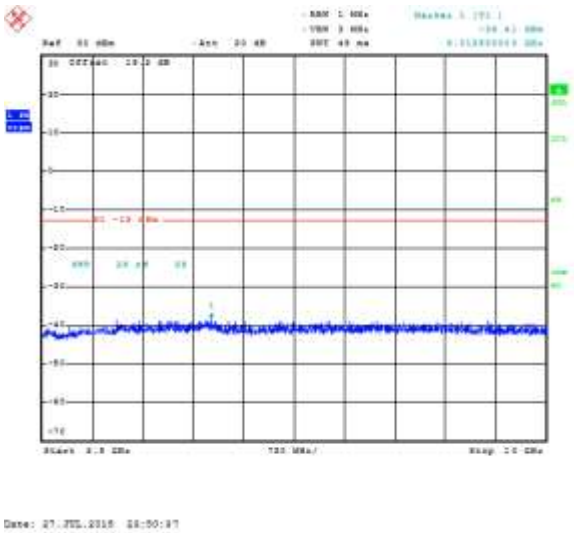


Figure 3-11a: Band 2, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)

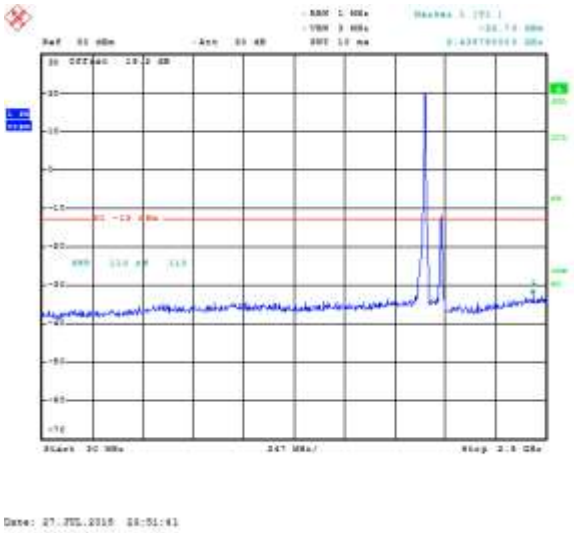
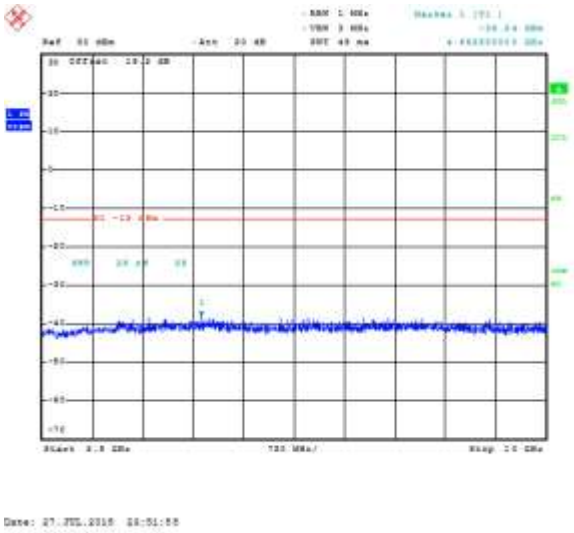


Figure 3-12a: Band 2, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)



LTE Band 2 Conducted RF Emission Test Data cont'd

Figure 3-13a: Band 2, Spurious Conducted Emissions, Low channel, 1.4MHz BW (RB= 1)

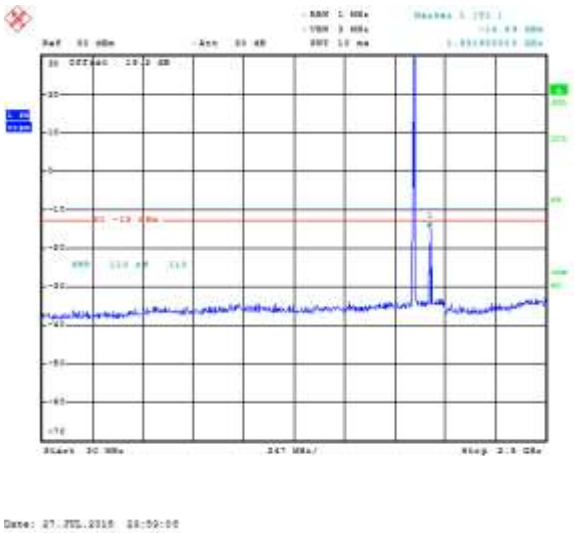


Figure 3-14a: Band 2, Spurious Conducted Emissions, Low channel, 1.4MHz BW (RB= 1)

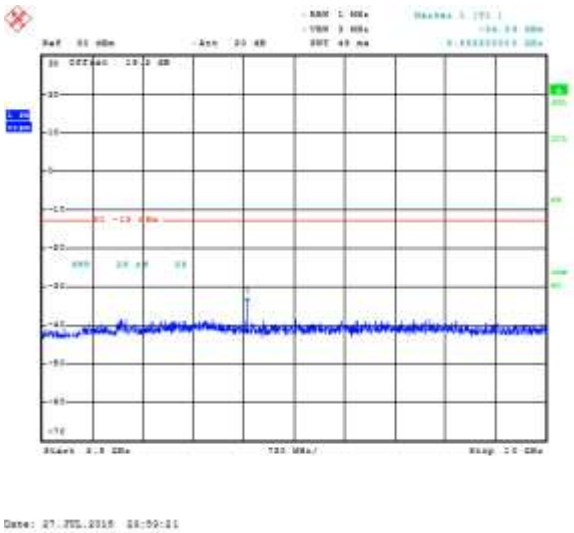


Figure 3-15a: Band 2, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 3)

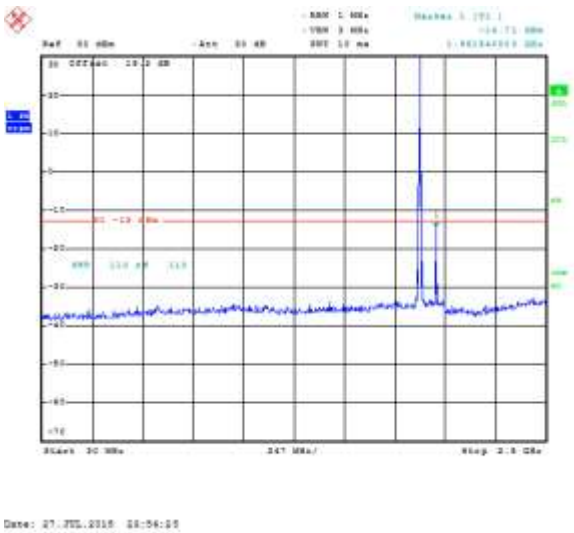
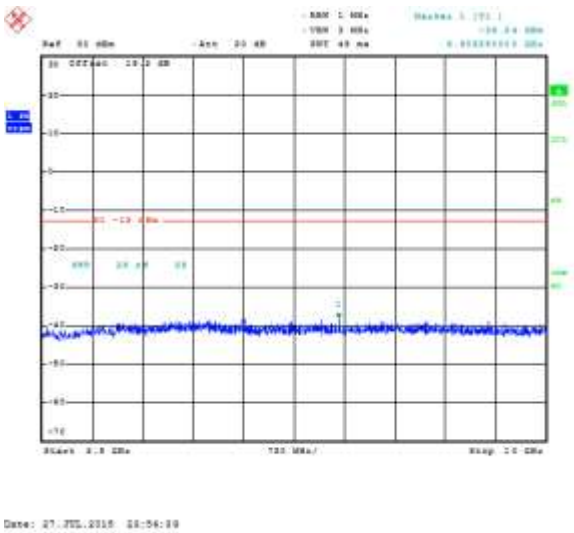


Figure 3-16a: Band 2, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 3)



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)

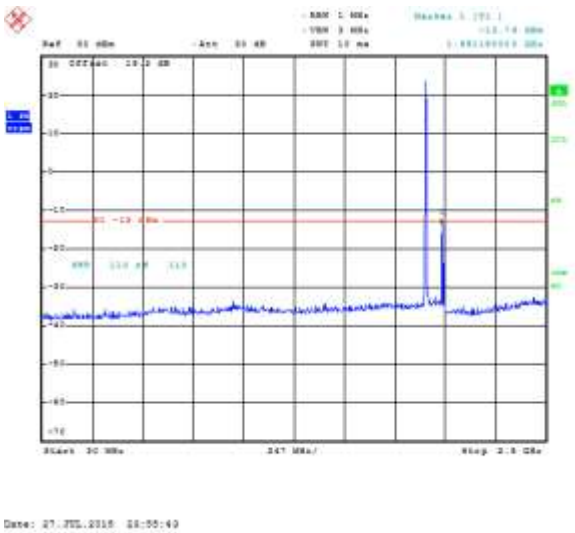


Figure 3-18a: Band 2, Spurious Conducted Emissions, High Channel, 1.4MHz BW (RB= 6)

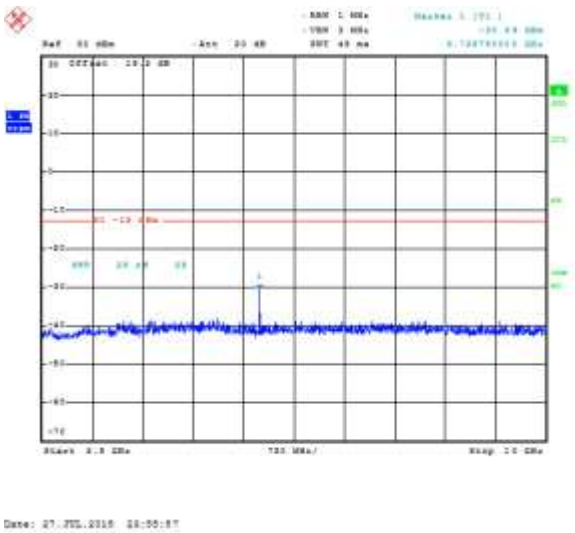


Figure 3-19a: Occupied Bandwidth, Band 2 Low Channel, 20MHz BW (RB= 100)

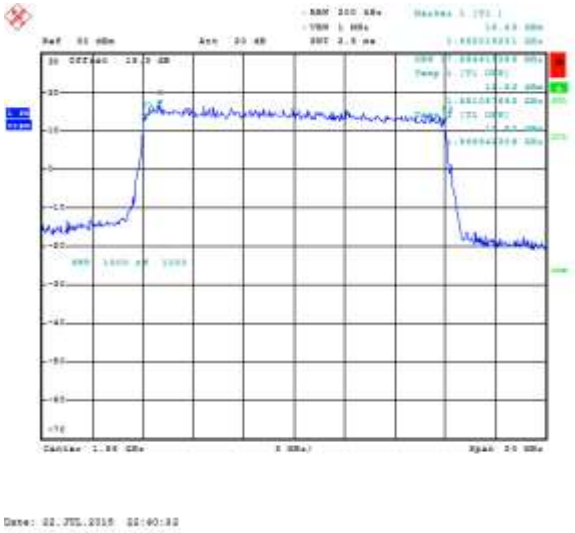
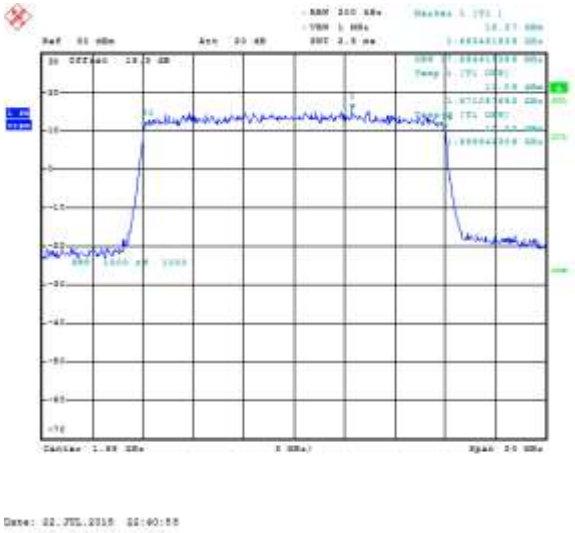


Figure 3-20a: Occupied Bandwidth, Band 2 Middle Channel, 20MHz BW (RB= 100)



LTE Band 2 Conducted RF Emission Test Data cont'd

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

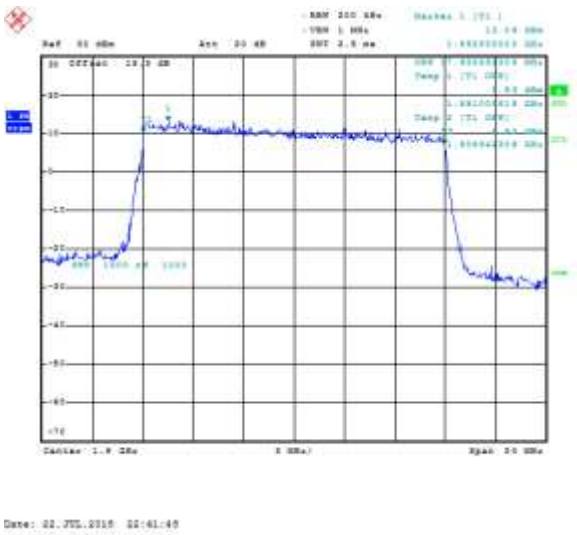


Figure 3-22a: -26 dBc Bandwidth, Band 2 Low Channel, 20MHz BW (RB= 100)

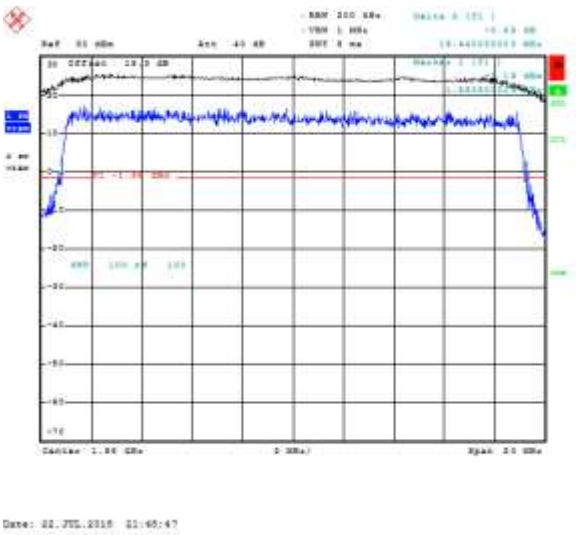


Figure 3-23a: -26 dBc Bandwidth, Band 2 Middle Channel, 20MHz BW (RB= 100)

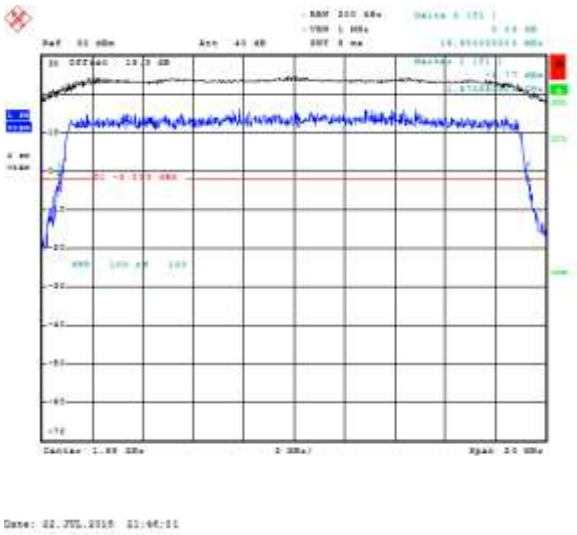
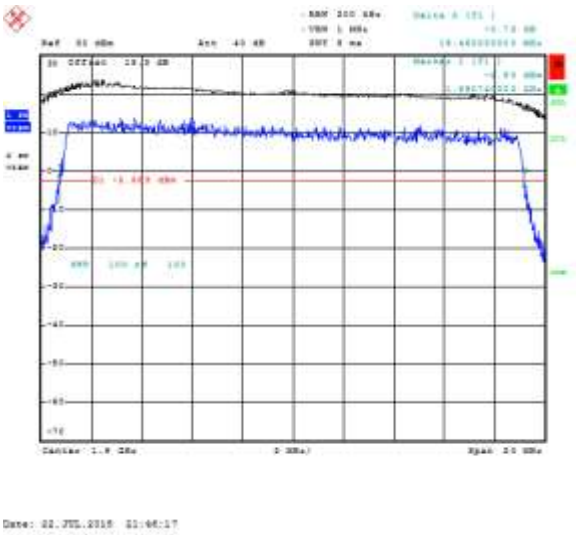


Figure 3-24a: -26 dBc Bandwidth, Band 2 High Channel, 20MHz BW (RB= 100)



LTE Band 2 Conducted RF Emission Test Data cont'd

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

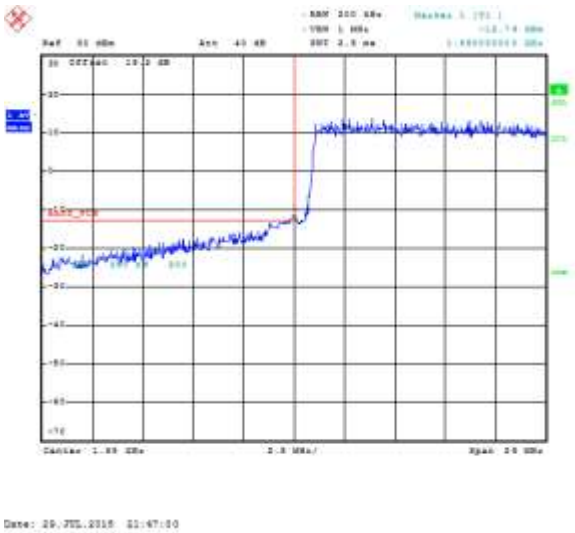


Figure 3-26a: Band 2 High Channel Mask, 20MHz BW, RB = 100

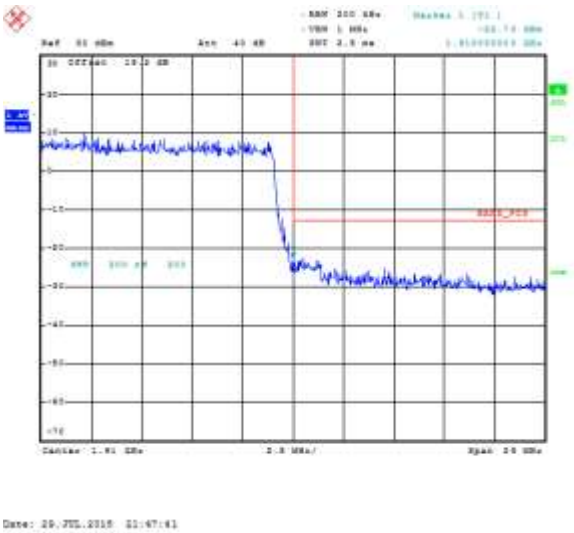


Figure 3-27a: Band 2 Low Channel Mask, 10MHz BW, RB = 50

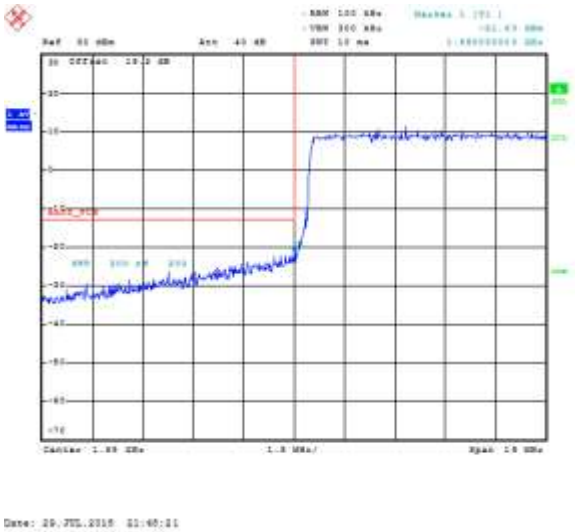
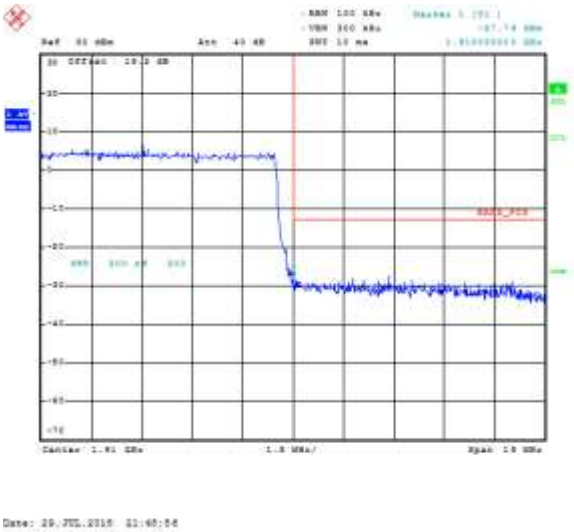


Figure 3-28a: Band 2 High Channel Mask, 10MHz BW, RB = 50



LTE Band 2 Conducted RF Emission Test Data cont'd

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

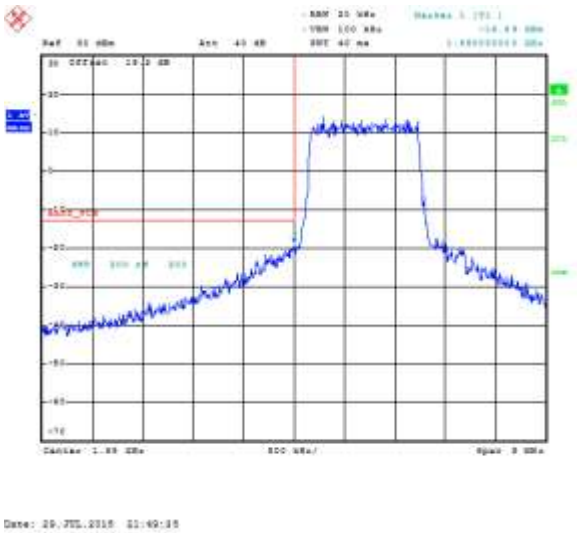


Figure 3-30a: Band 2 High Channel Mask, 1.4MHz BW, RB = 6

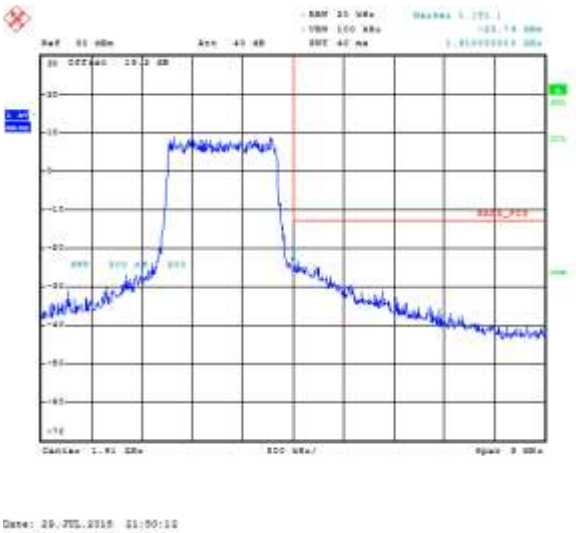


Figure 3-31a: Band 2 Low Channel Mask, 20MHz BW, RB = 1

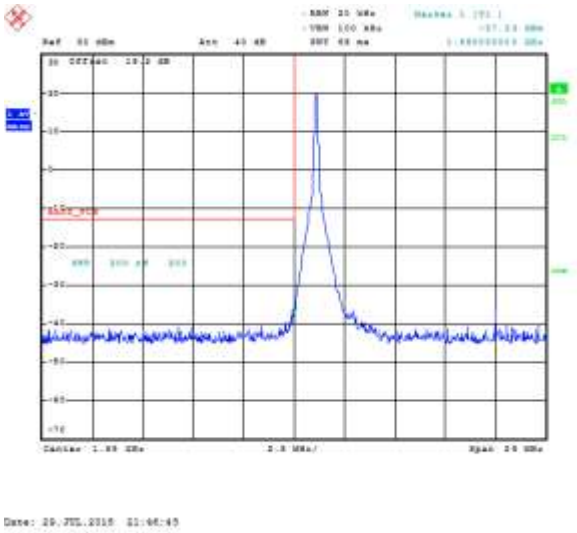
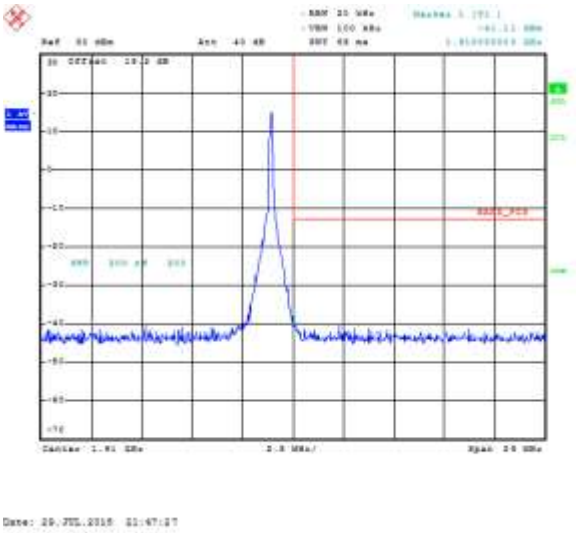


Figure 3-32a: Band 2 High Channel Mask, 20MHz BW, RB = 1



LTE Band 2 Conducted RF Emission Test Data cont'd

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

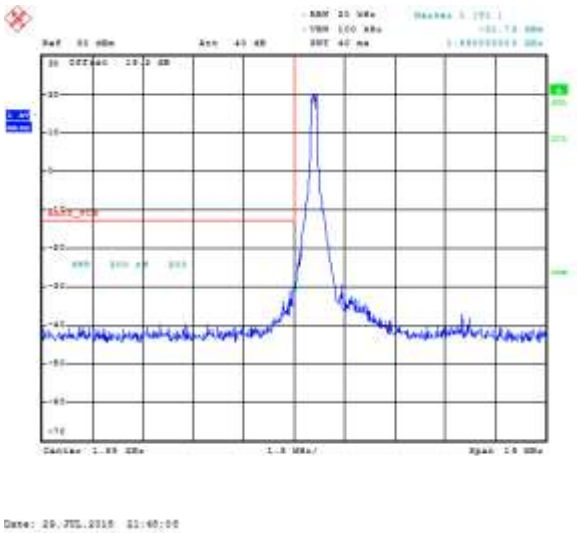


Figure 3-34a: Band 2 High Channel Mask, 10MHz BW, RB = 1

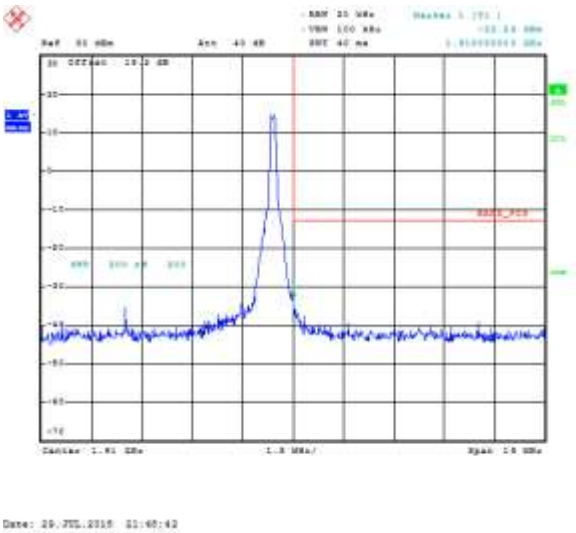


Figure 3-35a: Band 2 Low Channel Mask, 1.4MHz BW, RB = 1

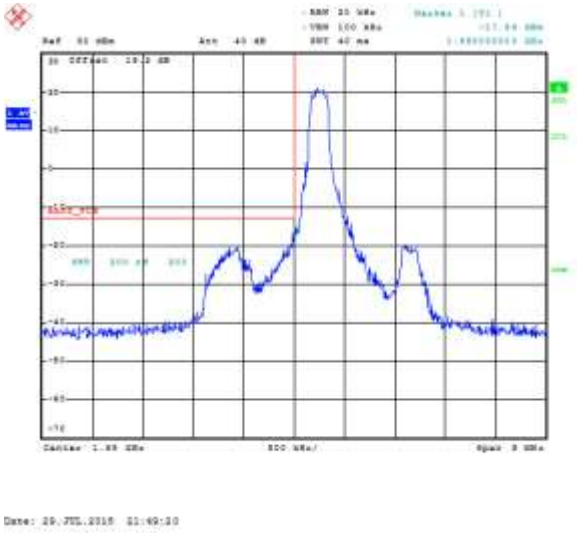
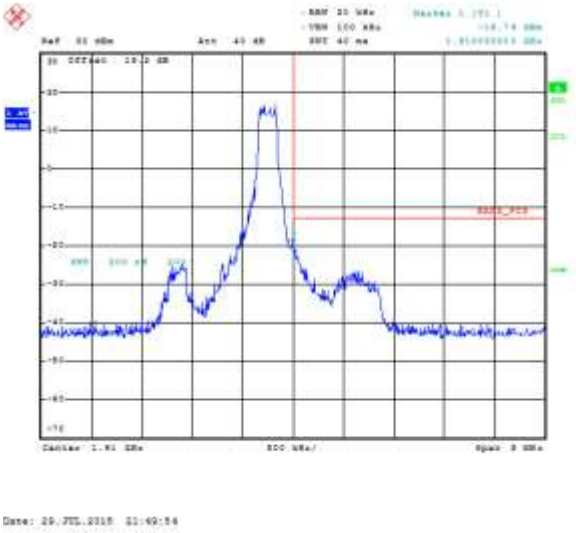


Figure 3-36a: Band 2 High Channel Mask, 1.4MHz BW, RB = 1



LTE Band 2 Conducted RF Emission Test Data cont'd

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

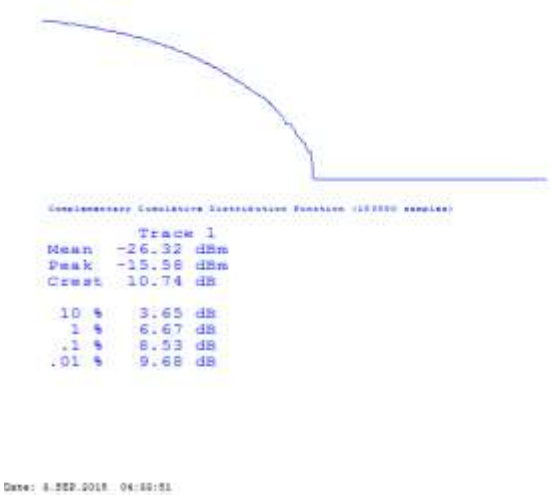


Figure 3-38a: Band 2, Mid Channel PAR, 20 MHz BW, RB = 100 16-QAM

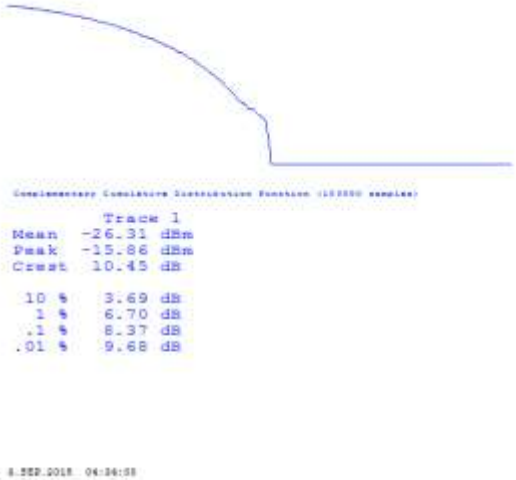


Figure 3-39a: Band 2, Mid Channel PAR, 10 MHz BW, RB = 25 QPSK

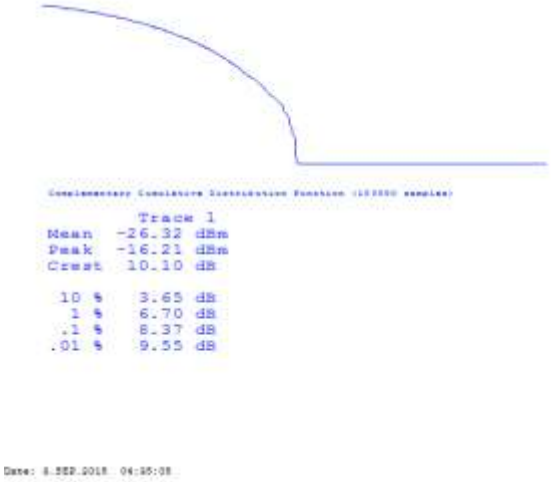
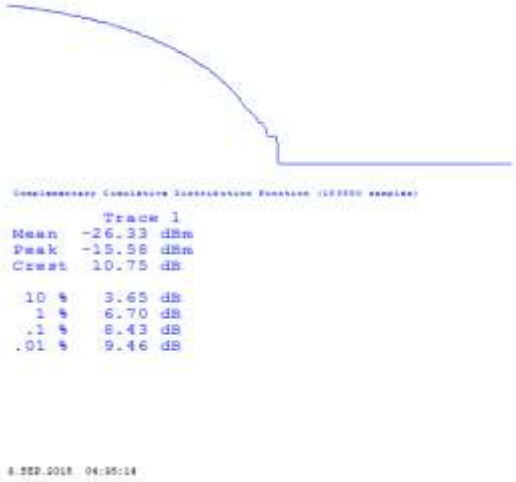


Figure 3-40a: Band 2, Mid Channel PAR, 10 MHz BW, RB = 50 16-QAM



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

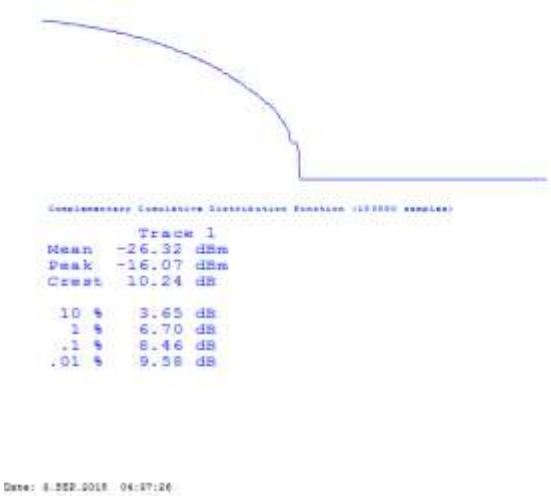
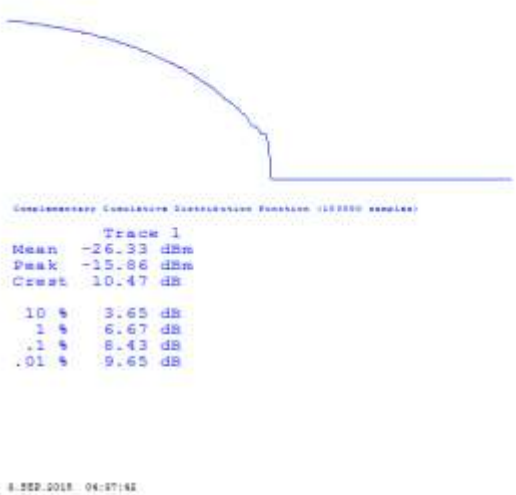


Figure 3-42a: Band 2, Mid Channel PAR, 1.4 MHz BW, RB = 6 16-QAM



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

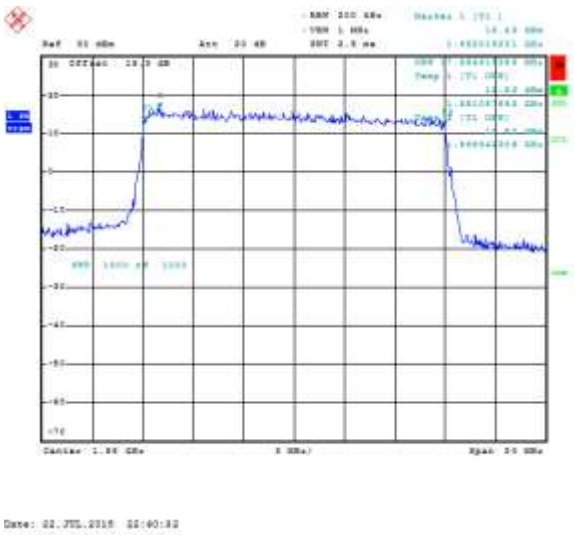


Figure 3-44a: Occupied Bandwidth, Band 2 Mid Channel, 20MHz BW (RB= 100) 16-QAM

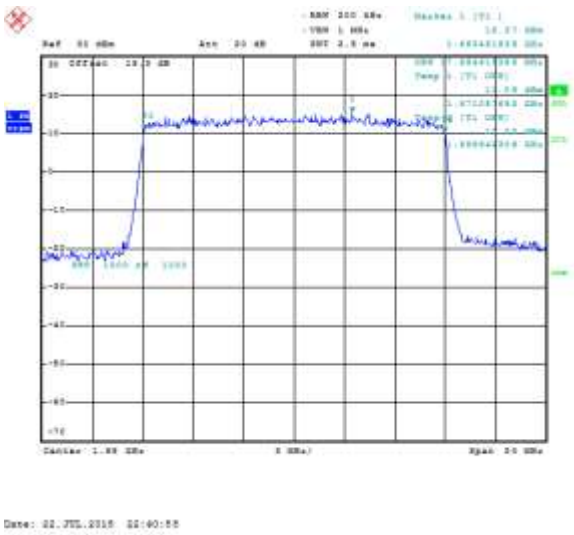
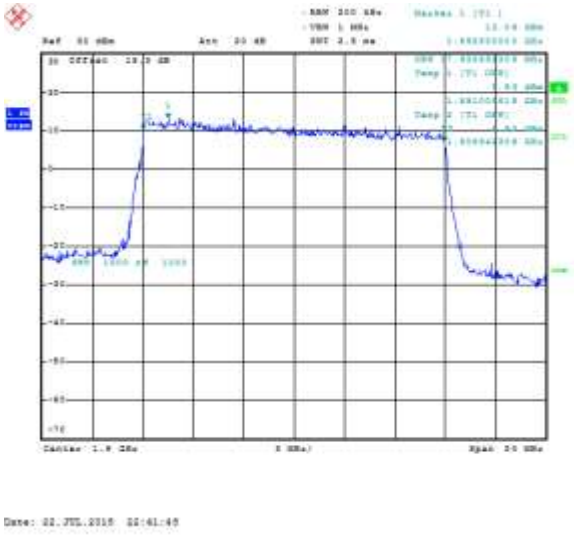
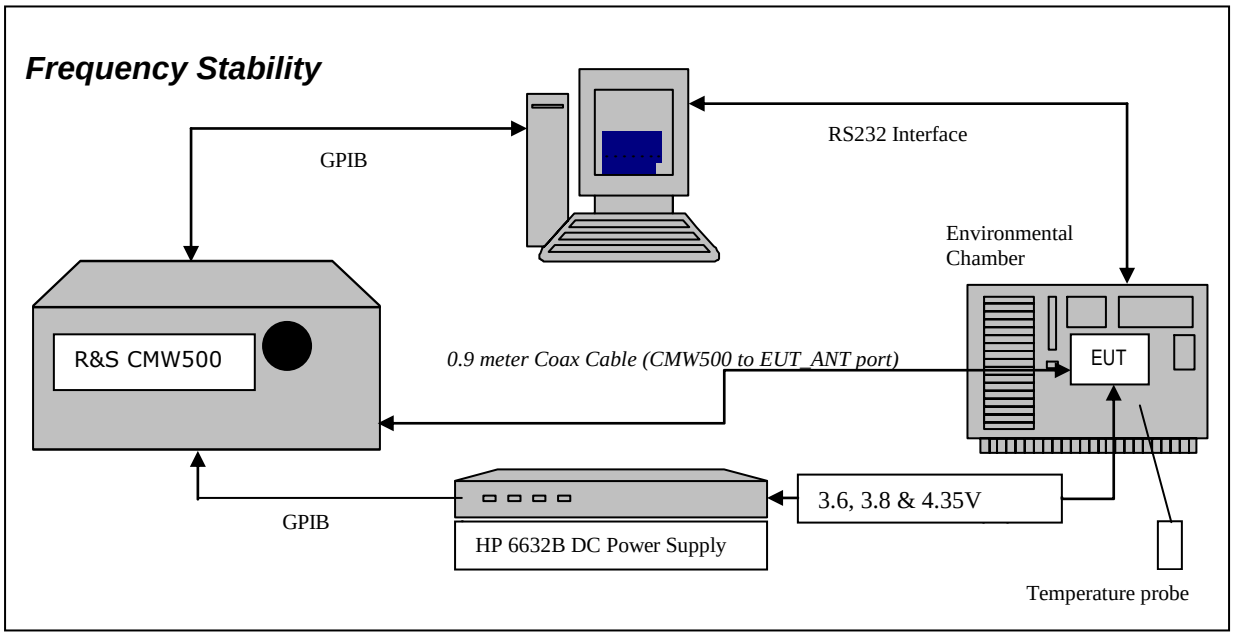


Figure 3-45a: Occupied Bandwidth, Band 2 High Channel, 20MHz BW (RB= 100) 16-QAM



APPENDIX 3B – LTE Band 2 FREQUENCY STABILITY TEST DATA

LTE Frequency Stability Test Data



The following configurations were measured for model RHK211LW (STV100-1):

The following measurements were performed by Sijia Li.

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 3.8 volts and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 3.8 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 3.8 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, 3.8 and 4.35 volts

The maximum frequency error in the LTE band 2 measured was -**0.0037 PPM.**

Date of test: April 17, 2015

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	2.98	0.0016
18900	1880.0	3.6	20	-6.45	-0.0034
19199	1900.0	3.6	20	-4.96	-0.0026

Traffic Channel Number	LTE Band 2 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	3.8	20	5.36	0.0029
18900	1880.0	3.8	20	-5.29	-0.0028
19199	1900.0	3.8	20	-5.18	-0.0027

Traffic Channel Number	LTE Band 2 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18600	1860.0	4.35	20	5.51	0.0030
18900	1880.0	4.35	20	-6.11	-0.0032
19199	1900.0	4.35	20	-7.08	**-0.0037**

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	4.71	0.0025
18600	1860.0	3.6	-20	7.07	0.0038
18600	1860.0	3.6	-10	4.48	0.0024
18600	1860.0	3.6	0	5.78	0.0031
18600	1860.0	3.6	10	6.25	0.0034
18600	1860.0	3.6	20	2.98	0.0016
18600	1860.0	3.6	30	-4.56	-0.0025
18600	1860.0	3.6	40	3.83	0.0021
18600	1860.0	3.6	50	5.15	0.0028
18600	1860.0	3.6	60	3.19	0.0021
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
18600	1860.0	3.8	-30	5.51	0.0030
18600	1860.0	3.8	-20	4.59	0.0025
18600	1860.0	3.8	-10	5.18	0.0028
18600	1860.0	3.8	0	7.02	0.0038
18600	1860.0	3.8	10	5.79	0.0031
18600	1860.0	3.8	20	5.36	0.0029
18600	1860.0	3.8	30	4.41	0.0024
18600	1860.0	3.8	40	5.89	0.0032
18600	1860.0	3.8	50	5.09	0.0024
18600	1860.0	3.8	60	5.31	0.0032
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
18600	1860.0	4.35	-30	5.48	0.0029
18600	1860.0	4.35	-20	3.68	0.0020
18600	1860.0	4.35	-10	4.61	0.0025
18600	1860.0	4.35	0	5.61	0.0030
18600	1860.0	4.35	10	4.05	0.0022
18600	1860.0	4.35	20	5.51	0.0030
18600	1860.0	4.35	30	7.40	**0.0040**
18600	1860.0	4.35	40	6.34	0.0034
18600	1860.0	4.35	50	-5.31	**0.0040**
18600	1860.0	4.35	60	-5.72	0.0034

LTE band 2 Results: channel 18900 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
18900	1880.00	3.6	-30	-8.27	**-0.0044**
18900	1880.00	3.6	-20	-6.69	-0.0036
18900	1880.00	3.6	-10	-5.91	-0.0031
18900	1880.00	3.6	0	-5.09	-0.0027
18900	1880.00	3.6	10	-5.79	-0.0031
18900	1880.00	3.6	20	-6.45	-0.0034
18900	1880.00	3.6	30	-7.72	-0.0041
18900	1880.00	3.6	40	-6.58	-0.0035
18900	1880.00	3.6	50	-5.61	-0.0030
18900	1880.00	3.6	60	-10.74	-0.0035
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
18900	1880.00	3.8	-30	-6.97	-0.0037
18900	1880.00	3.8	-20	-7.80	-0.0041
18900	1880.00	3.8	-10	-5.94	-0.0032
18900	1880.00	3.8	0	-7.75	-0.0041
18900	1880.00	3.8	10	-6.78	-0.0036
18900	1880.00	3.8	20	-5.29	-0.0028
18900	1880.00	3.8	30	-6.94	-0.0037
18900	1880.00	3.8	40	-7.64	-0.0041
18900	1880.00	3.8	50	-4.73	-0.0037
18900	1880.00	3.8	60	-6.31	-0.0041
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
18900	1880.00	4.35	-30	-6.55	-0.0035
18900	1880.00	4.35	-20	-5.56	-0.0030
18900	1880.00	4.35	-10	-7.02	-0.0037
18900	1880.00	4.35	0	-8.01	-0.0043
18900	1880.00	4.35	10	-6.41	-0.0034
18900	1880.00	4.35	20	-6.11	-0.0032
18900	1880.00	4.35	30	-7.61	-0.0040
18900	1880.00	4.35	40	-6.67	-0.0035
18900	1880.00	4.35	50	-7.05	-0.0040
18900	1880.00	4.35	60	-6.78	-0.0035

LTE band 2 Results: channel 19199 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
19199	1900.0	3.6	-30	-7.37	-0.0039
19199	1900.0	3.6	-20	-4.25	-0.0022
19199	1900.0	3.6	-10	-6.35	-0.0033
19199	1900.0	3.6	0	-5.61	-0.0030
19199	1900.0	3.6	10	-3.98	-0.0021
19199	1900.0	3.6	20	-4.96	-0.0026
19199	1900.0	3.6	30	-6.24	-0.0033
19199	1900.0	3.6	40	-6.65	-0.0035
19199	1900.0	3.6	50	-4.31	-0.0033
19199	1900.0	3.6	60	-6.54	-0.0035
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
19199	1900.0	3.8	-30	-6.17	-0.0032
19199	1900.0	3.8	-20	-5.85	-0.0031
19199	1900.0	3.8	-10	-6.19	-0.0033
19199	1900.0	3.8	0	-7.68	**-0.0040**
19199	1900.0	3.8	10	-5.11	-0.0027
19199	1900.0	3.8	20	-5.18	-0.0027
19199	1900.0	3.8	30	-6.35	-0.0033
19199	1900.0	3.8	40	-5.36	-0.0028
19199	1900.0	3.8	50	-7.61	-0.0033
19199	1900.0	3.8	60	-6.90	-0.0028
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
19199	1900.0	4.35	-30	-4.62	-0.0024
19199	1900.0	4.35	-20	-4.15	-0.0022
19199	1900.0	4.35	-10	-6.69	-0.0035
19199	1900.0	4.35	0	-4.55	-0.0024
19199	1900.0	4.35	10	-4.95	-0.0026
19199	1900.0	4.35	20	-7.08	-0.0037
19199	1900.0	4.35	30	-6.08	-0.0032
19199	1900.0	4.35	40	-6.08	-0.0032
19199	1900.0	4.35	50	-8.61	-0.0032
19199	1900.0	4.35	60	-6.32	-0.0032

APPENDIX 3C – LTE Band 2 RADIATED EMISSIONS TEST DATA

Radiated Power Test Data Results

The following configurations were measured for model RHK211LW (STV100-1):
The following measurements were performed by Savtej Sandhu.
Date of Test: July 23, 2015
The environmental tests conditions were: Temperature: 24.1 °C
Relative Humidity: 34.2 %
The BlackBerry® smartphone was standalone, USB Down and LCD facing the RX antenna when the turntable is at 0 degree position.
Measurements were performed with QPSK and 16QAM modulations. The smallest test margins are reported below.
Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

LTE band 2, 20MHz BW, RB=1, QPSK modulation

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dB)
F0	18700	1860.00	2	Horn	V	-29.66	-26.45	V-V	-16.07	24.50	0.28	33.00	8.50
F0	18700	1860.00	2	Horn	H	-26.45		H-H	-15.00				
F0	18900	1880.00	2	Horn	V	-28.69	-26.32	V-V	-15.76	24.85	0.31	33.00	8.15
F0	18900	1880.00	2	Horn	H	-26.32		H-H	-14.55				
F0	19099	1899.90	2	Horn	V	-28.48	-26.20	V-V	-15.48	**24.92**	0.31	33.00	8.08
F0	19099	1899.90	2	Horn	H	-26.20		H-H	-14.62				

LTE band 2, 20MHz BW, RB=1, 16-QAM modulation

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dB)
F0	18700	1860.00	2	Horn	V	-30.49	-27.40	V-V	-17.00	23.57	0.23	33.00	9.43
F0	18700	1860.00	2	Horn	H	-27.40		H-H	-15.93				
F0	18900	1880.00	2	Horn	V	-29.72	-27.25	V-V	-16.74	**23.98**	0.25	33.00	9.02
F0	18900	1880.00	2	Horn	H	-27.25		H-H	-15.42				
F0	19099	1899.90	2	Horn	V	-29.38	-27.20	V-V	-16.44	23.91	0.25	33.00	9.09
F0	19099	1899.90	2	Horn	H	-27.20		H-H	-15.63				

Radiated Emissions Test Data Results

The following measurements were performed by Savtej Sandhu.

Date of Test: July 21, 2015

The environmental test conditions were: Temperature: 26.0 ºC
Relative Humidity: 45.0 %

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

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

Measurements were performed in LTE band 2 with QPSK and 16-QAM modulations for 15MHz BW (channel18675, 18900, 19124 with RB allocation 1)

All emissions were at least 25 dB below the limit.

The following measurements were performed by Xing Fang.

Date of Test: July 22 and August 1, 2015

The environmental test conditions were: Temperature: 26.6 ºC
Relative Humidity: 30.2 %

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 up LCD facing to the RX antenna when the turntable is at 0 degree position

Measurements were performed in LTE band 2 with QPSK and 16-QAM modulations for 15MHz BW (channel18675, 18900, 19124 with RB allocation 1)

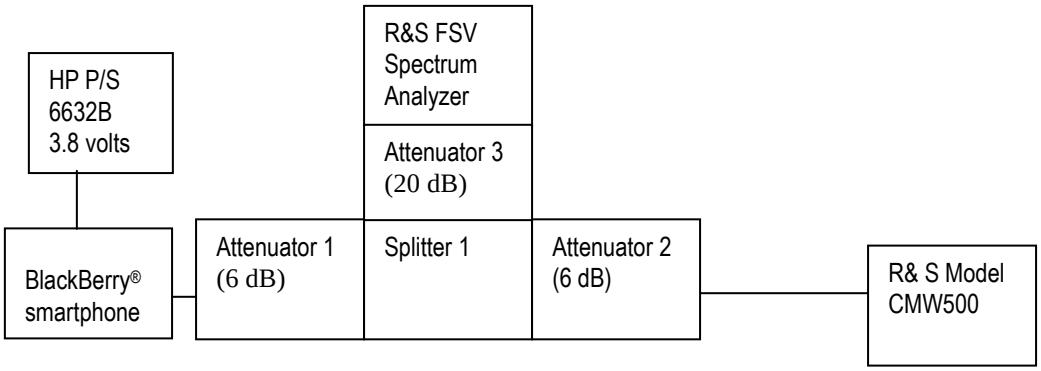
All emissions were at least 25 dB below the limit.

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

LTE Band 5 Conducted RF Emission Test Data

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

Test Setup Diagram



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 following test configurations were measured on RHK211LW (STV100-1):

Date of Test: July 24 to August 12, 2015

The environmental test conditions were: Temperature: 24.6 ºC
Relative Humidity: 37.2 %

The following measurements were performed by Landon Martin.

LTE Band 5 Conducted RF Emission Test Data cont'd

Emission Designator Table

Frequency Range (MHz)	Conducted Output Power (dBm)	Conducted Output Power (W)	Emission Designator	Band	Bandwidth (MHz)	Modulation
824.7-848.2	25.49	0.35	1M09G7D	LTE B5	1.4	QPSK
824.7-848.2	24.68	0.29	1M09D7W	LTE B5	1.4	16QAM
825.5-847.5	25.77	0.38	2M70G7D	LTE B5	3	QPSK
825.5-847.5	24.93	0.31	2M70D7W	LTE B5	3	16QAM
826.5-846.4	**25.99**	**0.40**	4M50G7D	LTE B5	5	QPSK
826.5-846.4	25.17	0.33	4M48D7W	LTE B5	5	16QAM
829-844	25.91	0.39	8M97G7D	LTE B5	10	QPSK
829-844	25.05	0.32	8M97D7W	LTE B5	10	16QAM

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

–26 dBc Bandwidth and Occupied Bandwidth (99%)

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

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

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

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

The worst case –26dBc bandwidth for LTE band 5 was measured to be 9.21 MHz. Results were derived in a 100 kHz resolution bandwidth.

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

Test Data for LTE Band 5 selected Frequencies in 10MHz BW (RB = 50)

LTE Band 5 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	QPSK	16-QAM
829.0	**9.21**	**8.97**	**8.97**
836.5	9.2	8.94	**8.97**
843.9	9.2	**8.97**	8.94

Test Data for LTE Band 5 selected Frequencies in 5MHz BW (RB = 25)

LTE Band 5 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16-QAM
826.5	4.48	4.48
836.5	4.48	4.47
846.5	4.48	4.47

Test Data for LTE Band 5 selected Frequencies in 3MHz BW (RB = 15)

LTE Band 5 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16-QAM
825.5	2.70	2.69
836.5	2.69	2.69
847.5	2.70	2.70

Test Data for LTE Band 5 selected Frequencies in 1.4MHz BW (RB = 6)

LTE Band 5 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16-QAM
824.7	1.09	1.08
836.5	1.09	1.09
848.3	1.09	1.09

Measurement Plots for LTE Band 5

See Figures 4-1a to 4-18a for the plots of the conducted spurious emissions.
See Figures 4-19a to 4-36a and 4-45a to 4-47a for the plots of 99% Occupied Bandwidth and -26 dBc Bandwidth.
See Figures 4-37a to 4-44a for the plots of the Channel mask.

LTE Band 5 Conducted RF Emission Test Data cont'd

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

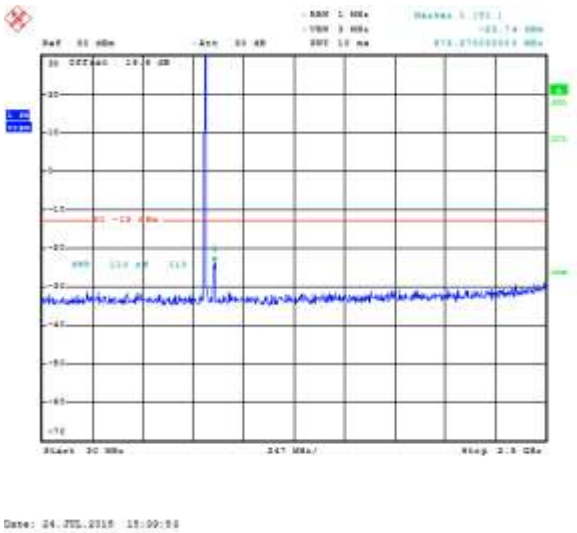


Figure 4-2a: Band 5, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)

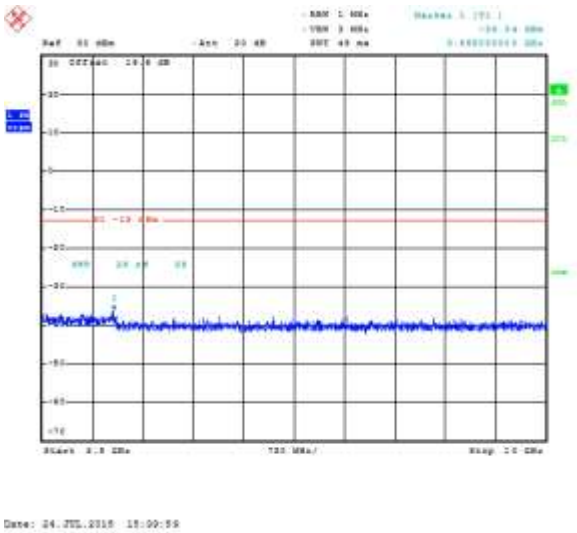


Figure 4-3a: Band 5, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 25)

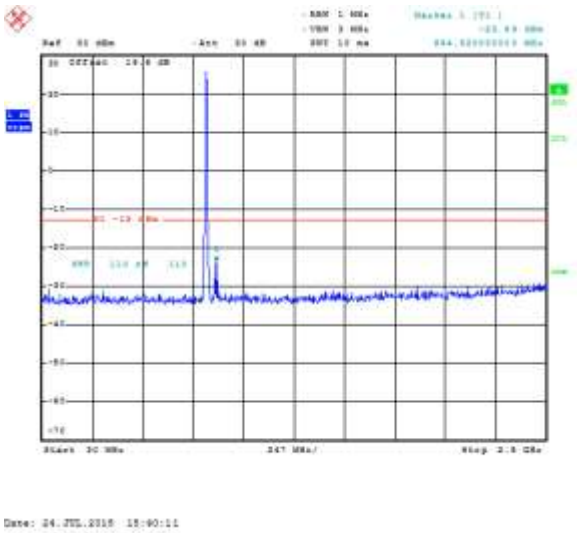
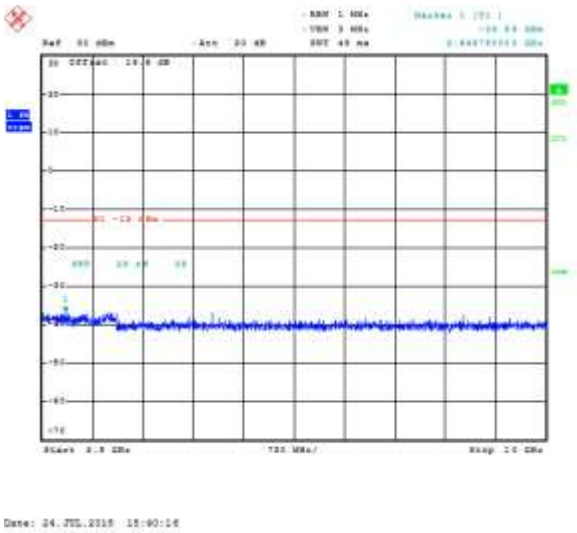


Figure 4-4a: Band 5, Spurious Conducted Emissions, Middle channel, 10MHz BW (RB= 25)



LTE Band 5 Conducted RF Emission Test Data cont'd

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

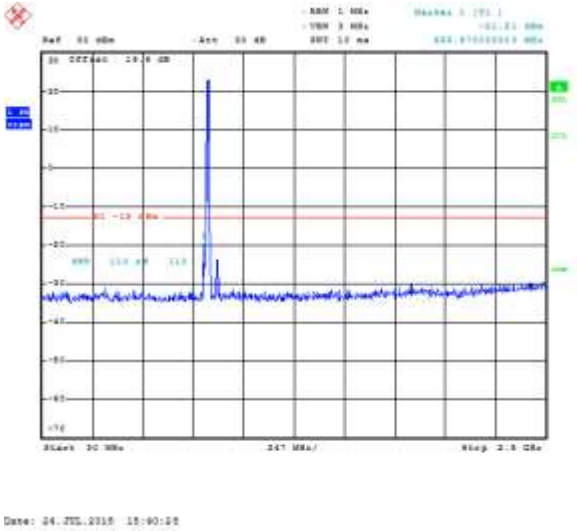


Figure 4-6a: Band 5, Spurious Conducted Emissions, High Channel, 10MHz BW (RB= 50)

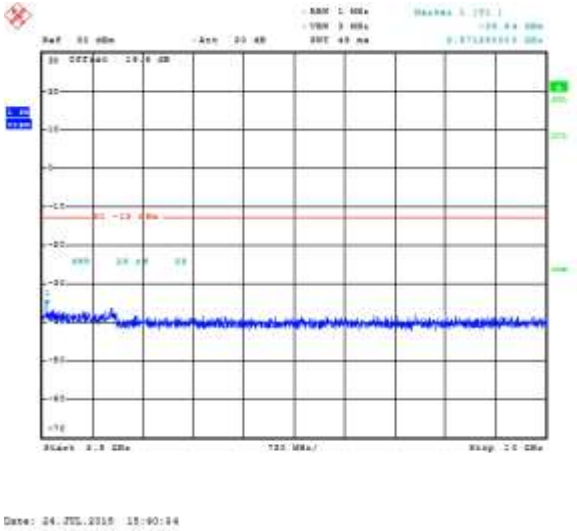


Figure 4-7a: Band 5, Spurious Conducted Emissions, Low channel, 5MHz BW (RB= 1)

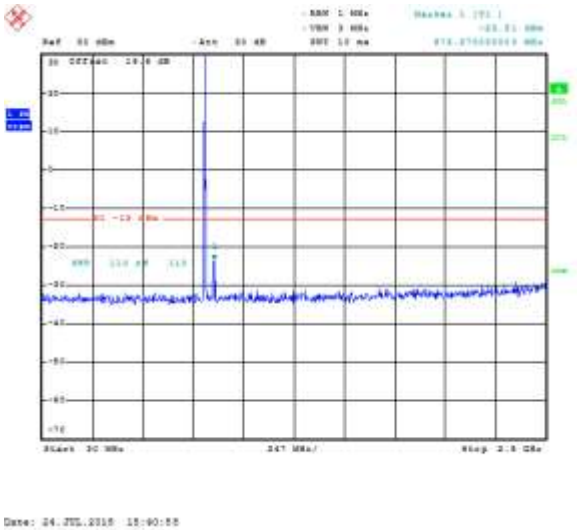
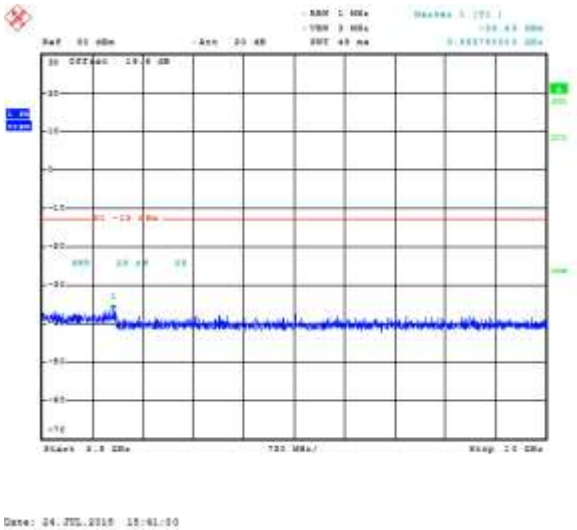


Figure 4-8a: Band 5, Spurious Conducted Emissions, Low channel, 5MHz BW (RB= 1)



LTE Band 5 Conducted RF Emission Test Data cont'd

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

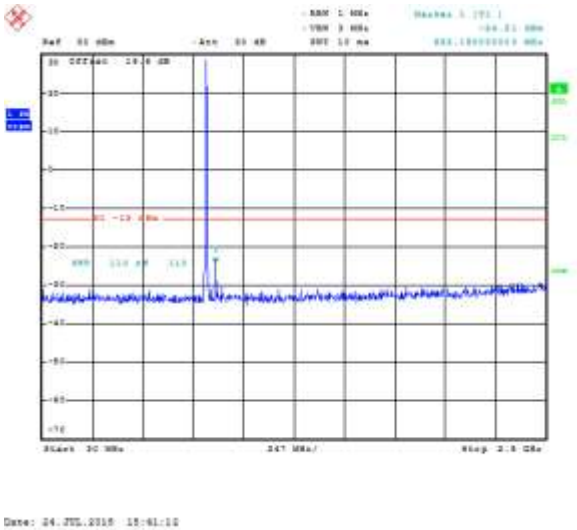


Figure 4-10a: Band 5, Spurious Conducted Emissions, Middle Channel, 5MHz BW (RB= 15)

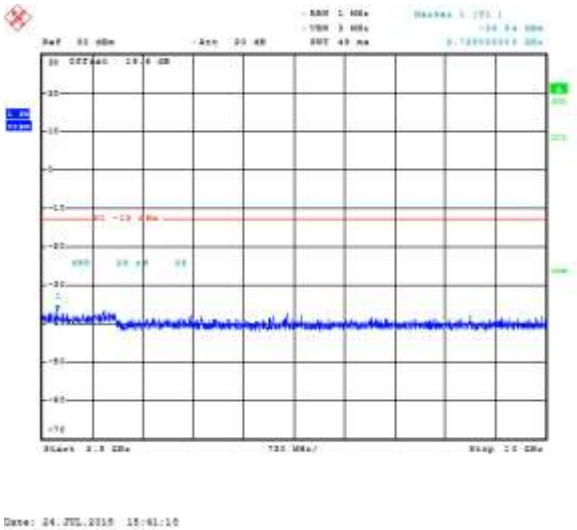


Figure 4-11a: Band 5, Spurious Conducted Emissions, High channel, 5MHz BW (RB= 25)

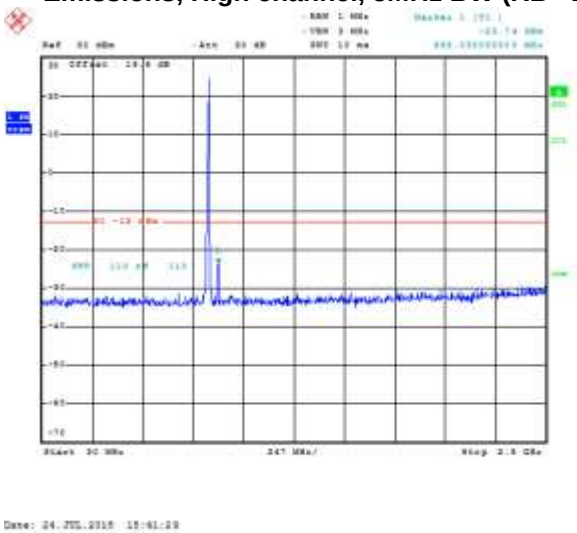
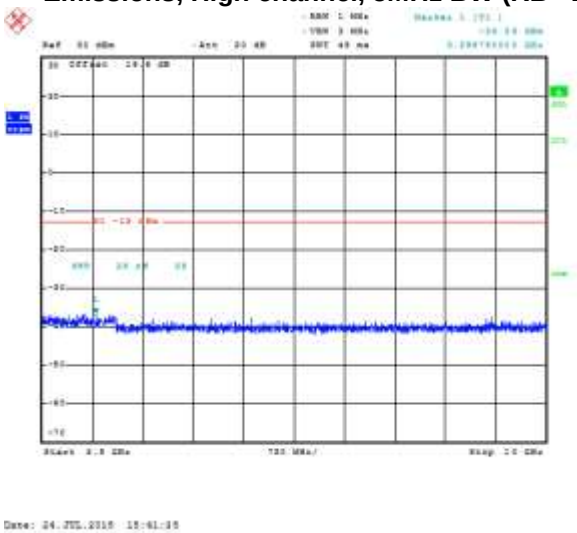


Figure 4-12a: Band 5, Spurious Conducted Emissions, High channel, 5MHz BW (RB= 25)



LTE Band 5 Conducted RF Emission Test Data cont'd

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

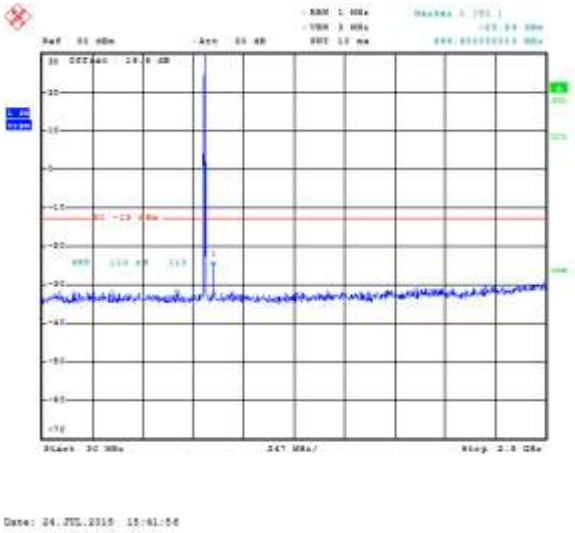


Figure 4-14a: Band 5, Spurious Conducted Emissions, Low Channel, 1.4MHz BW (RB= 1)

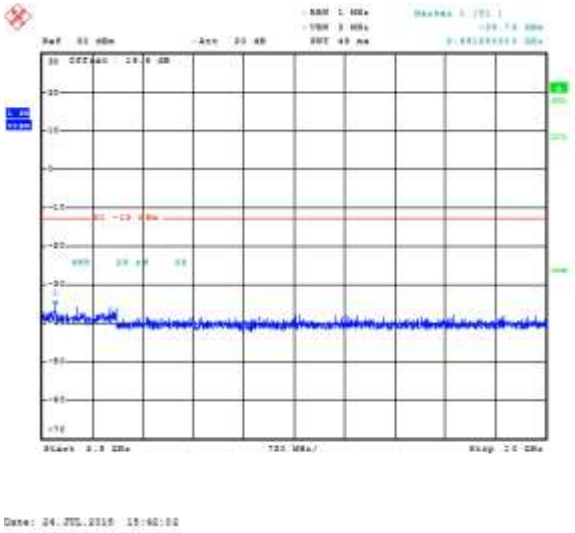


Figure 4-15a: Band 5, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 3)

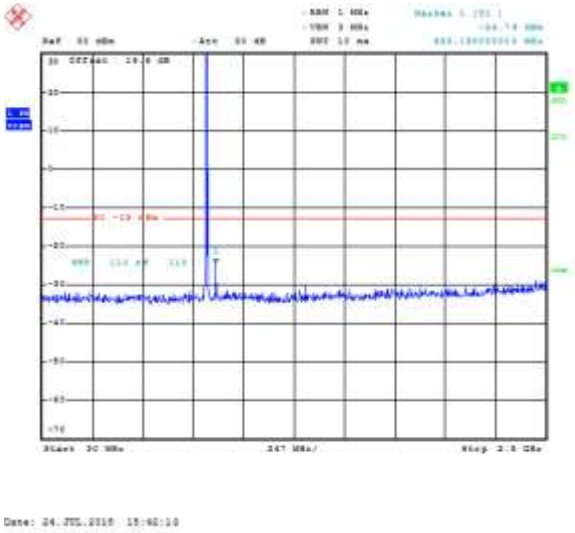
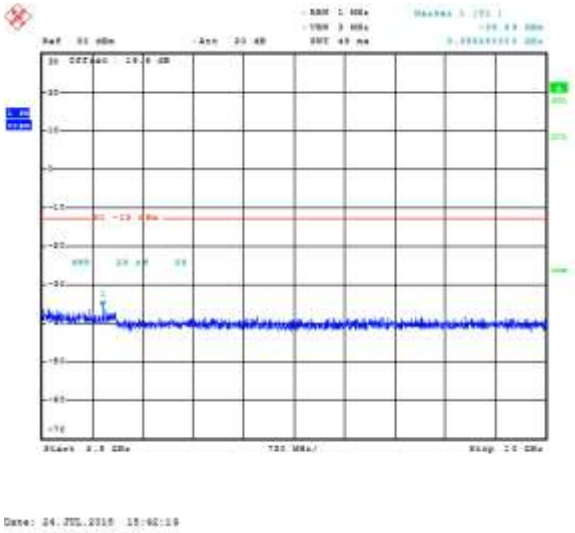


Figure 4-16a: Band 5, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 3)



LTE Band 5 Conducted RF Emission Test Data cont'd

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

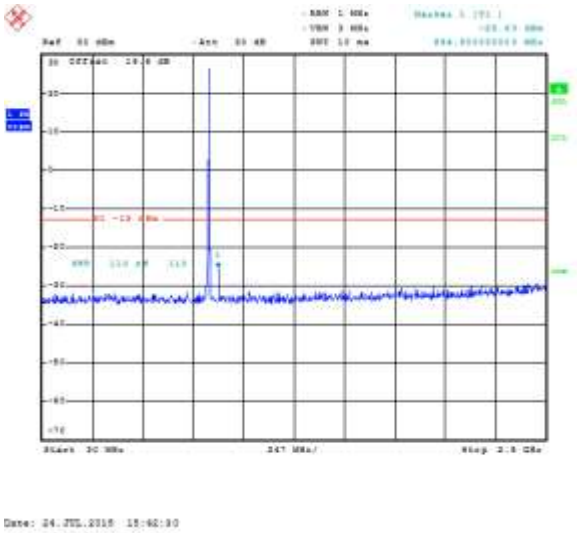
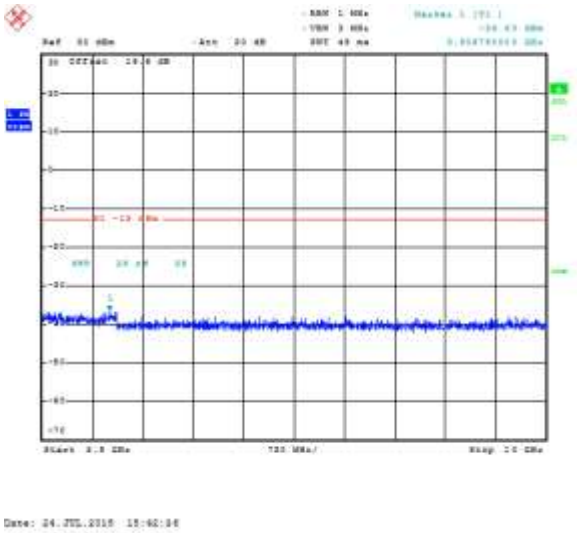


Figure 4-18a: Band 5, Spurious Conducted Emissions, High channel, 1.4MHz BW (RB= 6)



LTE Band 5 Conducted RF Emission Test Data cont'd

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

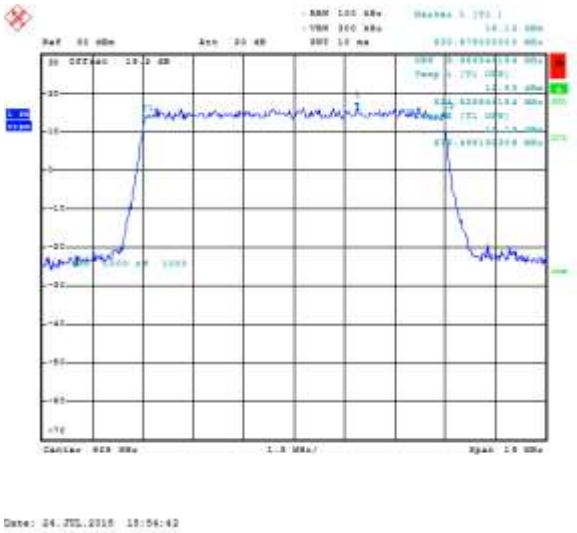


Figure 4-20a: Occupied Bandwidth, Band 5 Middle Channel, 10MHz BW, RB=50

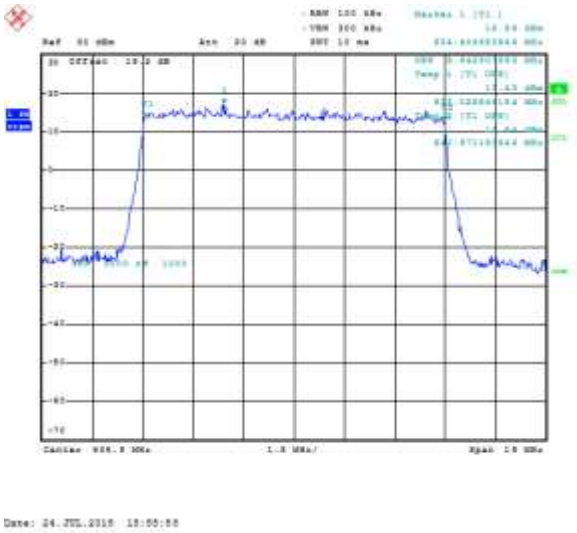
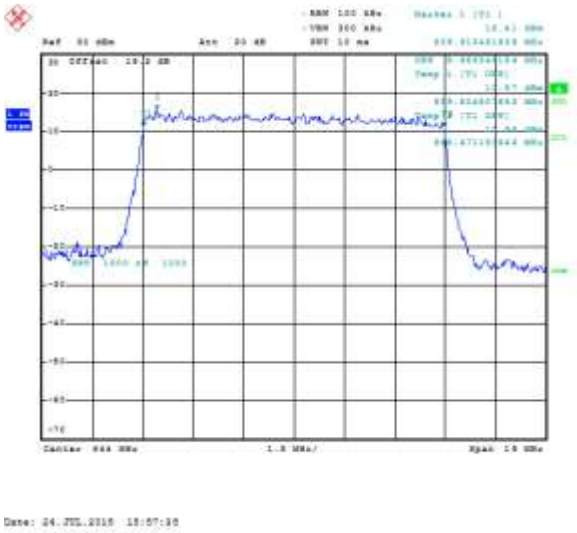


Figure 4-21a: Occupied Bandwidth, Band 5 High Channel, 10MHz BW, RB=50



LTE Band 5 Conducted RF Emission Test Data cont'd

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

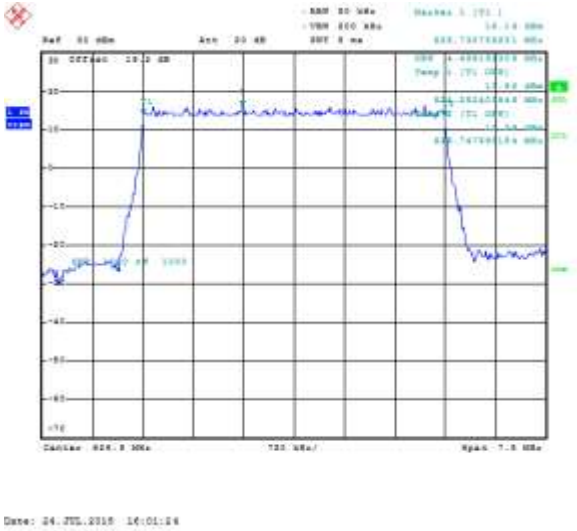


Figure 4-23a: Occupied Bandwidth, Band 5 Middle Channel, 5MHz BW, RB=25

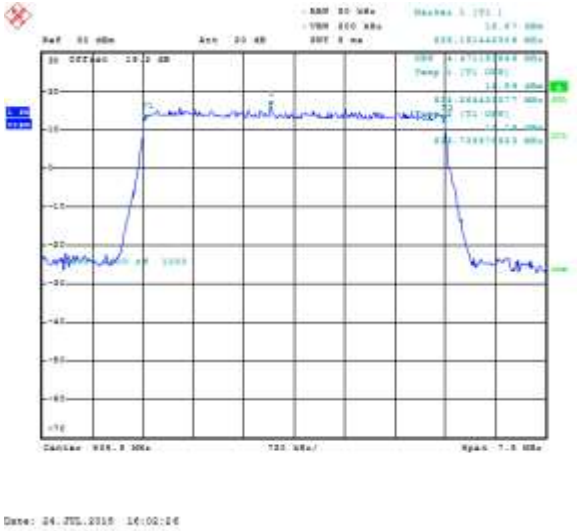
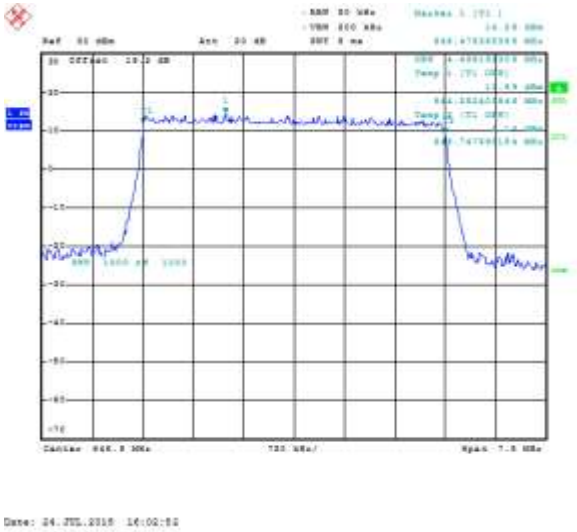


Figure 4-24a: Occupied Bandwidth, Band 5 High Channel, 5MHz BW, RB=25



LTE Band 5 Conducted RF Emission Test Data cont'd

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

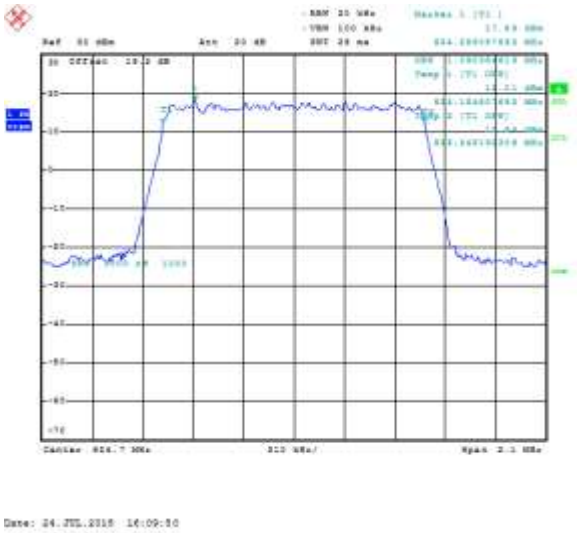


Figure 4-26a: Occupied Bandwidth, Band 5 Middle Channel, 1.4MHz BW, RB=6

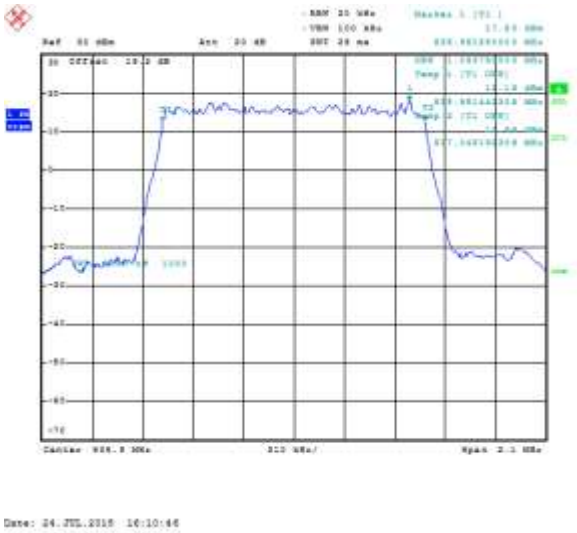
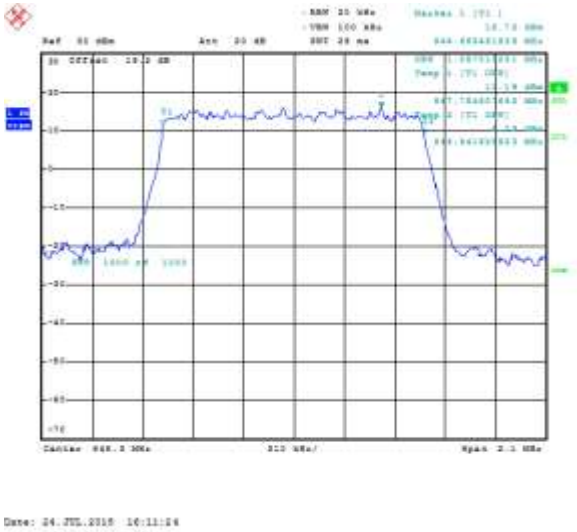


Figure 4-27a: Occupied Bandwidth, Band 5 High Channel, 1.4MHz BW, RB=6



LTE Band 5 Conducted RF Emission Test Data cont'd

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

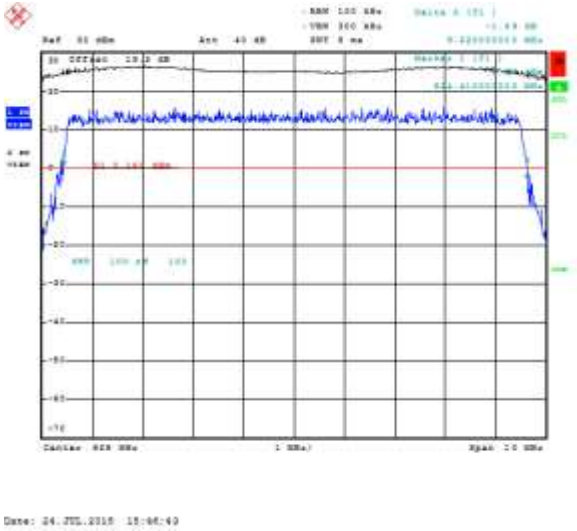


Figure 4-29a: -26 dBc Bandwidth, Band 5 Middle Channel, 10MHz BW, RB=50

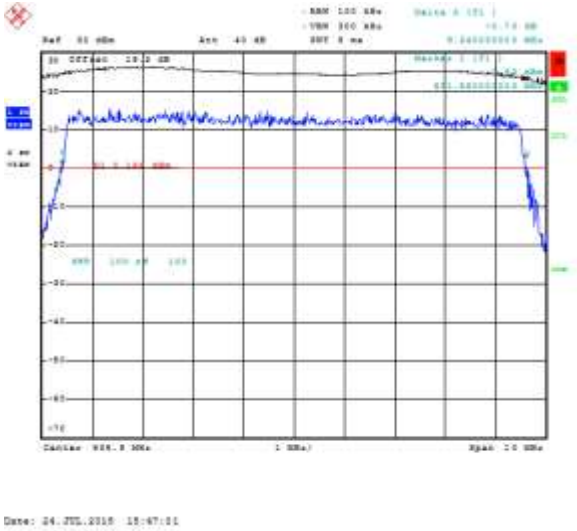


Figure 4-30a: -26 dBc Bandwidth, Band 5 High Channel, 10MHz BW, RB=50

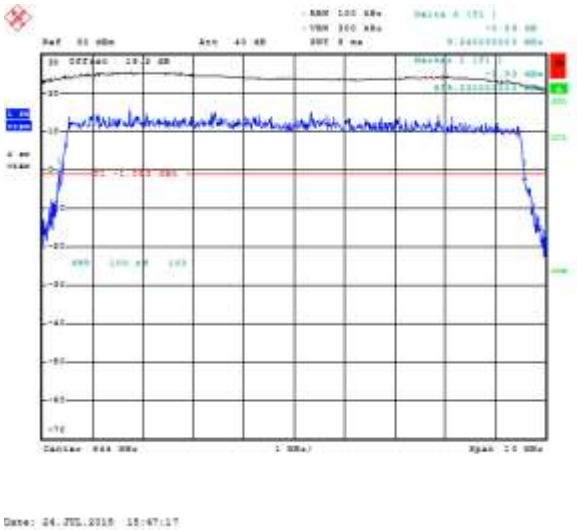
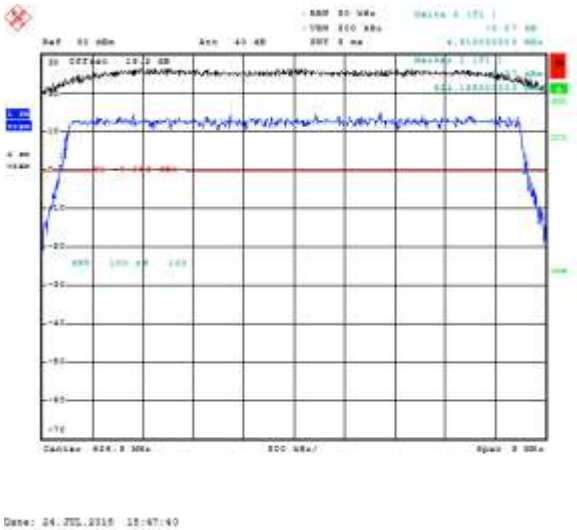


Figure 4-31a: -26 dBc Bandwidth, Band 5 Low Channel, 5MHz BW, RB=25



LTE Band 5 Conducted RF Emission Test Data cont'd

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

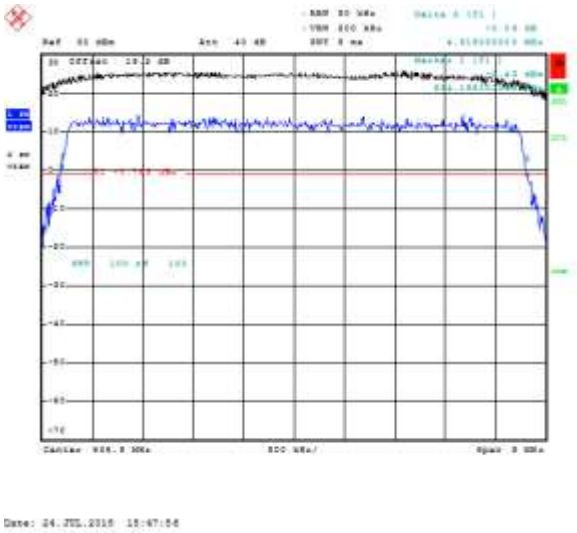


Figure 4-33a: -26 dBc Bandwidth, Band 5 High Channel, 5MHz BW, RB=25

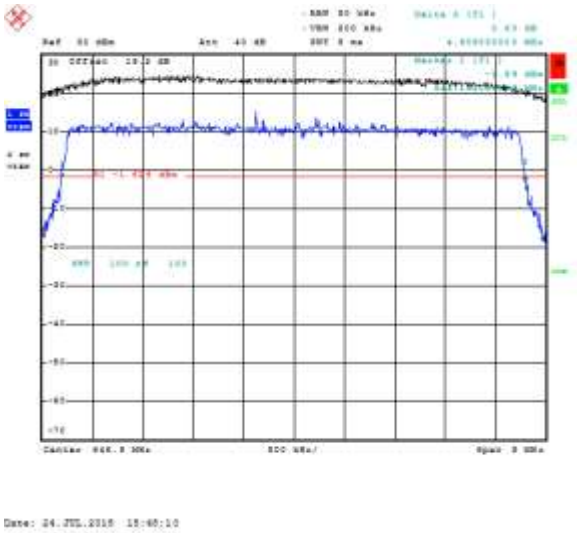


Figure 4-34a: -26 dBc Bandwidth, Band 5 Low Channel, 1.4MHz BW, RB=6

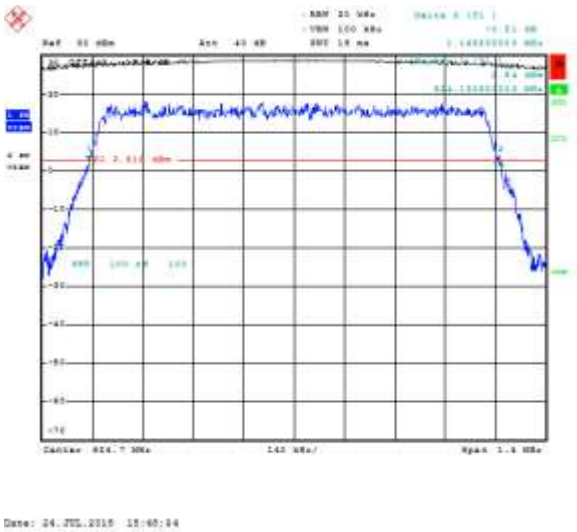
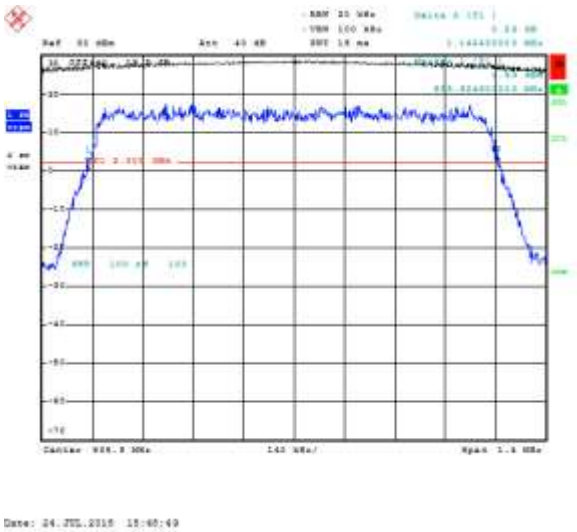


Figure 4-35a: -26 dBc Bandwidth, Band 5 Middle Channel, 1.4MHz BW, RB=6



LTE Band 5 Conducted RF Emission Test Data cont'd

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

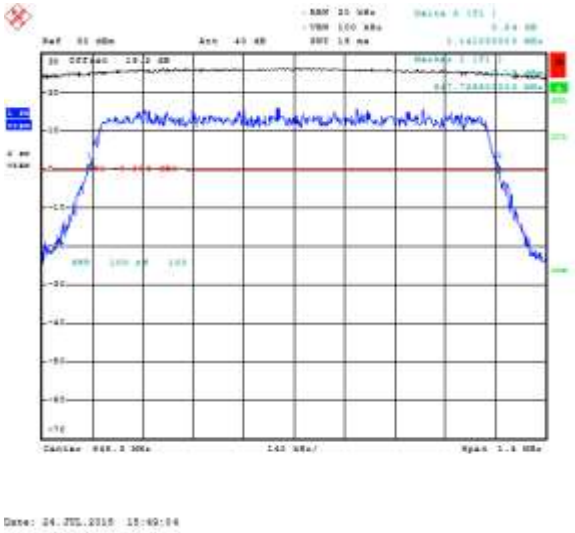


Figure 4-37a: Band 5 Low Channel Mask, 10MHz BW, RB=50

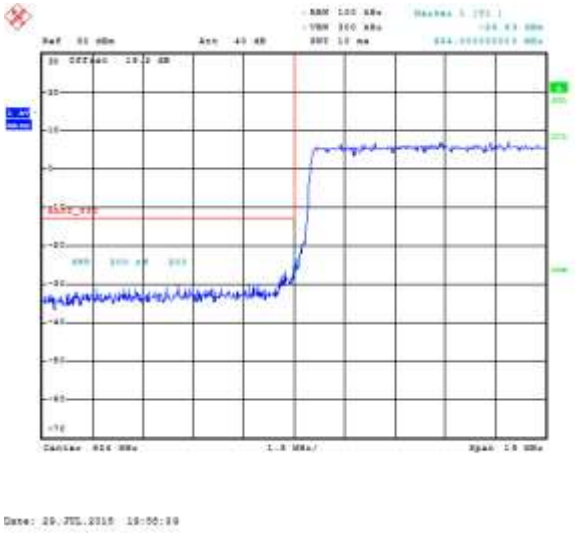
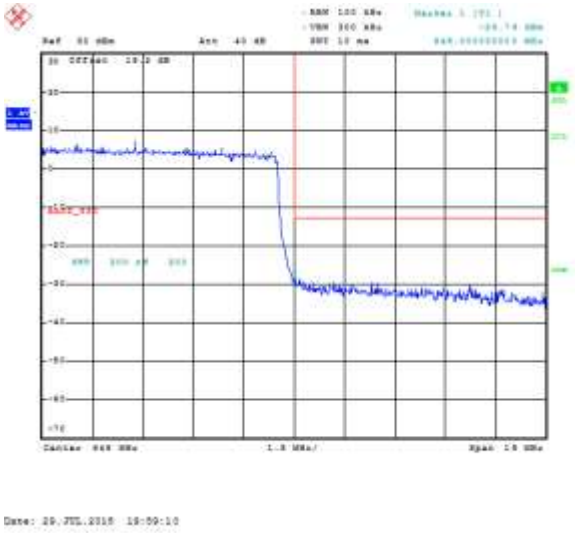


Figure 4-38a: Band 5 High Channel Mask, 10MHz BW, RB=50



LTE Band 5 Conducted RF Emission Test Data cont'd

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

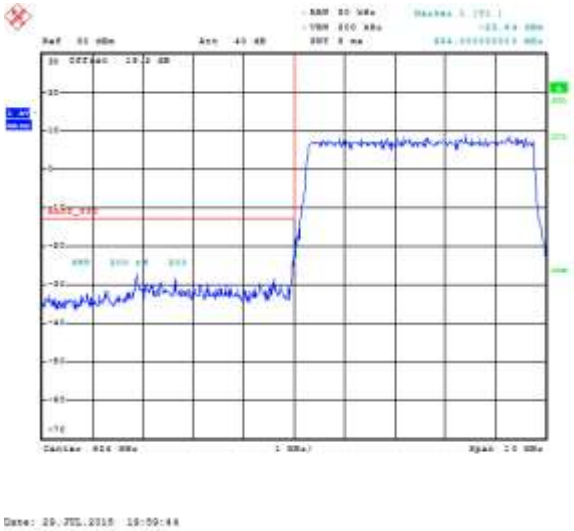


Figure 4-40a: Band 5 High Channel Mask, 5MHz BW, RB=25

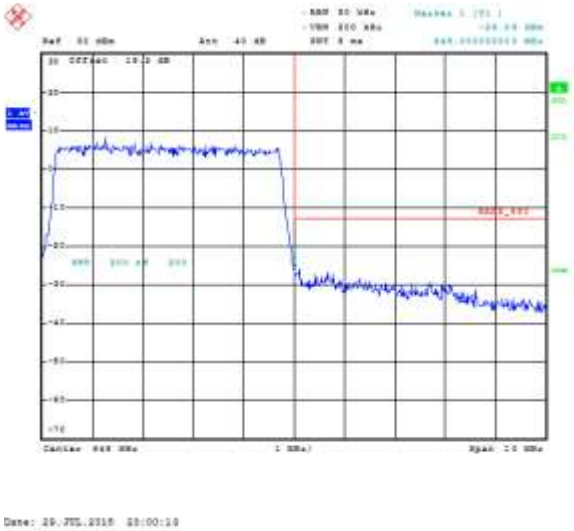


Figure 4-41a: Band 5 Low Channel Mask, 1.4MHz BW, RB=6

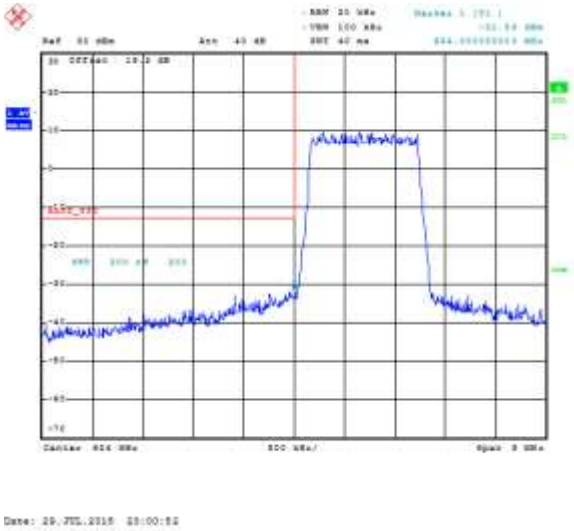
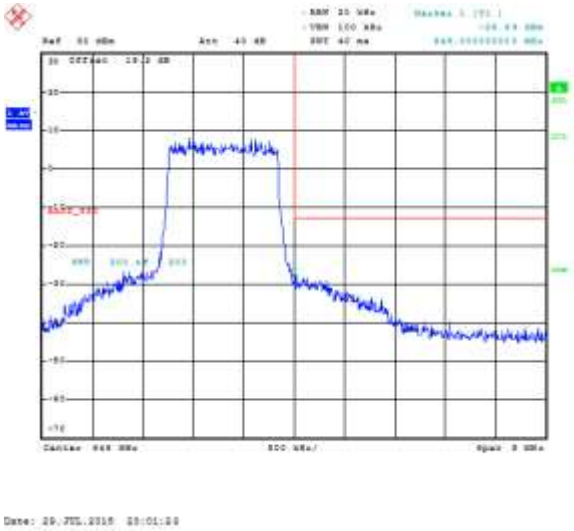


Figure 4-42a: Band 5 High Channel Mask, 1.4MHz BW, RB=6



LTE Band 5 Conducted RF Emission Test Data cont'd

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

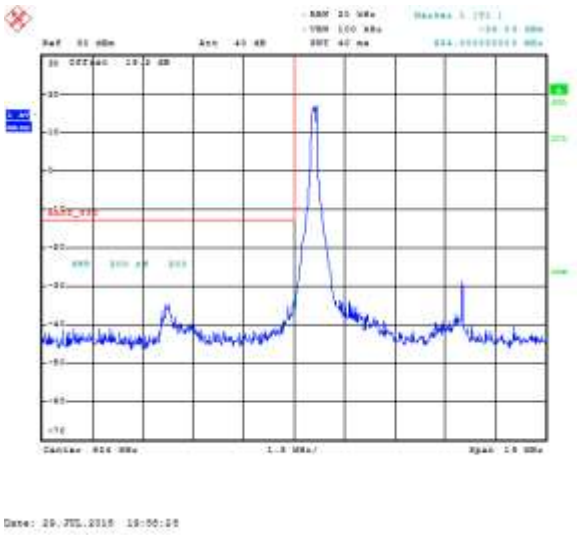
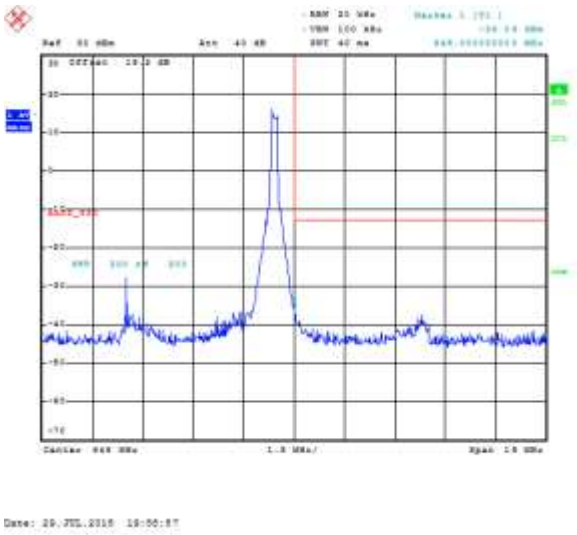


Figure 4-44a: Band 5 High Channel Mask, 10MHz BW, RB=1



LTE Band 5 Conducted RF Emission Test Data cont'd

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

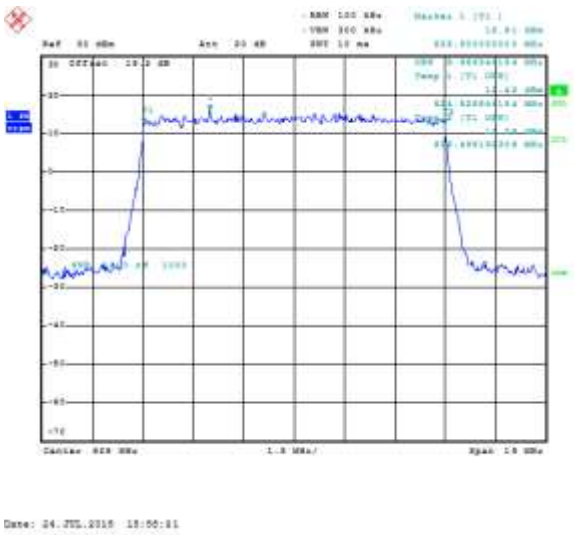


Figure 3-46a: Occupied Bandwidth, Band 5 Mid Channel, 20MHz BW (RB= 50) 16-QAM

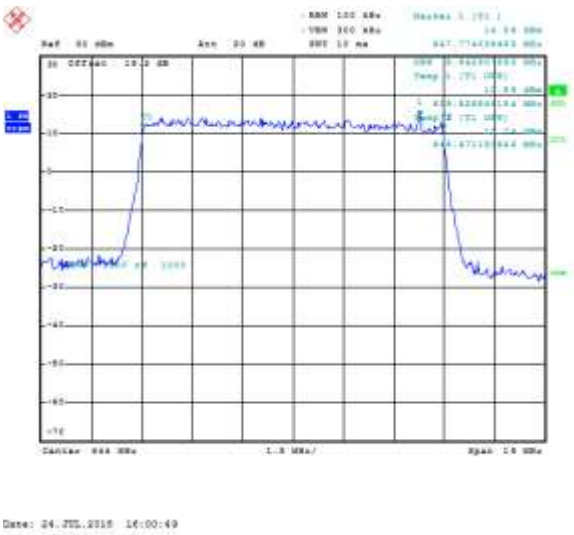
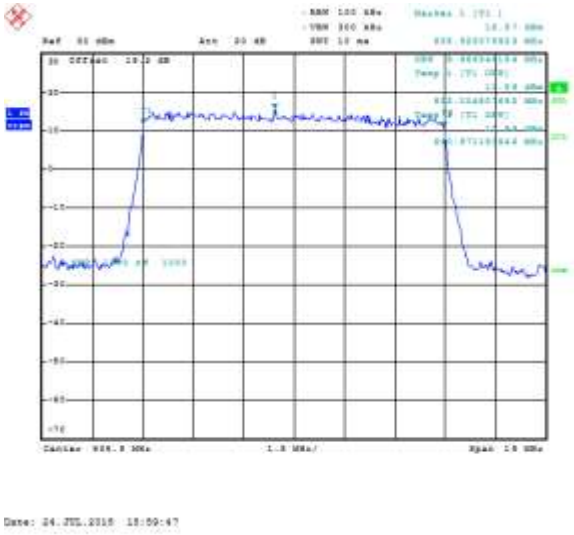
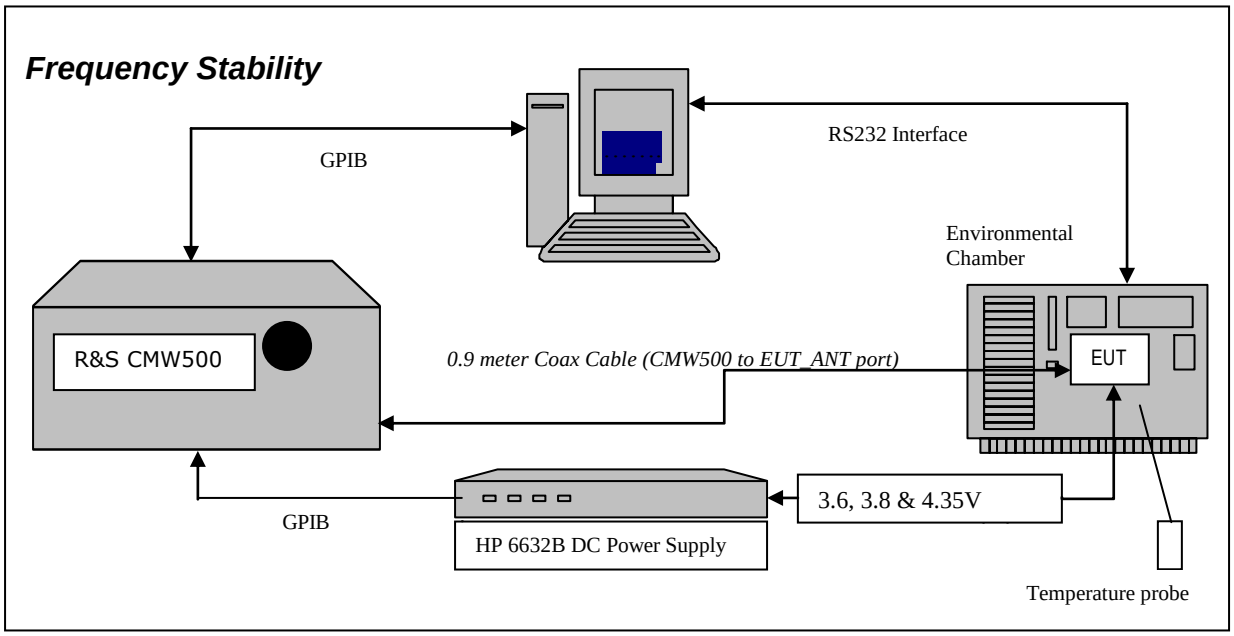


Figure 3-47a: Occupied Bandwidth, Band 5 High Channel, 10MHz BW (RB= 50) 16-QAM



APPENDIX 4B – LTE Band 5 FREQUENCY STABILITY TEST DATA

LTE Band 5 Frequency Stability Test Data



The following measurements were performed by Sijia Li.

CFR 47 Chapter 1 - Federal Communications Commission Rules

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

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

The EUT meets the requirements as stated in CFR 47 chapter 1, Section 27.54, CFR 47 and RSS-139, 6.3 Frequency Stability.
Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-metre coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMW 500 and the EUT antenna port.

Test Setup:

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

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

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

The EUT repetitively transmitted 100 bursts for each set of programmed parameters recording temperature, voltage settings, and systematically selected frequencies. The power supply was cycled from minimum voltage 3.6 volts, 3.8 volts and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 3.8 volts and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 829.0 MHz, 836.5 MHz and 844.0 MHz each was measured under 10 MHz bandwidth with maximum (50) RBs. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million.

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

Procedure:

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

15. Switch on the HP 6632B power supply; CMW 500 Communications test Set, and Environmental Chamber.
16. Start test program
17. Set the Temperature to –30°C and maintain a period of one- hour soak time, with the EUT supply voltage disabled.
18. Set power supply voltage to 3.6 volts.
19. Set up CMW 500 Radio Communication Tester.
20. Command the CMW 500 to switch to the low channel.
21. Enable the voltage to the EUT, and connect a link to the CMW 500 test set.
22. EUT is commanded to Transmit 100 Bursts.
23. Software logs the following data from the CMW 500, power supply and temperature chamber: Traffic Channel Number, Traffic Channel Frequency, Power Level, Chamber Temperature, Supply Voltage, Power and Frequency Error.
24. The CMW 500 commands the EUT to change frequency to the middle channel and high channel and repeats steps 7 to 9.
25. Repeat steps 5 to 10 changing the supply voltage to 3.8 Volts
26. Increase temperature by 10°C and soak for 1/2 hour.
27. Repeat steps 4 - 12 for temperatures –30°C to 60°C.
28. Repeat steps 5 to 10 changing the supply voltage to 4.35 volts

Procedure 5 to 10 was repeated at room temperature (20°C) with the power supply voltage set to 3.6, 3.8 and 4.35 volts

The following test configurations were measured on model RHK211LW (STV100-1):

The maximum frequency error in the LTE Band 5 measured was **0.0041 PPM**.

The following test configurations were measured on model RHK211LW (STV100-1):

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

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20450	829.0	3.6	20	1.72	0.0021
20525	836.5	3.6	20	2.17	0.0026
20600	844.0	3.6	20	-1.92	-0.0023

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20450	829.0	3.8	20	3.40	**0.0041**
20525	836.5	3.8	20	1.89	0.0023
20600	844.0	3.8	20	**-2.98**	-0.0035

Traffic Channel Number	LTE Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20450	829.0	4.35	20	1.97	0.0024
20525	836.5	4.35	20	-2.39	-0.0029
20600	844.0	4.35	20	-2.35	-0.0028

LTE band 5 Results: channel 20400 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20450	829.0	3.6	-30	-3.33	-0.0040
20450	829.0	3.6	-20	-3.91	-0.0047
20450	829.0	3.6	-10	-2.05	-0.0025
20450	829.0	3.6	0	3.36	0.0041
20450	829.0	3.6	10	3.46	0.0042
20450	829.0	3.6	20	1.72	0.0021
20450	829.0	3.6	30	-2.89	-0.0035
20450	829.0	3.6	40	-2.27	-0.0027
20450	829.0	3.6	50	-2.85	-0.0034
20450	829.0	3.6	60	-2.86	-0.0035
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
20450	829.0	3.8	-30	-4.48	**-0.0054**
20450	829.0	3.8	-20	3.92	0.0047
20450	829.0	3.8	-10	-3.08	-0.0037
20450	829.0	3.8	0	2.96	0.0036
20450	829.0	3.8	10	-1.16	-0.0014
20450	829.0	3.8	20	3.40	0.0041
20450	829.0	3.8	30	-2.49	-0.0030
20450	829.0	3.8	40	-2.53	-0.0031
20450	829.0	3.8	50	-2.55	-0.0031
20450	829.0	3.8	60	-1.57	-0.0019
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
20450	829.0	4.35	-30	-2.80	-0.0034
20450	829.0	4.35	-20	-3.76	-0.0045
20450	829.0	4.35	-10	2.39	0.0029
20450	829.0	4.35	0	3.58	0.0043
20450	829.0	4.35	10	3.82	0.0046
20450	829.0	4.35	20	1.97	0.0024
20450	829.0	4.35	30	-3.75	-0.0045
20450	829.0	4.35	40	-3.45	-0.0042
20450	829.0	4.35	50	1.85	0.0022
20450	829.0	4.35	60	3.45	0.0042

LTE band 5 Results: channel 20525 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20525	836.5	3.6	-30	2.92	0.0035
20525	836.5	3.6	-20	-3.26	-0.0039
20525	836.5	3.6	-10	2.52	0.0030
20525	836.5	3.6	0	2.95	0.0035
20525	836.5	3.6	10	-1.85	-0.0022
20525	836.5	3.6	20	2.17	0.0026
20525	836.5	3.6	30	-3.59	-0.0043
20525	836.5	3.6	40	2.32	0.0028
20525	836.5	3.6	50	-4.06	**-0.0049**
20525	836.5	3.6	60	-3.68	-0.0044
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
20525	836.5	3.8	-30	-4.01	-0.0048
20525	836.5	3.8	-20	-2.90	-0.0035
20525	836.5	3.8	-10	3.60	0.0043
20525	836.5	3.8	0	1.92	0.0023
20525	836.5	3.8	10	2.95	0.0035
20525	836.5	3.8	20	1.89	0.0023
20525	836.5	3.8	30	2.07	0.0025
20525	836.5	3.8	40	-3.12	-0.0037
20525	836.5	3.8	50	2.92	0.0035
20525	836.5	3.8	60	-4.02	-0.0048
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
20525	836.5	4.35	-30	-2.39	-0.0029
20525	836.5	4.35	-20	-3.19	-0.0038
20525	836.5	4.35	-10	3.50	0.0042
20525	836.5	4.35	0	3.25	0.0039
20525	836.5	4.35	10	3.22	0.0038
20525	836.5	4.35	20	-2.39	-0.0029
20525	836.5	4.35	30	-3.72	-0.0044
20525	836.5	4.35	40	-1.97	-0.0024
20525	836.5	4.35	50	-2.16	-0.0026
20525	836.5	4.35	60	-2.27	-0.0027

LTE band 5 Results: channel 20649 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
20600	844.0	3.6	-30	-5.31	**-0.0063**
20600	844.0	3.6	-20	-4.65	-0.0055
20600	844.0	3.6	-10	-3.60	-0.0043
20600	844.0	3.6	0	-2.59	-0.0031
20600	844.0	3.6	10	2.83	0.0034
20600	844.0	3.6	20	-1.92	-0.0023
20600	844.0	3.6	30	-2.60	-0.0031
20600	844.0	3.6	40	-2.89	-0.0034
20600	844.0	3.6	50	-3.68	-0.0044
20600	844.0	3.6	60	-3.83	-0.0045
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
20600	844.0	3.8	-30	-5.09	-0.0060
20600	844.0	3.8	-20	-4.16	-0.0049
20600	844.0	3.8	-10	-2.57	-0.0031
20600	844.0	3.8	0	1.96	0.0023
20600	844.0	3.8	10	1.95	0.0023
20600	844.0	3.8	20	-2.98	-0.0035
20600	844.0	3.8	30	-3.92	-0.0046
20600	844.0	3.8	40	-2.90	-0.0034
20600	844.0	3.8	50	2.15	0.0025
20600	844.0	3.8	60	-4.84	-0.0057
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
20600	844.0	4.35	-30	-2.76	-0.0033
20600	844.0	4.35	-20	-5.01	-0.0059
20600	844.0	4.35	-10	-4.48	-0.0053
20600	844.0	4.35	0	-2.26	-0.0027
20600	844.0	4.35	10	2.62	0.0031
20600	844.0	4.35	20	-2.35	-0.0028
20600	844.0	4.35	30	-3.50	-0.0042
20600	844.0	4.35	40	-4.22	-0.0050
20600	844.0	4.35	50	-4.08	-0.0048
20600	844.0	4.35	60	-3.76	-0.0045

APPENDIX 4C – LTE Band 5 RADIATED EMISSIONS TEST DATA

Radiated Power Test Data Results

The following configurations were measured for model RHK211LW (STV100-1):
The following measurements were performed by Shiva Kumbham.
Date of Test: August 11, 2015
The environmental tests conditions were: Temperature: 26.0 °C
Relative Humidity: 36.9 %
The BlackBerry® smartphone was standalone horizontal down and LCD Screen pointing to the RX antenna when the turntable is at 0 degree position.
Measurements were performed with QPSK and 16QAM modulations.
Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

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

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBm)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dBm)
F0	20425	826.50	5	Horn	V	-41.00	-32.20	V-V	2.62	**20.43**	0.11	38.50	18.07
F0	20425	826.50	5	Horn	H	-32.20		H-H	1.18				
F0	20525	836.50	5	Horn	V	-40.96	-34.25	V-V	1.29	18.98	0.08	38.50	19.52
F0	20525	836.50	5	Horn	H	-34.25		H-H	0.21				
F0	20624	846.40	5	Horn	V	-41.79	-34.38	V-V	1.80	19.55	0.09	38.50	18.95
F0	20624	846.40	5	Horn	H	-34.38		H-H	-0.21				

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

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBm)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dBm)
F0	20425	826.50	5	Horn	V	-42.06	-33.05	V-V	1.67	19.48	0.09	38.50	19.02
F0	20425	826.50	5	Horn	H	-33.05		H-H	0.31				
F0	20525	836.50	5	Horn	V	-41.89	-34.19	V-V	1.39	19.08	0.08	38.50	19.42
F0	20525	836.50	5	Horn	H	-34.19		H-H	0.31				
F0	20624	846.40	5	Horn	V	-42.74	-34.22	V-V	1.97	**19.72**	0.09	38.50	18.78
F0	20624	846.40	5	Horn	H	-34.22		H-H	-0.05				

Radiated Emissions Test Data Results cont'd

The following measurements were performed by Savtej Sandhu.

Date of Test: August 10, 2015

The environmental test conditions were: Temperature: 25.8 ºC
Relative Humidity: 33.3 %

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, and the frequency range scanned was 30MHz – 1GHz.

Measurements were performed in LTE band 5 with QPSK and 16-QAM modulation for 3MHz BW (channel 20415, 20525 and 20634 with RB = 6).

All emissions were at least 25 dB below the limit.

The following measurements were performed by Winston Vernon

Date of Test: August 10-11, 2015

The environmental test conditions were: Temperature: 27.5 ºC
Relative Humidity: 34.3 %

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

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

Measurements were performed in LTE band 5 with QPSK and 16-QAM modulation for 3MHz BW (channel 20415, 20525 and 20634 with RB = 6).

All emissions were at least 25 dB below the limit.

Radiated Power Test Data Results

The following configurations were measured for model RHT181LW (STV100-2):
The following measurements were performed by Imran Kanji.
Date of Test: October 13, 2015
The environmental tests conditions were: Temperature: 26.0 °C
Relative Humidity: 36.9 %
The BlackBerry® smartphone was standalone horizontal down and LCD Screen pointing to the RX antenna when the turntable is at 0 degree position.
Measurements were performed with QPSK and 16QAM modulations.
Test Distance was 3.0 meters with the RX antenna height scans between 1-4 meters height.

LTE band 5, 3MHz BW, RB=1, QPSK modulation

								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 (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dBm)
F0	20415	825.50	5	Horn	V	-40.47	-32.44	V-V	2.19	**20.00**	0.10	38.50	18.50
F0	20415	825.50	5	Horn	H	-32.44		H-H	1.37				
F0	20525	836.50	5	Horn	V	-39.90	-32.73	V-V	1.86	19.55	0.09	38.50	18.95
F0	20525	836.50	5	Horn	H	-32.73		H-H	0.79				
F0	20634	847.40	5	Horn	V	-39.54	-35.22	V-V	-0.16	17.59	0.06	38.50	20.91
F0	20634	847.40	5	Horn	H	-35.22		H-H	-0.44				

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

								Substitution Method					
EUT				Rx Antenna		Spectrum Analyzer		Tracking Generator					
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBm)	Max (V,H) (dBm)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (dBm)	Corrected Reading (W)	Limit (dBm)	Diff to Limit (dBm)
F0	20425	826.50	5	Horn	V	-41.29	-33.36	V-V	1.30	**19.11**	0.08	38.50	19.39
F0	20425	826.50	5	Horn	H	-33.36		H-H	0.43				
F0	20525	836.50	5	Horn	V	-40.63	-33.35	V-V	1.26	18.95	0.08	38.50	19.55
F0	20525	836.50	5	Horn	H	-33.35		H-H	0.14				
F0	20624	846.40	5	Horn	V	-39.44	-35.01	V-V	0.10	17.85	0.06	38.50	20.65
F0	20624	846.40	5	Horn	H	-35.01		H-H	-0.24				

Radiated Emissions Test Data Results cont'd

The following measurements were performed by Savtej Sandhu.

Date of Test: October 9, 2015

The environmental test conditions were: Temperature: 26.1 ºC
Relative Humidity: 32.2 %

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, and the frequency range scanned was 30MHz – 1GHz.

Measurements were performed in LTE band 5 with QPSK modulation for 3MHz BW (channel 20415, 20525 and 20634 with RB = 1) and 16-QAM modulation for 5MHz BW (channel 20425, 20525 and 20624 with RB = 1) .

All emissions were at least 25 dB below the limit.

The following measurements were performed by Xing Fang.

Date of Test: October 9, 2015

The environmental test conditions were: Temperature: 27.5 ºC
Relative Humidity: 34.3 %

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

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

Measurements were performed in LTE band 5 with QPSK modulation for 3MHz BW (channel 20415, 20525 and 20634 with RB = 1) and 16-QAM modulation for 5MHz BW (channel 20425, 20525 and 20624 with RB = 1) .

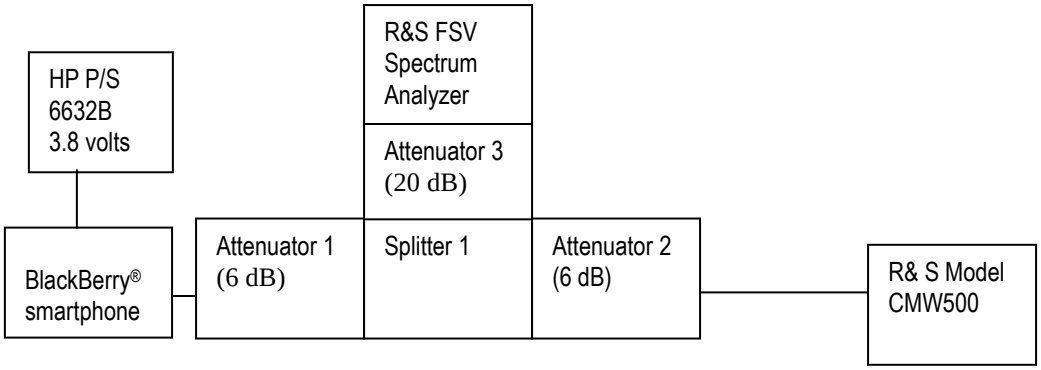
All emissions were at least 25 dB below the limit.

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

LTE Band 4 Conducted RF Emission Test Data

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

Test Setup Diagram



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 following configurations were measured for model RHK211LW (STV100-1):

Date of Test: July 22 – September 3, 2015

The environmental test conditions were: Temperature: 26.3ºC
Relative Humidity: 38.6 %

The following measurements were performed by Sijia Li and Landon Martin.

LTE Band 4 Conducted RF Emission Test Data cont'd

Emission Designator Table

Frequency Range (MHz)	Conducted Output Power (dBm)	Conducted Output Power (W)	Emission Designator	Band	Bandwidth (MHz)	Modulation
1710.7-1754.3	22.57	0.18	1M09G7D	LTE B4	1.4	QPSK
1710.7-1754.3	21.92	0.16	1M09D7W	LTE B4	1.4	16QAM
1711.5-1753.5	22.95	0.20	2M69G7D	LTE B4	3	QPSK
1711.5-1753.5	22.17	0.16	2M69D7W	LTE B4	3	16QAM
1712.5-1752.5	23.13	0.21	4M49G7D	LTE B4	5	QPSK
1712.5-1752.5	22.17	0.16	4M49D7W	LTE B4	5	16QAM
1715-1750	**23.14**	**0.21**	8M96G7D	LTE B4	10	QPSK
1715-1750	22.53	0.18	8M96D7W	LTE B4	10	16QAM
1717.5-1747.5	22.92	0.20	13M4G7D	LTE B4	15	QPSK
1717.5-1747.5	22.17	0.16	13M4D7W	LTE B4	15	16QAM
1720-1745	23.08	0.20	17M9G7D	LTE B4	20	QPSK
1720-1745	22.24	0.17	18M0D7W	LTE B4	20	16QAM

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

–26 dBc Bandwidth and Occupied Bandwidth (99%)

The modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth For each 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz and 20MHz with Resource Block allocations 100,75,50,25,6 and 3 for LTE band 4,.

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

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

The worst case –26dBc bandwidth for LTE band 4 was measured to be 18.9 MHz. Results were derived in a 200 kHz resolution bandwidth.

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

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

LTE Band 4 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	QPSK	16-QAM
1720.0	18.64	17.93	17.93
1732.5	18.6	17.88	17.88
1745.0	**18.9**	17.93	**17.98**

Test Data for LTE Band 4 selected Frequencies in 15MHz BW (RB = 75)

LTE Band 4 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16-QAM
1717.5	13.41	13.41
1732.5	13.41	13.45
1747.5	13.45	13.41

Test Data for LTE Band 4 selected Frequencies in 10MHz BW (RB = 50)

LTE Band 4 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16-QAM
1715	8.94	8.94
1732.5	8.97	8.97
1750	8.97	8.94

Test Data for LTE Band 4 selected Frequencies in 5MHz BW (RB = 25)

LTE Band 4 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16-QAM
1712.5	4.48	4.50
1732.5	4.48	4.47
1752.5	4.50	4.48

Test Data for LTE Band 4 selected Frequencies in 3MHz BW (RB = 15)

LTE Band 4 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16-QAM
1711.5	2.70	2.69
1732.5	2.70	2.69
1753.5	2.70	2.69

Test Data for LTE Band 4 selected Frequencies in 1.4MHz BW (RB = 6)

LTE Band 4 Frequency (MHz)	99% Occupied Bandwidth (MHz)	
	QPSK	16-QAM
1710.7	1.09	1.08
1732.5	1.10	1.09
1754.3	1.09	1.09

Peak to Average Ratio (PAR)

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

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

The worst case measured was 10.16 dB in 20MHz bandwidth with 50 RBs.

Measurement Plots for LTE Band 4

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

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

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

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

LTE Band 4 Conducted RF Emission Test Data cont'd

Figure 5-1a: Band 4, Spurious Conducted Emissions, Low channel, 20MHz BW (RB= 1)

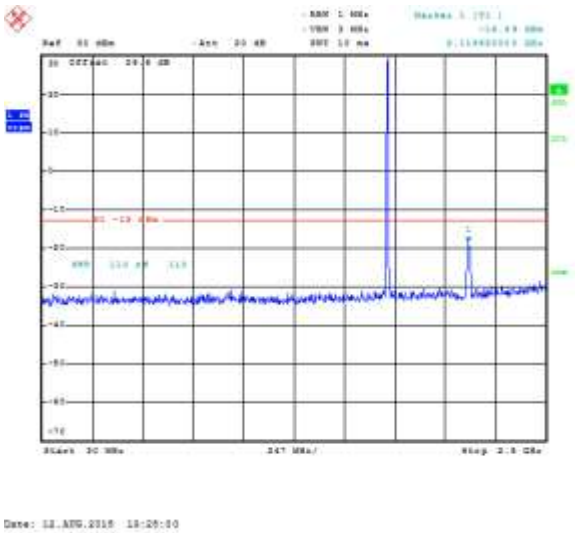


Figure 5-2a: Band 4, Spurious Conducted Emissions, Low channel, 20MHz BW (RB= 1)

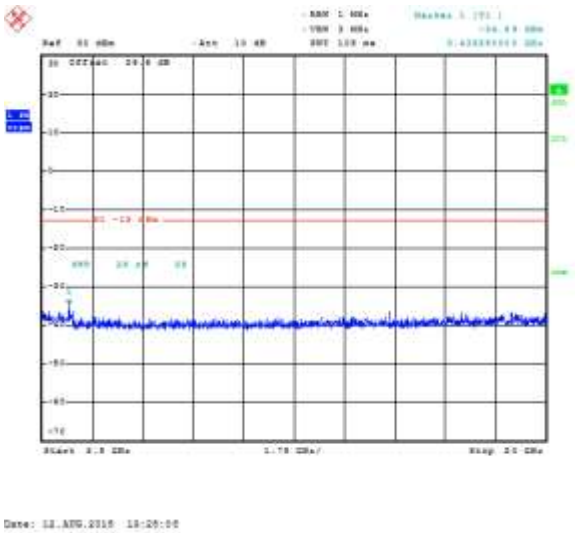


Figure 5-3a: Band 4, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 50)

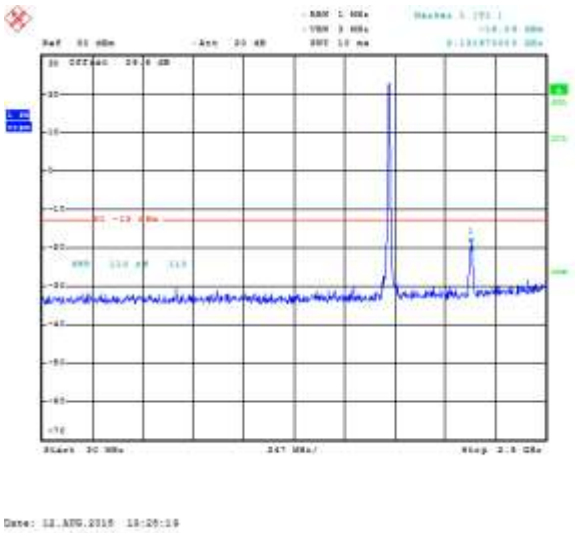
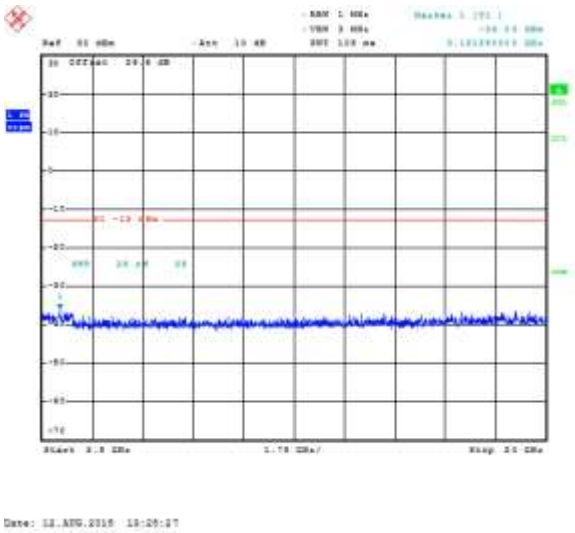


Figure 5-4a: Band 4, Spurious Conducted Emissions, Middle channel, 20MHz BW (RB= 50)



LTE Band 4 Conducted RF Emission Test Data cont'd

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

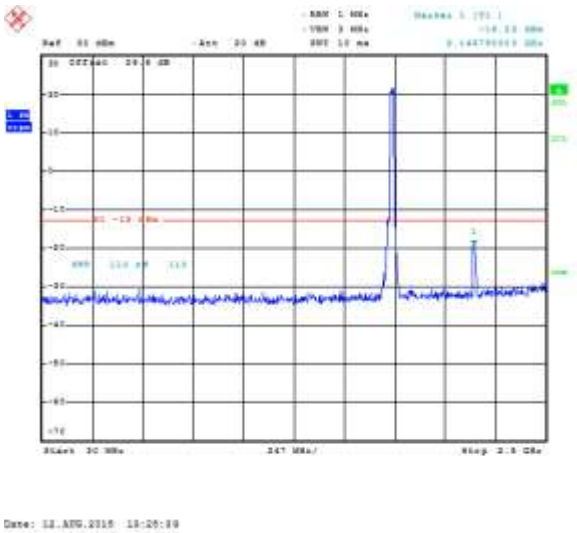


Figure 5-6a: Band 4, Spurious Conducted Emissions, High Channel, 20MHz BW (RB= 100)

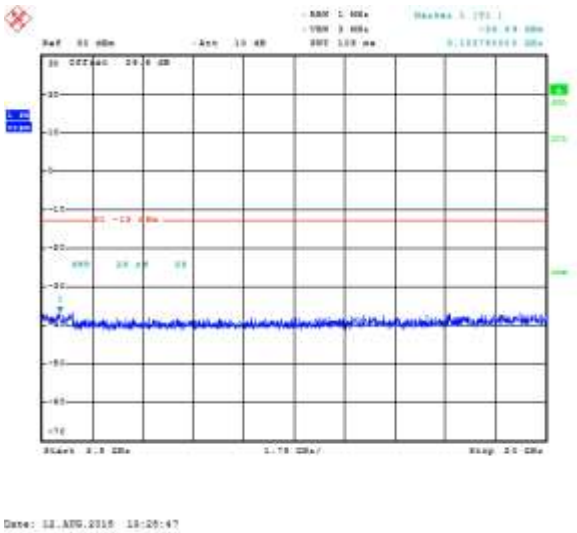


Figure 5-7a: Band 4, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)

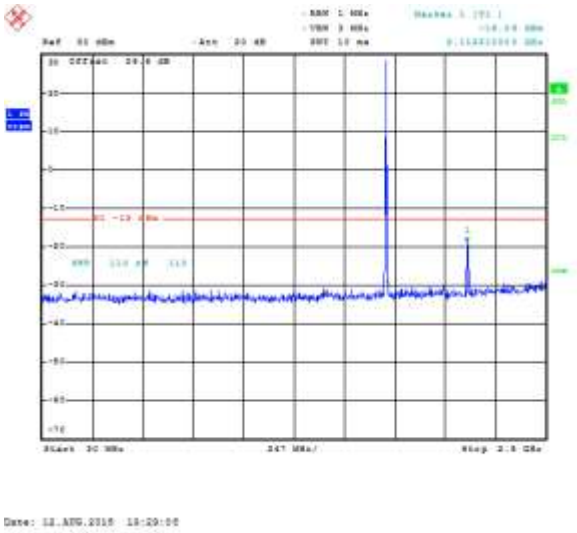
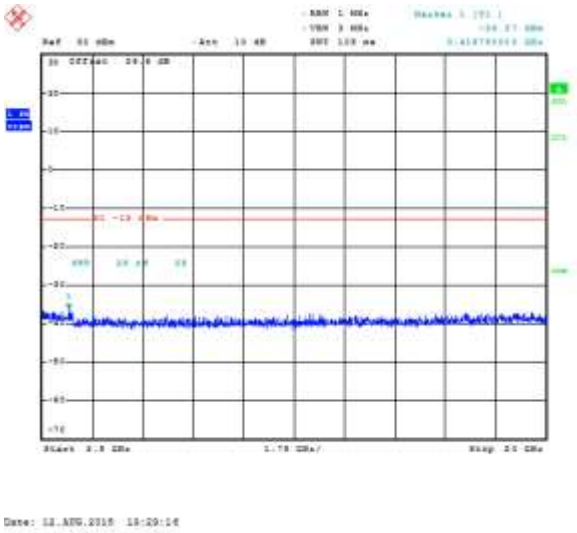


Figure 5-8a: Band 4, Spurious Conducted Emissions, Low channel, 10MHz BW (RB= 1)



LTE Band 4 Conducted RF Emission Test Data cont'd

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

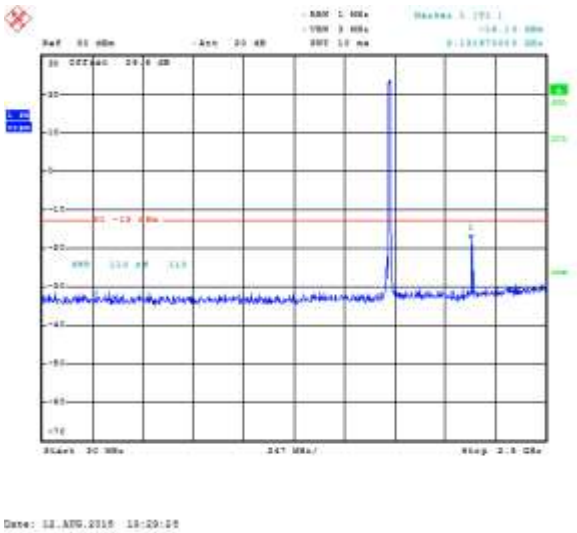


Figure 5-10a: Band 4, Spurious Conducted Emissions, Middle Channel, 10MHz BW (RB= 25)

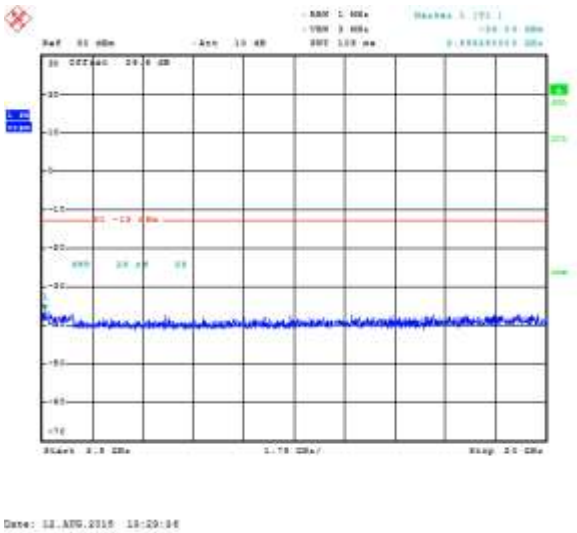


Figure 5-11a: Band 4, Spurious Conducted Emissions, High channel, 10MHz BW (RB= 50)

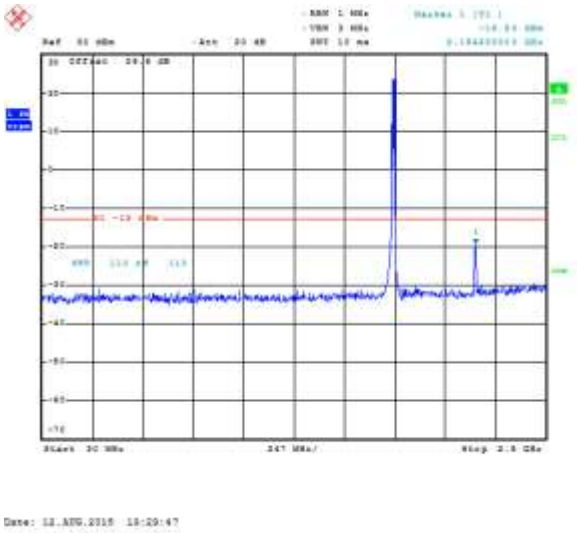
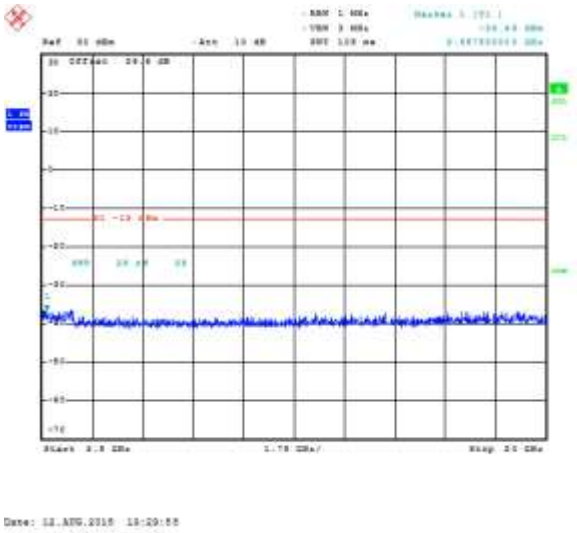


Figure 5-12a: Band 4, Spurious Conducted Emissions, High channel, 10MHz BW (RB= 50)



LTE Band 4 Conducted RF Emission Test Data cont'd

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

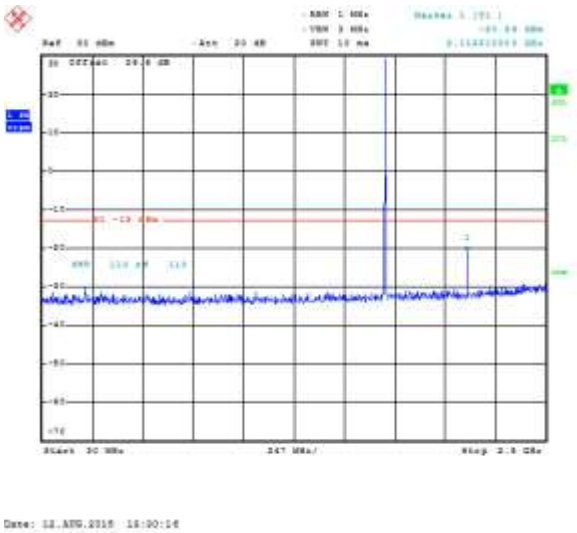


Figure 5-14a: Band 4, Spurious Conducted Emissions, Low Channel, 1.4MHz BW (RB= 1)

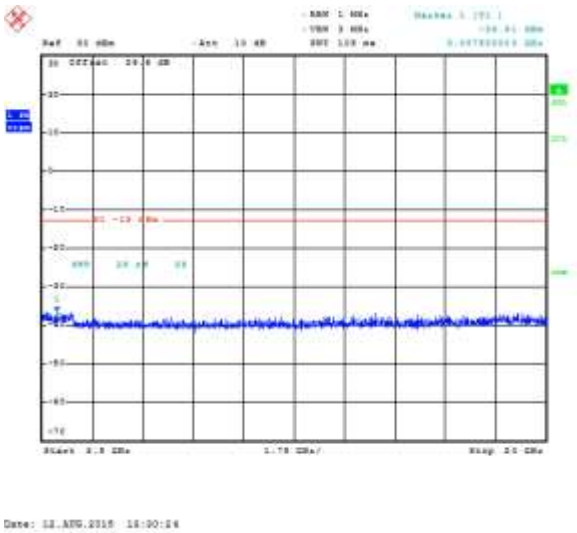


Figure 5-15a: Band 4, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 3)

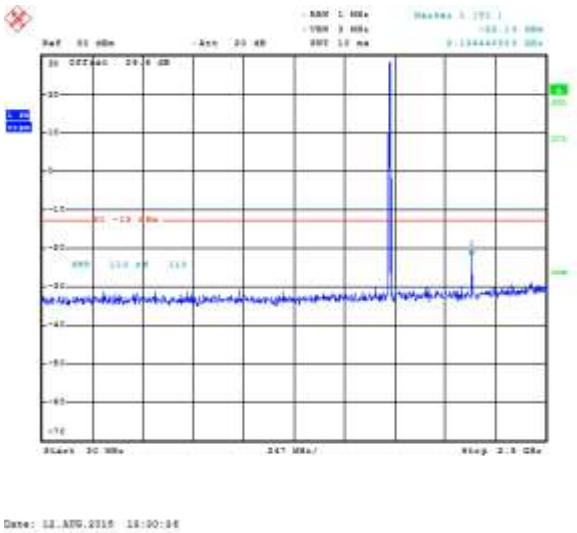
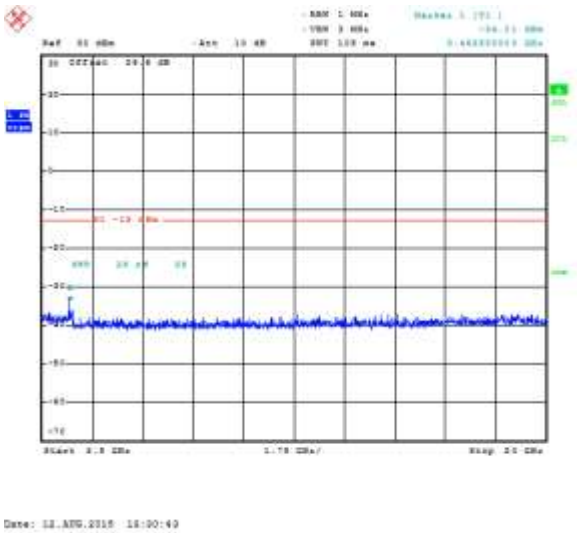


Figure 5-16a: Band 4, Spurious Conducted Emissions, Middle channel, 1.4MHz BW (RB= 3)



LTE Band 4 Conducted RF Emission Test Data cont'd

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

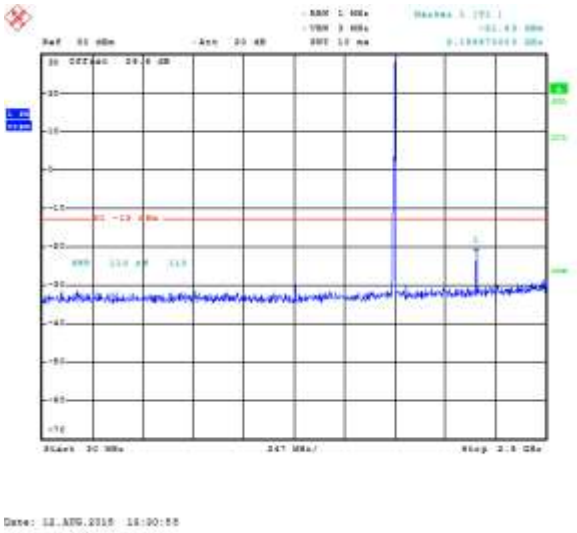
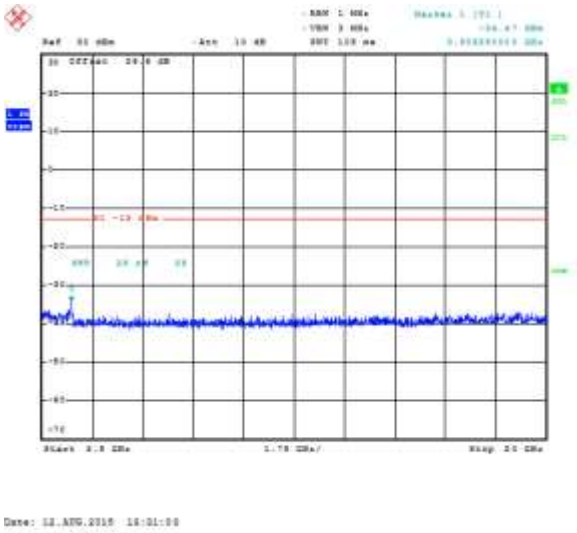


Figure 5-18a: Band 4, Spurious Conducted Emissions, High channel, 1.4MHz BW (RB= 6)



LTE Band 4 Conducted RF Emission Test Data cont'd

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

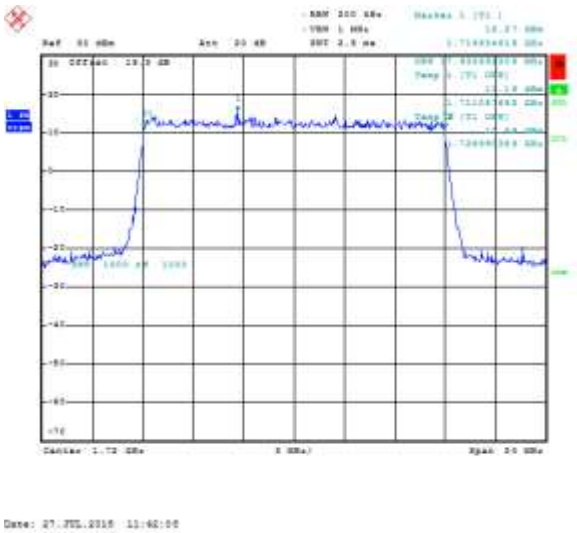


Figure 5-20a: Occupied Bandwidth, Band 4 Middle Channel, 20MHz BW, RB=100

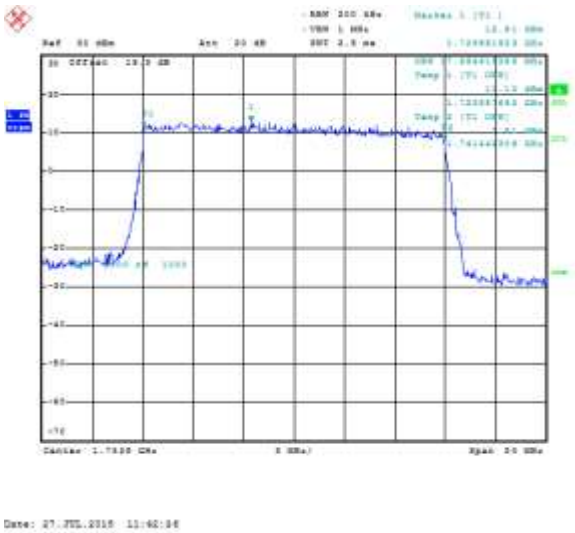
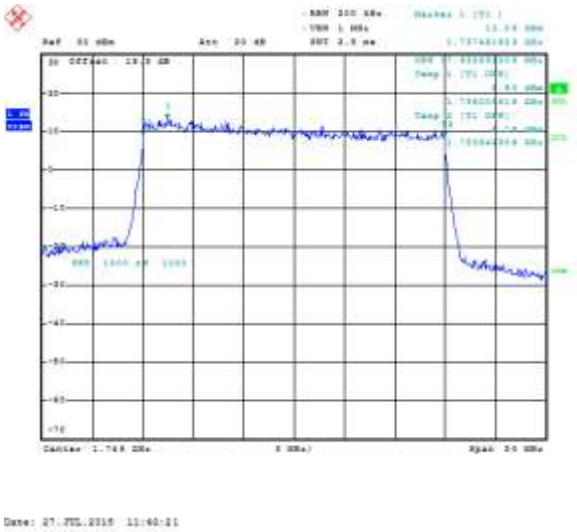


Figure 5-21a: Occupied Bandwidth, Band 4 High Channel, 20MHz BW, RB=100



LTE Band 4 Conducted RF Emission Test Data cont'd

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

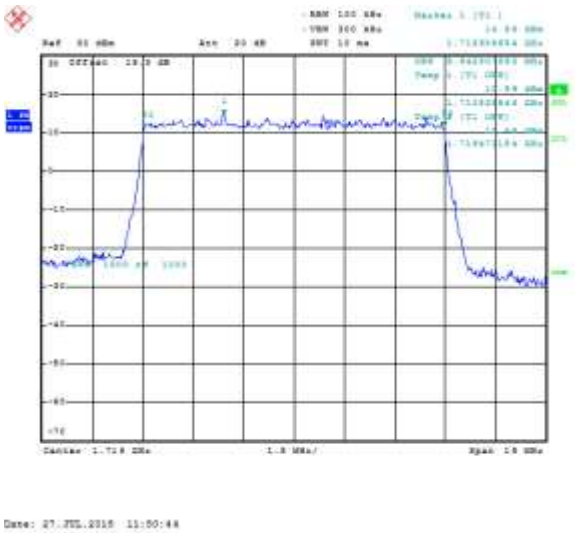


Figure 5-23a: Occupied Bandwidth, Band Middle Channel, 10MHz BW, RB=50

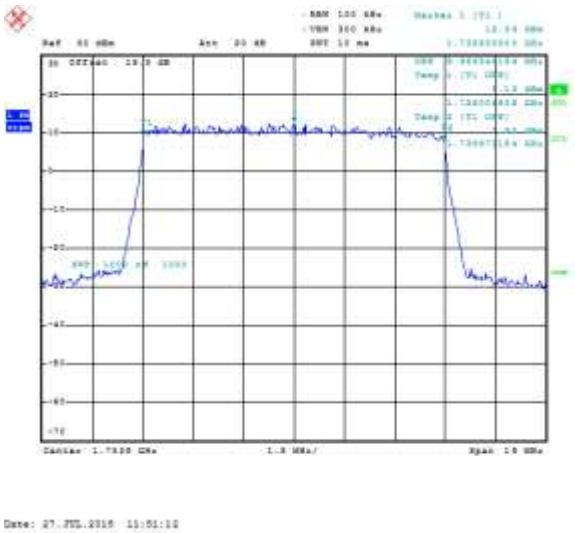
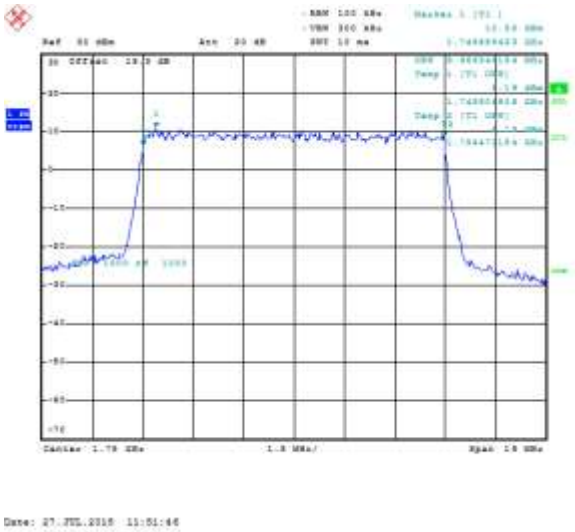


Figure 5-24a: Occupied Bandwidth, Band 4 High Channel, 10MHz BW, RB=50



LTE Band 4 Conducted RF Emission Test Data cont'd

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

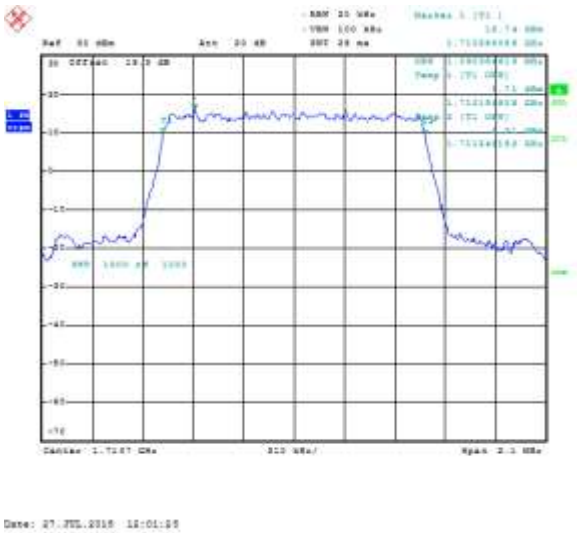


Figure 5-26a: Occupied Bandwidth, Band 4 Middle Channel, 1.4MHz BW, RB=6

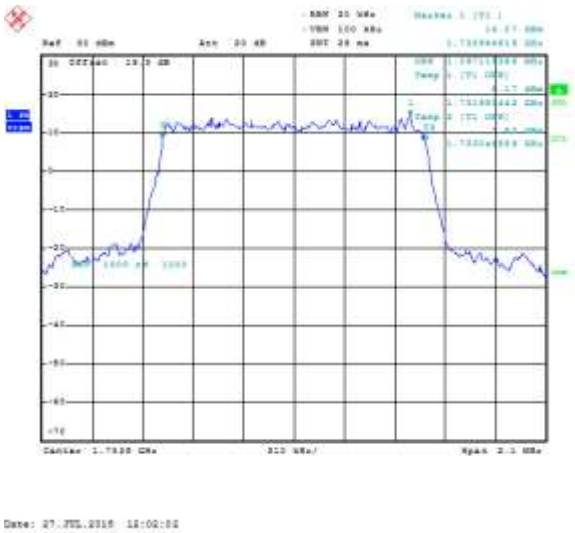
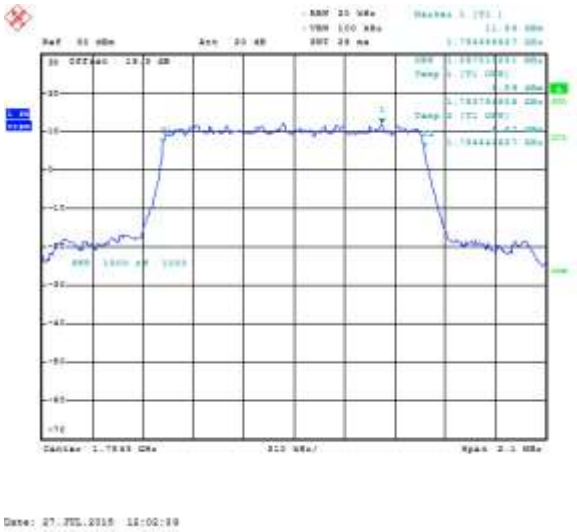


Figure 5-27a: Occupied Bandwidth, Band 4 High Channel, 1.4MHz BW, RB=6



LTE Band 4 Conducted RF Emission Test Data cont'd

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

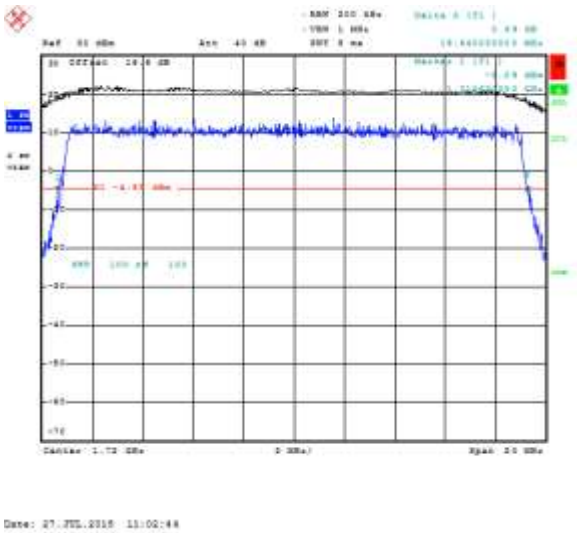


Figure 5-29a: -26 dBc Bandwidth, Band 4 Middle Channel, 20MHz BW, RB=100

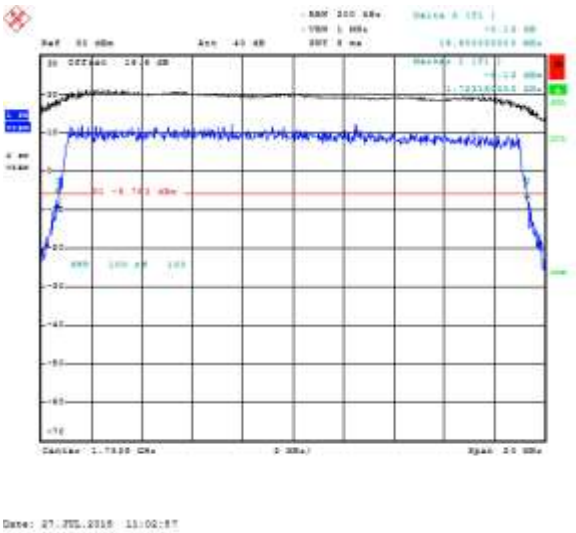


Figure 5-30a: -26 dBc Bandwidth, Band 4 High Channel, 20MHz BW, RB=100

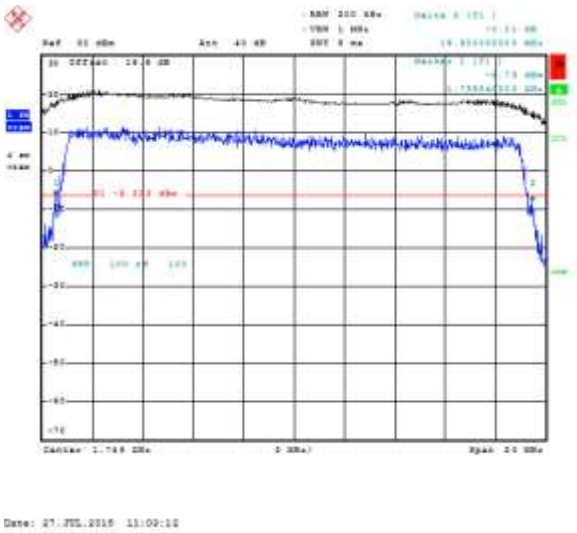
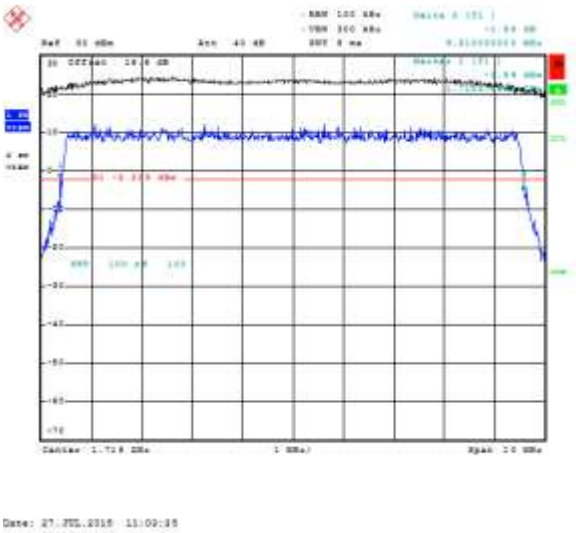


Figure 5-31a: -26 dBc Bandwidth, Band 4 Low Channel, 10MHz BW, RB=50



LTE Band 4 Conducted RF Emission Test Data cont'd

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

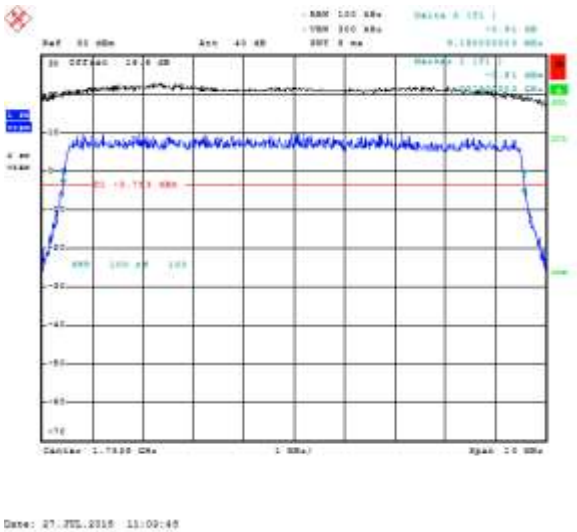


Figure 5-33a: -26 dBc Bandwidth, Band 4 High Channel, 10MHz BW, RB=50

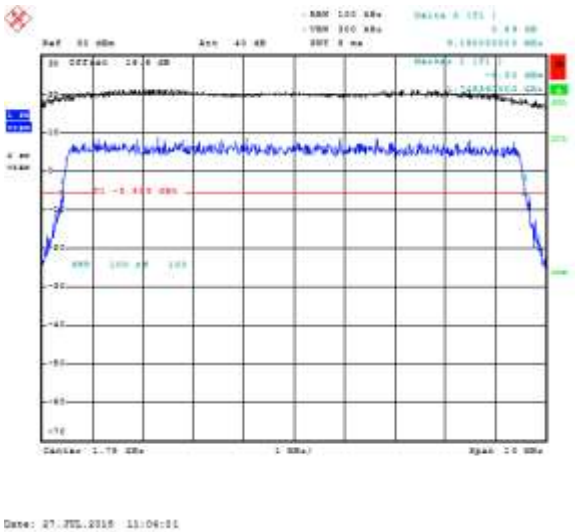


Figure 5-34a: -26 dBc Bandwidth, Band 4 Low Channel, 1.4MHz BW, RB=6

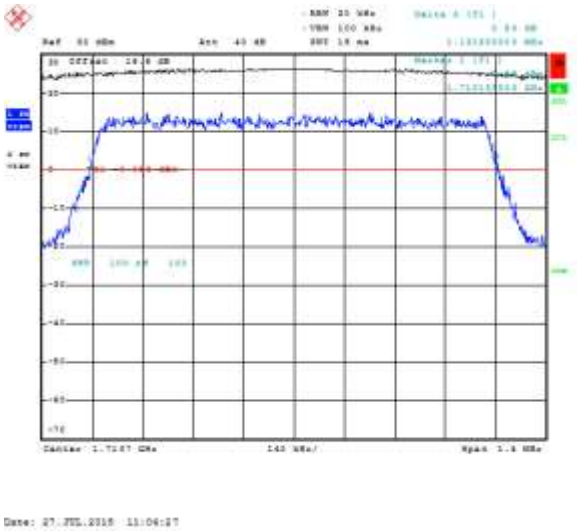


Figure 5-35a: -26 dBc Bandwidth, Band 4 Middle Channel, 1.4MHz BW, RB=6