EMI Test Report

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

A division of Research In Motion Limited

REPORT NO: RTS-6011-1209-16

PRODUCT MODEL NO:	RFG81UW
TYPE NAME:	BlackBerry® smartphone
FCC ID:	L6ARFG80UW
IC:	2503A-RFG80UW
EMISSION DESIGNATOR (GSM):	248KGXW
EMISSION DESIGNATOR (EDGE):	248KG7W
EMISSION DESIGNATOR (WCDMA):	4M18F9W

DATE: September 19, 2012

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

592

Statement of Performance:

The BlackBerry® smartphone, model RFG81UW, part number CER-48928-001 Rev2 and accessories perform within the requirements of the test standards when configured and operated per RIM's instructions.

Declaration:

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

Documented by:

Berkin Can
Regulatory Compliance Specialist
Date: September 19, 2012

Reviewed by:

Heng Lin
Regulatory Compliance Specialist
Date: September 20, 2012

Reviewed and Approved by:

Masud S. Attayi, P.Eng.
Manager, Regulatory Compliance
Date: September 21, 2012

Table of Contents

A) Scope

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

- FCC CFR 47 Part 2, Oct, 2011
- FCC CFR 47 Part 22, Subpart H, Cellular Radiotelephone Services, Oct., 2011
- FCC CFR 47 Part 24 Subpart E, Broadband PCS, Oct., 2011
- Industry Canada, RSS-132 Issue 2, September 2005, Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz.
- Industry Canada, RSS-133 Issue 5, February 2009, 2 GHz Personal Communications Services.
- Industry Canada, RSS-GEN Issue 3, December 2010, General Requirements and Information for the Certification of Radio communication Equipment

B) Associated Documents

1) Test report TR2-0037-12-1h

C) Product Identification

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

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

RIM Testing Services EMI test facilities

305 Phillip Street	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 19 – August 15, 2012.

The sample EUT included:

Sample	Model	CER NUMBER	PIN	Software Information
1	RFG81UW	CER-48928-001 Rev2	2A4A554A	OS Version: 10.0.6.420 Bundle 420
2	RFG81UW	CER-48928-001 Rev2	2A4A5504	OS Version: 10.0.6.420 Bundle 420

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

BlackBerry® smartphone Accessories Tested

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

D) Support Equipment Used for the Testing of the EUT

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

E) Test Results Chart

SPECIFICATION		TEST TYPE	RESULT	TEST DATA APPENDIX
FCC CFR 47	IC			
Part 2.1051 Part 22.917 Part 22.901	RSS-GEN, 4.9	GSM 850 Conducted Spurious Emissions	Pass	1A
Part 2.1051 Part 24.238(a)	RSS-GEN, 4.9	PCS 1900 Conducted Spurious Emissions	Pass	1A
Part 2.202 Part 22.917	RSS-GEN, 4.6	GSM 850 Occupied Bandwidth and Channel Mask	Pass	1A
Part 2.202 Part 24.238	RSS-GEN, 4.6	PCS 1900 Occupied Bandwidth and Channel Mask	Pass	1A
Part 2.1046(a)	RSS-133, 6.4 RSS-132, 4.4	GSM Conducted RF Output Power	Pass	2A
Part 2.1055(a)(d) Part 22.917	RSS-132, 4.3	GSM 850 Frequency Stability vs. Temperature and Voltage	Pass	3A
Part 2.1055(a)(d) Part 24.235	RSS-132, 4.3	PCS 1900 Frequency Stability vs. Temperature and Voltage	Pass	3A
Part 22, Subpart H, Part 24, Subpart E	RSS-GEN, 4.9	GSM ERP, EIRP	Pass	See test report TR2-0037-12-1h
Part 22, Subpart H Part 24, Subpart E	RSS-GEN, 4.9	GSM Radiated Spurious/Harmonic Emissions	Pass	See test report TR2-0037-12-1h
Part 2.1051 Part 22.917 Part 22.901(d)	RSS-GEN, 4.9	WCDMA Band V Conducted Spurious Emissions	Pass	1B
Part 2.1051 Part 24.238(a)	RSS-GEN, 4.9	WCDMA Band II Conducted Spurious Emissions	Pass	1B
Part 2.202 Part 22.917	RSS-GEN, 4.6	WCDMA Band V Occupied Bandwidth and Channel Mask	Pass	1B
Part 2.202 Part 24.238	RSS-GEN, 4.6	WCDMA Band II Occupied Bandwidth and Channel Mask	Pass	1B
Part 2.1046(a)	RSS-133, 6.4 RSS-132, 4.4	WCDMA Band II and V Conducted RF Output Power	Pass	2B
Part 2.1055(a)(d) Part 22.917	RSS-132, 4.3	WCDMA Band V Frequency Stability vs. Temperature and Voltage	Pass	3B

Part 2.1055(a)(d) Part 24.235	RSS-GEN, 4.7	WCDMA Band II Frequency Stability vs. Temperature and Voltage	Pass	3B
Part 22, Subpart H	RSS-GEN, 4.9	WCDMA Band V Radiated Spurious/Harmonic Emissions, ERP	Pass	See test report TR2-0037-12-1h
Part 24, Subpart E	RSS-GEN, 4.9	WCDMA Band II Radiated Spurious/Harmonic Emissions, EIRP	Pass	See test report TR2-0037-12-1h

F) Summary of Results

1) Conducted Emission Measurements

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

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions requirements in the PCS1900 as per 47 CFR 2.1051, CFR 24.238(a) and RSS-GEN, 4.9. The EUT was on the low, middle and high channels. The frequency range investigated was from 10 MHz to 20 GHz.
See APPENDIX 1A for test data

b) The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask requirements in the GSM850 as per 47 CFR 2.202, CFR 22.917 and RSS-GEN, 4.6. The EUT was measured in CALL and EDGE mode on the low, middle and high channels. The worst case occupied bandwidth was 247.0 kHz on the middle channel in CALL mode, and 245.0 kHz on middle channel in EDGE mode.
See APPENDIX 1A for test data.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask requirements in the PCS1900 as per 47 CFR 2.202, CFR 24.238 and RSS-GEN, 4.6. The EUT was measured in CALL and EDGE mode on the low, middle and high channels. The worst case occupied bandwidth was 248.0 kHz on the high channel in CALL, and 248.0 kHz on the middle in EDGE mode.
See APPENDIX 1A for test data.

c) The BlackBerry® smartphone met the requirements of the Tx Conducted RF output Power requirements in the GSM850 as per 47 CFR 2.1046, and RSS-GEN, 4.4. The EUT was measured on the low, middle and high channels.
See APPENDIX 2A for test data.

The BlackBerry® smartphone met the requirements of the Tx Conducted RF output Power requirements in the PCS1900 as per 47 CFR 2.1046, and RSS-GEN, 6.4. The EUT was on the low, middle and high channels.
See APPENDIX 2A for test data

d) The BlackBerry® smartphone met the requirements of the Frequency Stability requirements in the GSM850 as per 47 CFR 2.1055, CFR 22.917 and RSS-GEN, 4.3. The EUT was measured in GSM850 mode on the low, middle and high channels.
See APPENDIX 3A for test data.

The BlackBerry® smartphone met the requirements of the Frequency Stability requirements in the PCS1900 as per 47 CFR 2.1055, CFR 24.235 and RSS-GEN, 4.7. The EUT was measured in PCS1900 mode on the low, middle and high channels.
See APPENDIX 3A for test data.

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

The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions requirements in the WCDMA Band II as per 47 CFR 2.1051, CFR 24.238(a) and RSS-GEN, 4.9. The EUT was on the low, middle and high channels. The frequency range investigated was from 10 MHz to 20 GHz.
See APPENDIX 1B for test data

f) The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask requirements in the WCDMA Band V as per 47 CFR 2.202, CFR 22.917 and RSS-GEN, 4.6. The EUT was measured in Loopback and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.167 MHz on the low and middle channels in Loopback mode, and 4.167 MHz on all three channels in HSUPA mode.
See APPENDIX 1B for test data.

The BlackBerry® smartphone met the requirements of the Occupied Bandwidth and channel mask requirements in the WCDMA Band II as per 47 CFR 2.202, CFR 24.238 and RSS-GEN, 4.6. The EUT was measured in Loopback and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.175 MHz on the high channel in Loopback mode, and 4.175 MHz on the low and middle channels in HSUPA mode.
See APPENDIX 1B for test data.

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

The BlackBerry® smartphone met the requirements of the Tx Conducted RF output Power requirements in the WCDMA Band II as per 47 CFR 2.1046, and RSS-GEN, 6.4. The EUT was on the low, middle and high channels.
See APPENDIX 2B for test data

h) The BlackBerry® smartphone met the requirements of the Frequency Stability requirements in the WCDMA Band V as per 47 CFR 2.1055, CFR 22.917 and RSS-GEN, 4.3. The EUT was measured in WCDMA Band V mode on the low, middle and high channels.
See APPENDIX 3B for test data.

The BlackBerry® smartphone met the requirements of the Frequency Stability requirements in the WCDMA Band II as per 47 CFR 2.1055, CFR 24.235 and RSS-GEN, 4.7. The EUT was measured in WCDMA Band II mode on the low, middle and high channels.
See APPENDIX 3B for test data.

Measurement Uncertainty ± 3.2 dB

H) Compliance Test Equipment Used

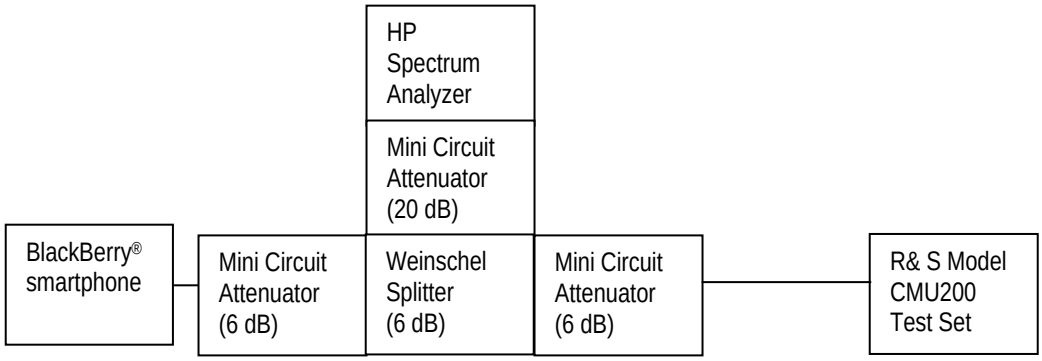
UNIT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL DUE DATE (YY MM DD)	USE
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	109747	12-11-20	RF Conducted Emissions
Spectrum Analyzer	HP	8563E	3745A08112	13-10-05	RF Conducted Emissions
DC Power Supply	HP	6632B	US37472178	12-09-27	RF Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0340060	12-10-20	RF Conducted Emissions

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

GSM Conducted RF Emission Test Data

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

Test Setup Diagram



Date of Test: August 10, 2012

The environmental test conditions were:

Temperature: 25.2 ºC
Relative Humidity: 36.5 %

The following measurements were performed by Berkin Can.

GSM Conducted RF Emission Test Data cont'd

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

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each carrier frequency of low, middle and high, the modulation spectrum was measured by both methods of 99% power bandwidth and –26 dBc bandwidth.
The resolution bandwidth required for out-of-band emissions in the 1 MHz bands immediately outside and adjacent to the frequency block, was determined to be at least 1% of the emission bandwidth.
The worst case –26dBc bandwidth for the GSM850 band was measured to be 270 kHz, and for the PCS1900 band was measured to be 273 kHz as shown below. Results were derived in a 3.0 kHz resolution bandwidth.
On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

Test Data for 850 band and 1900 band in Call mode

850 band Frequency (MHz)	-26dBc Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
824.2	268	243
837.6	270	247
848.8	270	243

1900 band Frequency (MHz)	-26dBc Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
1850.2	273	247
1880.0	270	247
1909.8	267	248

Measurement Plots for 850 and 1900 bands in Call mode
Refer to the following measurement plots for more detail.

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

GSM Conducted RF Emission Test Data cont'd

Test Data for 850 and 1900 bands in EDGE mode

850 band Frequency (MHz)	99% Occupied Bandwidth (kHz)
824.2	240
837.6	245
848.8	240

1900 band Frequency (MHz)	99% Occupied Bandwidth (kHz)
1850.2	245
1880.0	243
1909.8	248

Measurement Plots for 850 and 1900 bands in EDGE mode
Refer to the following measurement plots for more detail:

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

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

GSM Conducted RF Emission Test Data cont'd

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

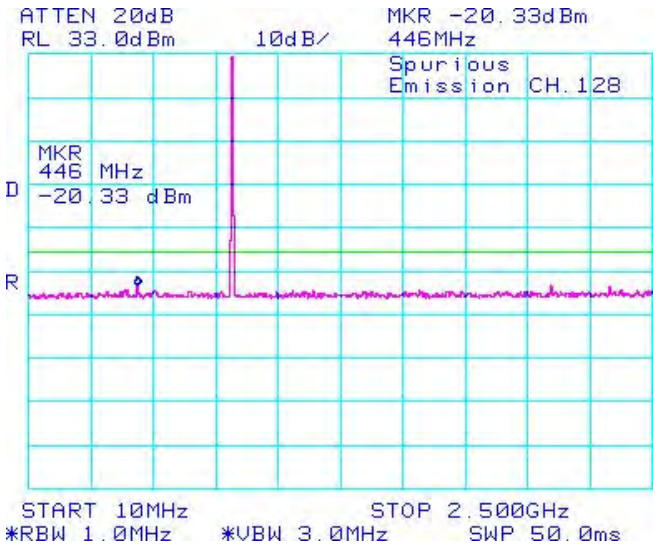


Figure 1-2a: GSM850 band, Spurious Conducted Emissions, Low channel

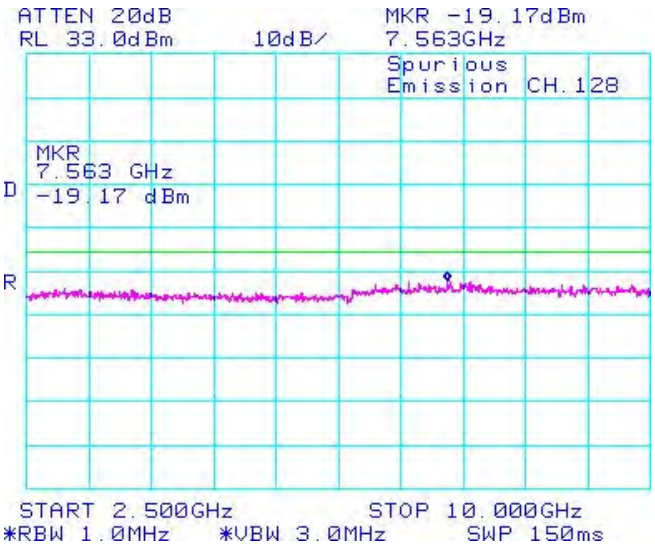


Figure 1-3a: GSM850 band, Spurious Conducted Emissions, Middle Channel

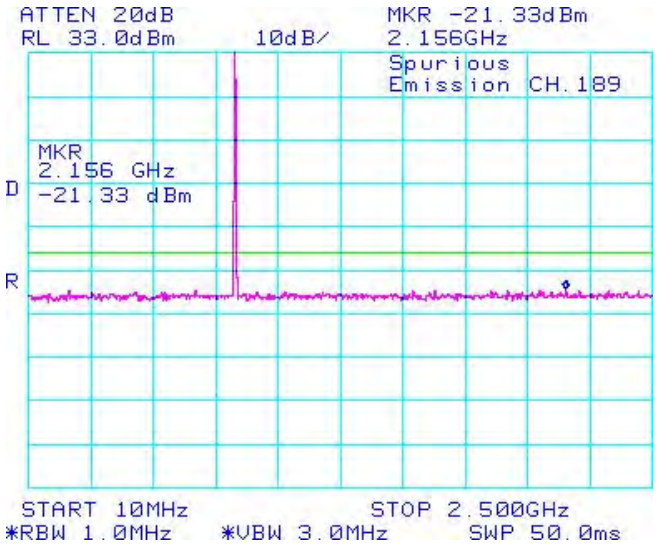
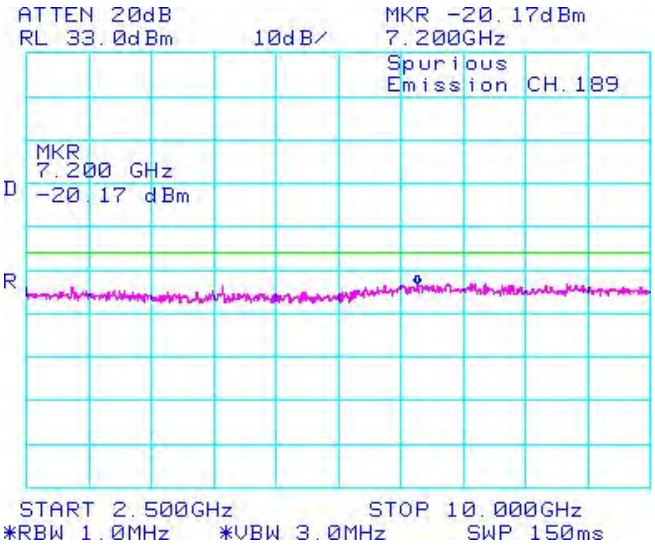


Figure 1-4a: GSM850 band, Spurious Conducted Emissions, Middle Channel



GSM Conducted RF Emission Test Data cont'd

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

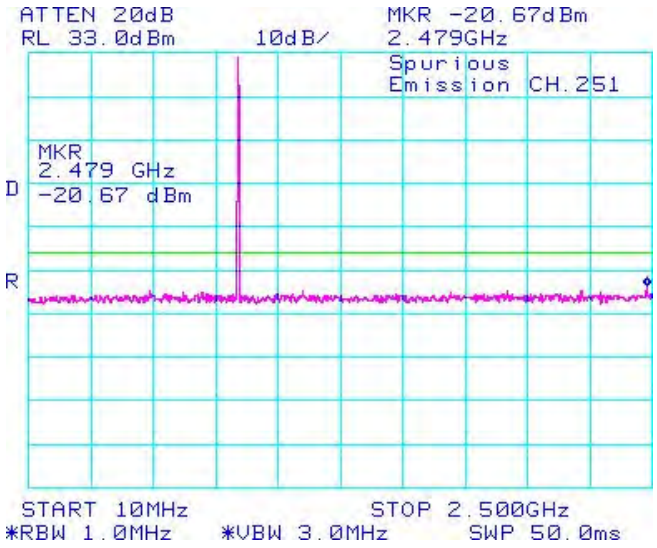


Figure 1-6a: GSM850 band, Spurious Conducted Emissions, High Channel

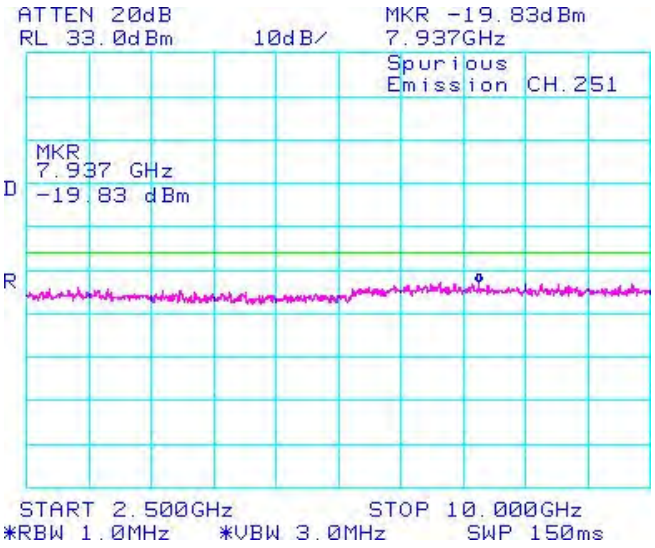


Figure 1-7a: PCS1900 band, Spurious Conducted Emissions, Low Channel

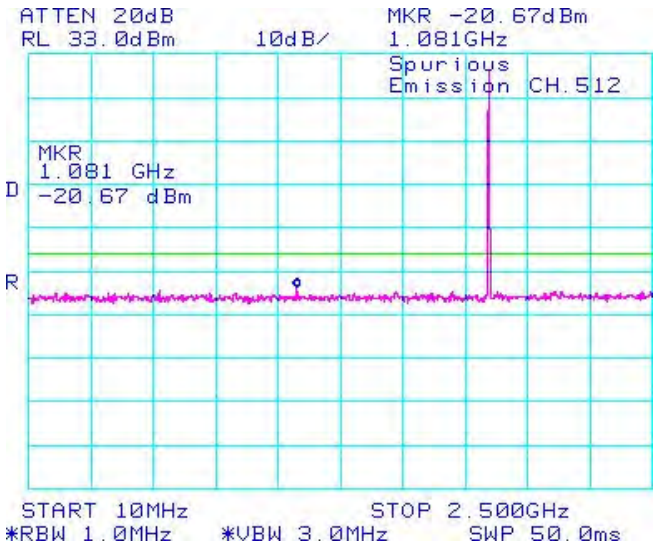
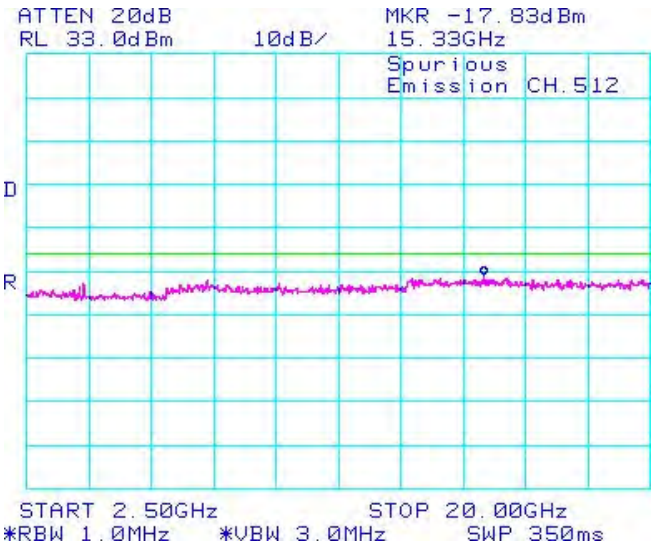


Figure 1-8a: PCS1900 band, Spurious Conducted Emissions, Low Channel



GSM Conducted RF Emission Test Data cont'd

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

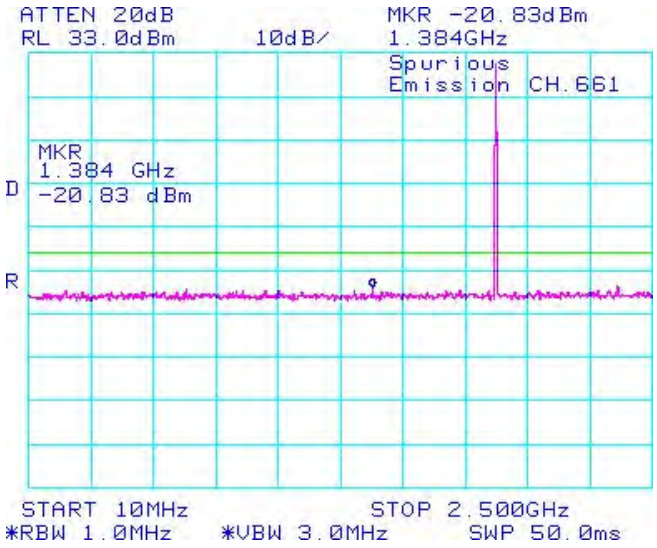


Figure 1-10a: PCS1900 band, Spurious Conducted Emissions, Middle Channel

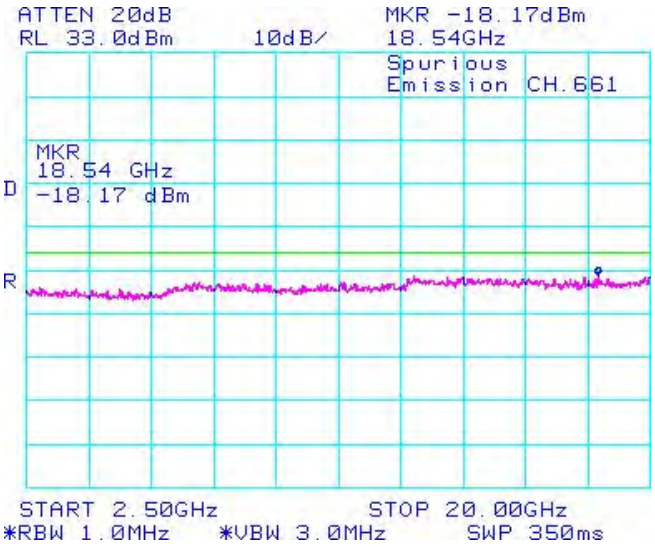


Figure 1-11a: PCS1900 band, Spurious Conducted Emissions, High Channel

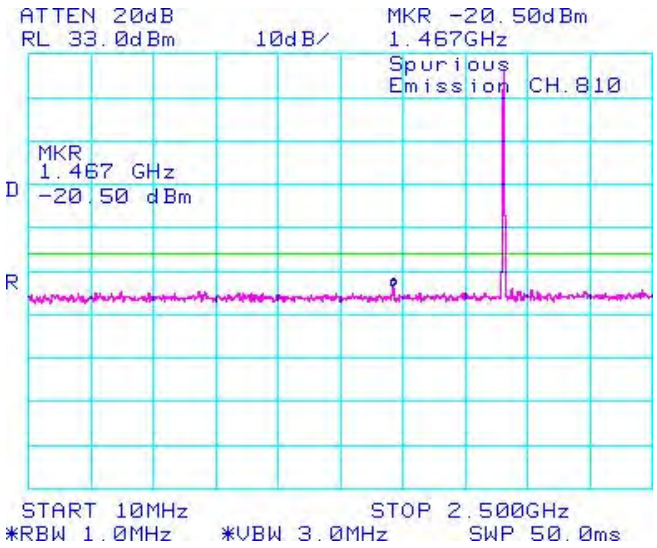
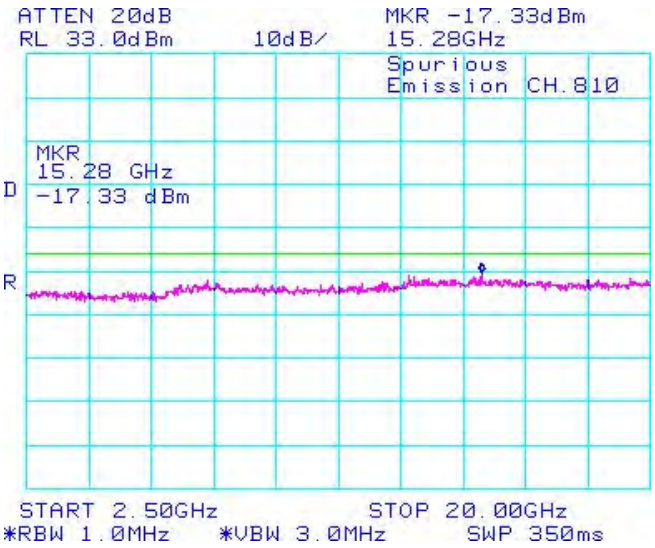


Figure 1-12a: PCS1900 band, Spurious Conducted Emissions, High Channel



GSM Conducted RF Emission Test Data cont'd

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

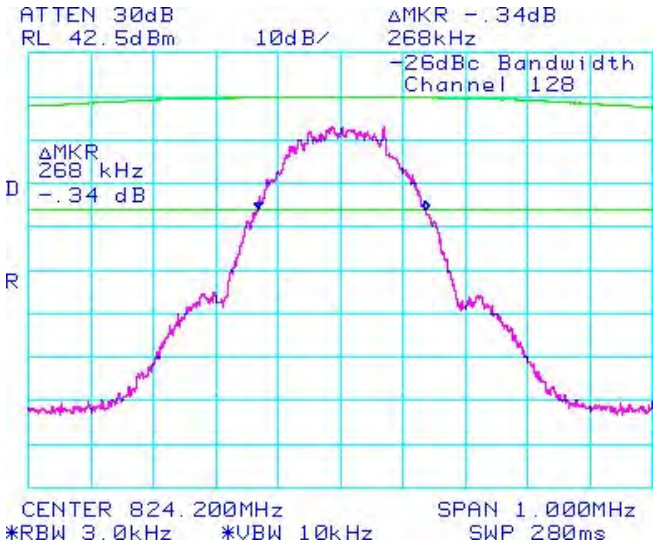


Figure 1-14a: Occupied Bandwidth, GSM850 band Low Channel in GSM mode

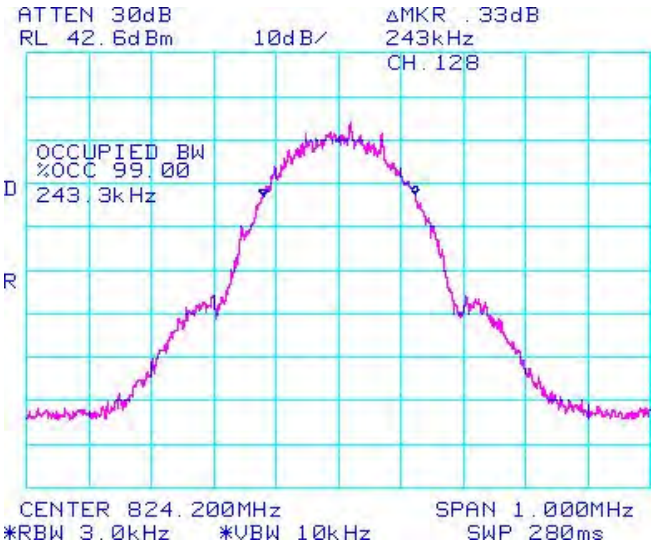


Figure 1-15a: -26dBc bandwidth, GSM850 band Middle Channel in GSM mode

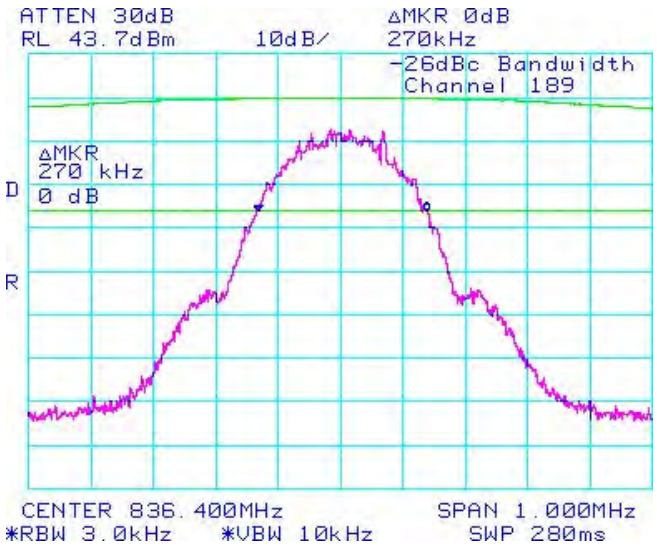
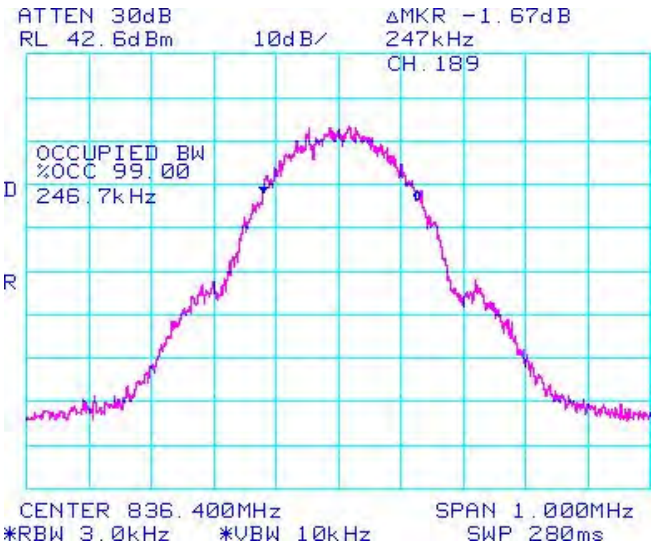


Figure 1-16a: Occupied Bandwidth, GSM850 band Middle Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

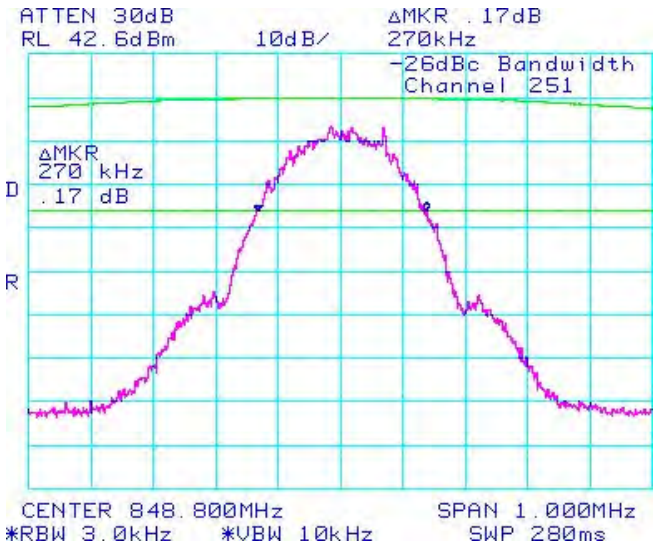


Figure 1-18a: Occupied Bandwidth, GSM850 band High Channel in GSM mode

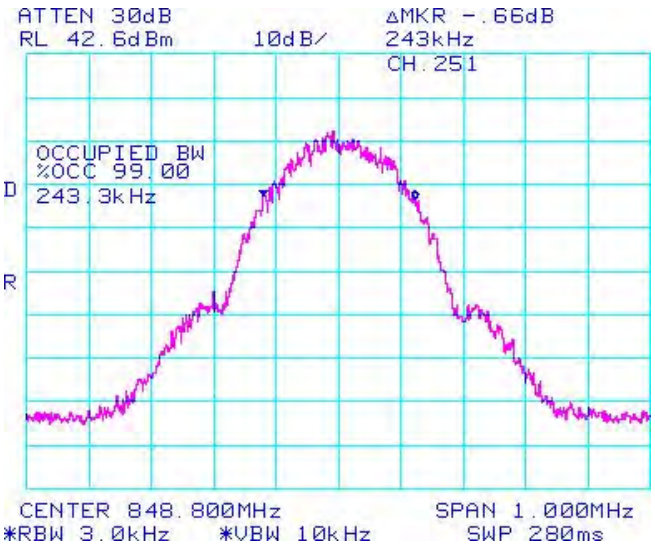


Figure 1-19a: -26dBc bandwidth, PCS1900 Low Channel in GSM mode

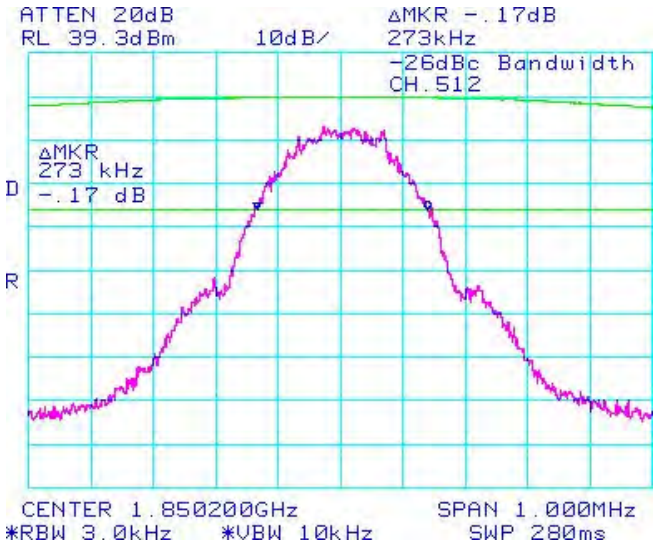
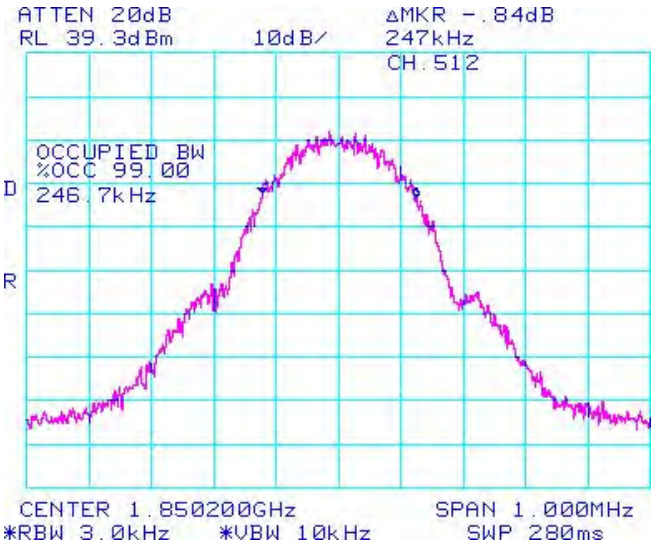


Figure 1-20a: Occupied Bandwidth, PCS1900 Low Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

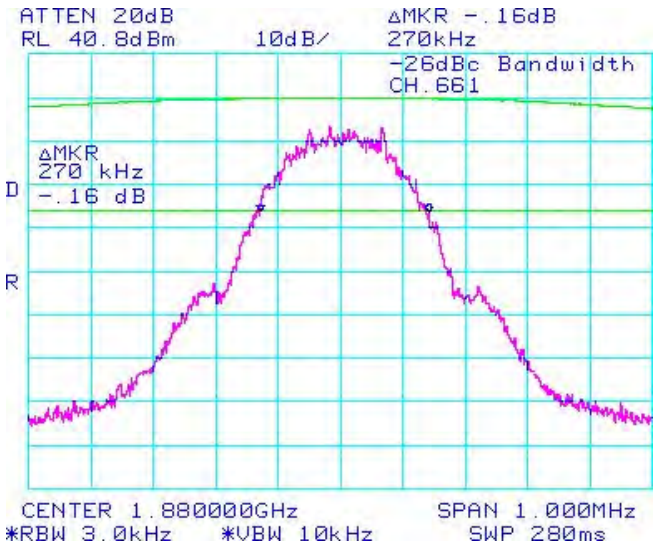


Figure 1-22a: Occupied Bandwidth, PCS1900 Middle Channel in GSM mode

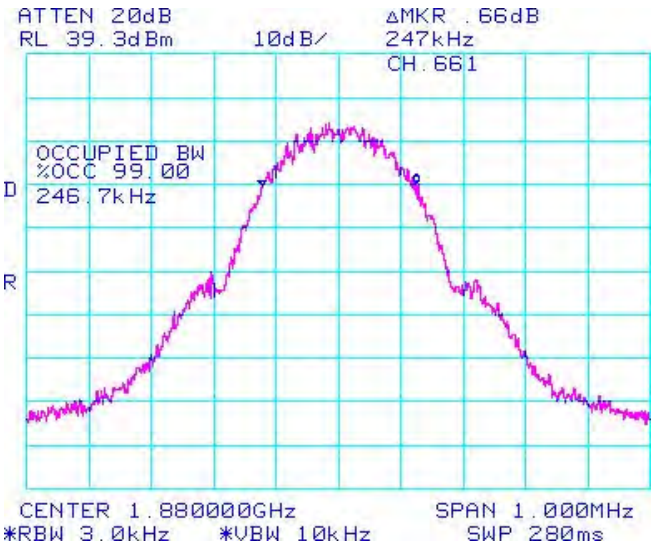


Figure 1-23a: -26dBc bandwidth, PCS1900 High Channel in GSM mode

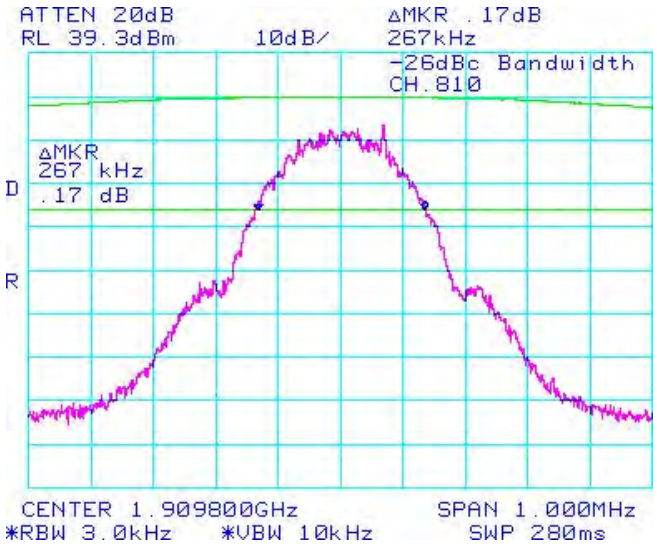
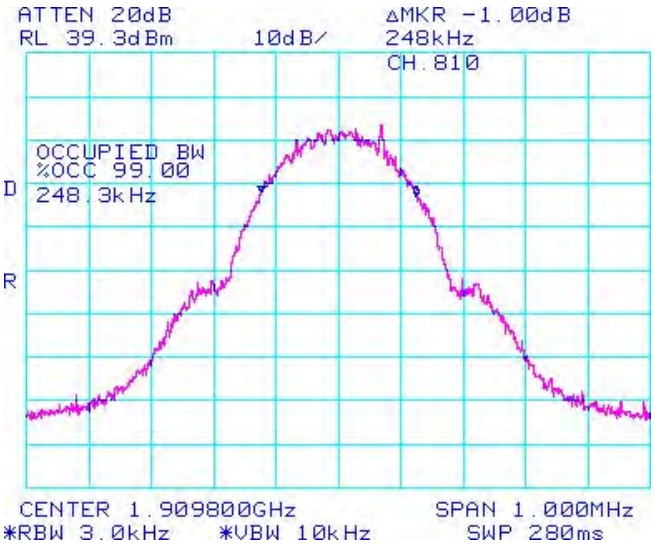


Figure 1-24a: Occupied Bandwidth, PCS1900 High Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

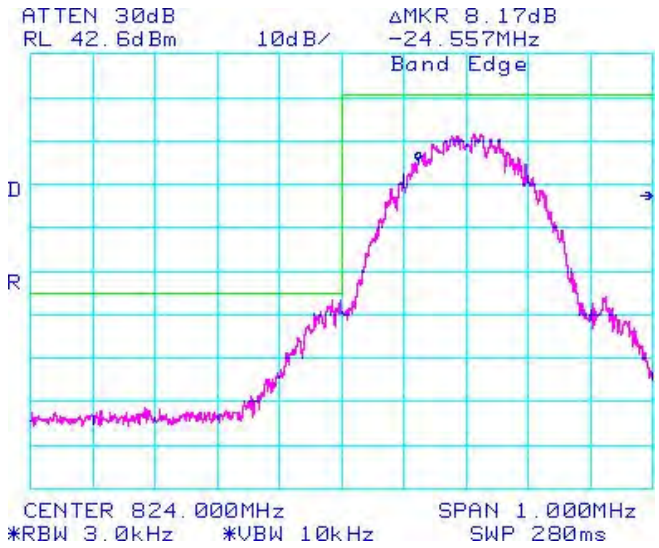


Figure 1-26a: GSM850 band High Channel Mask in GSM mode

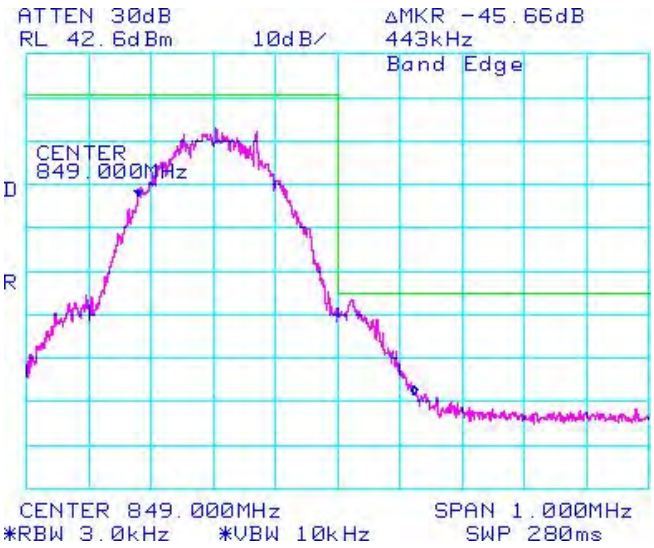


Figure 1-27a: PCS1900, Low Channel Mask in GSM mode

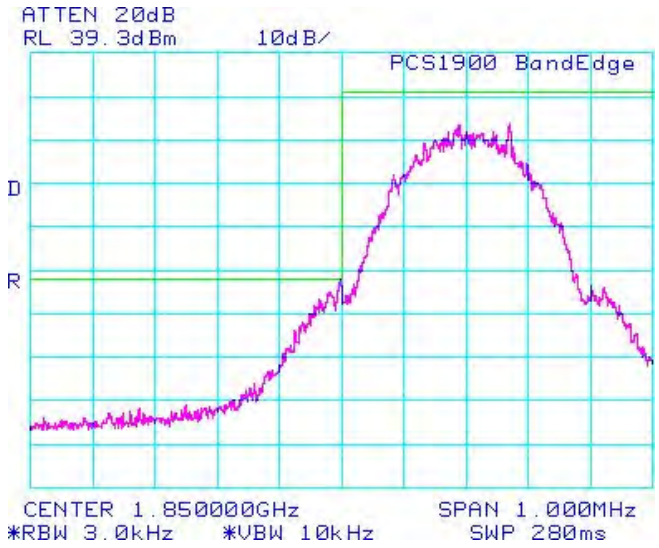
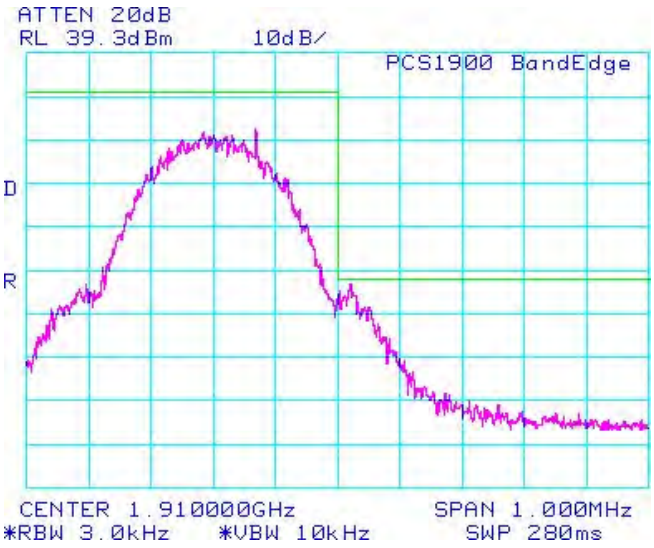


Figure 1-28a: PCS1900, High Channel Mask in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

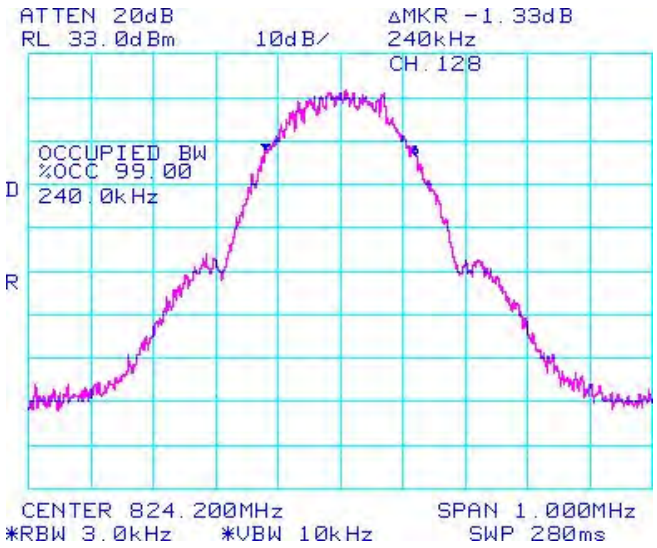


Figure 1-30a: Occupied Bandwidth, GSM850 Band, Middle Channel in EDGE mode

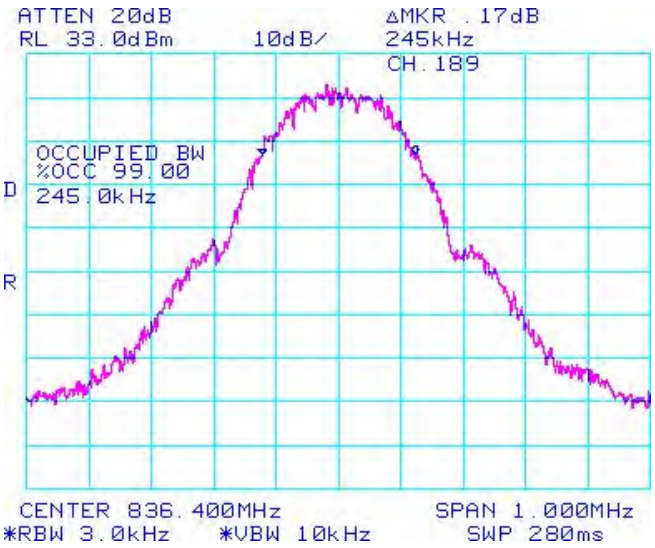


Figure 1-31a: Occupied Bandwidth, GSM850 band, High Channel in EDGE mode

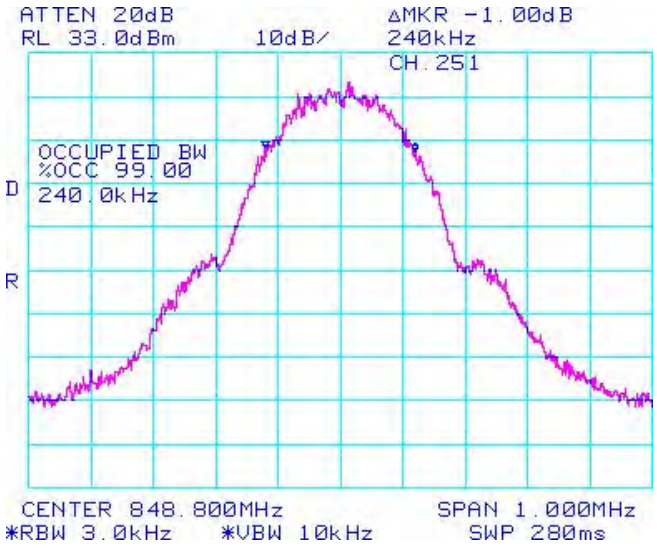
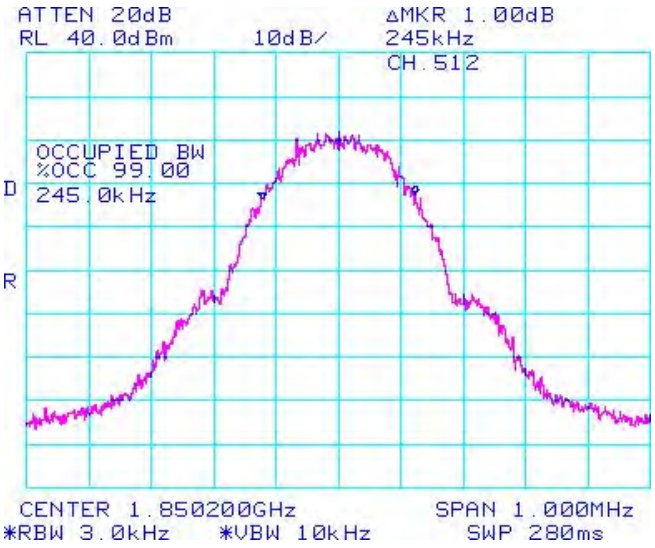


Figure 1-32a: Occupied Bandwidth, PCS1900 Band, Low Channel in EDGE mode



GSM Conducted RF Emission Test Data cont'd

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

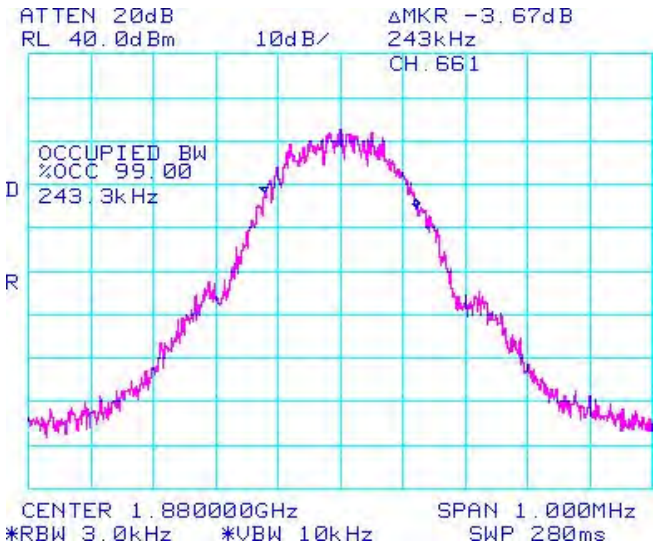


Figure 1-34a: Occupied Bandwidth, PCS1900 Band, High Channel in EDGE mode

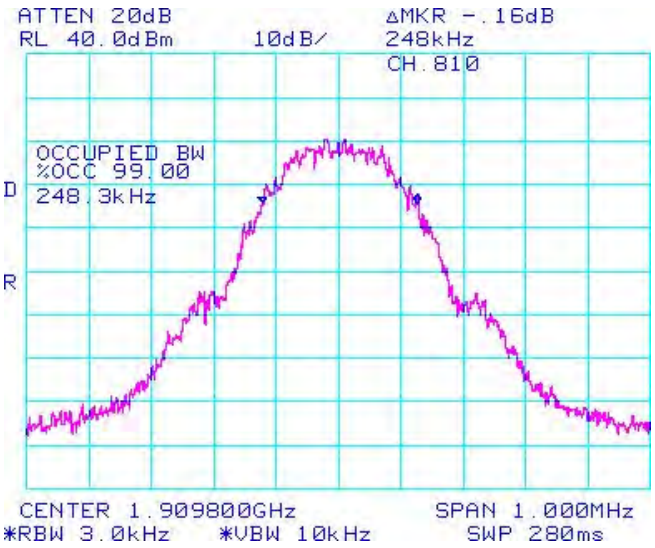


Figure 1-35a: GSM850 Band, Low Channel Mask in EDGE mode

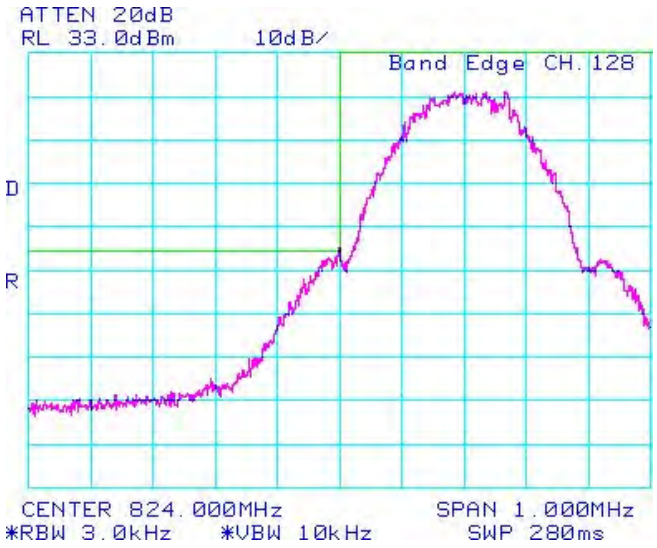
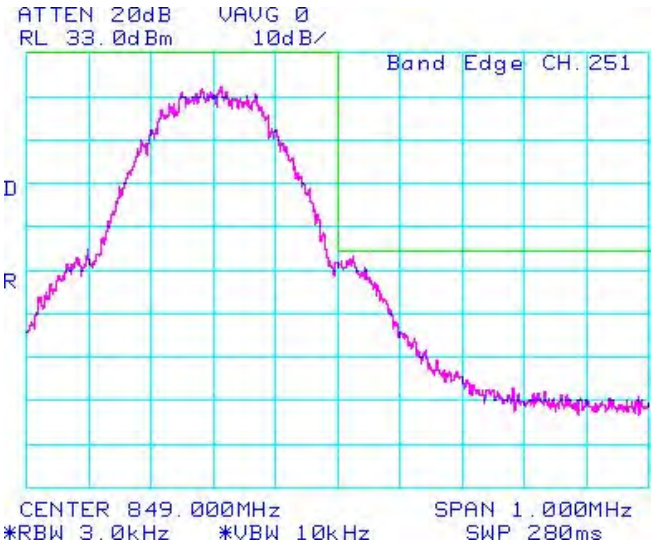


Figure 1-36a: GSM850 Band, High Channel Mask in EDGE mode



GSM Conducted RF Emission Test Data cont'd

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

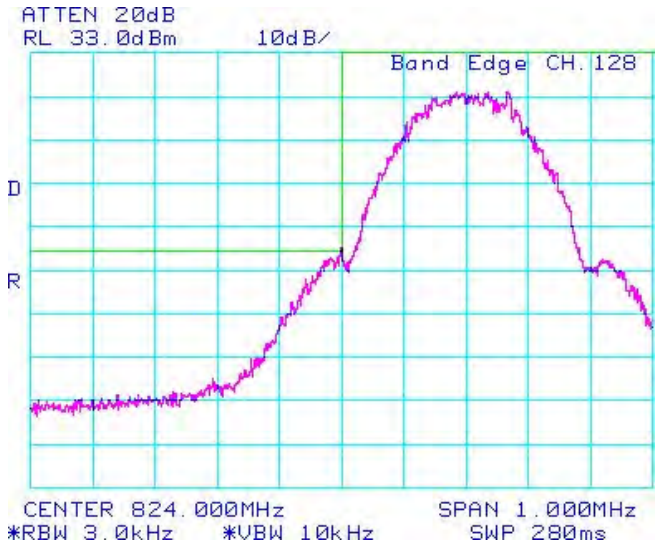
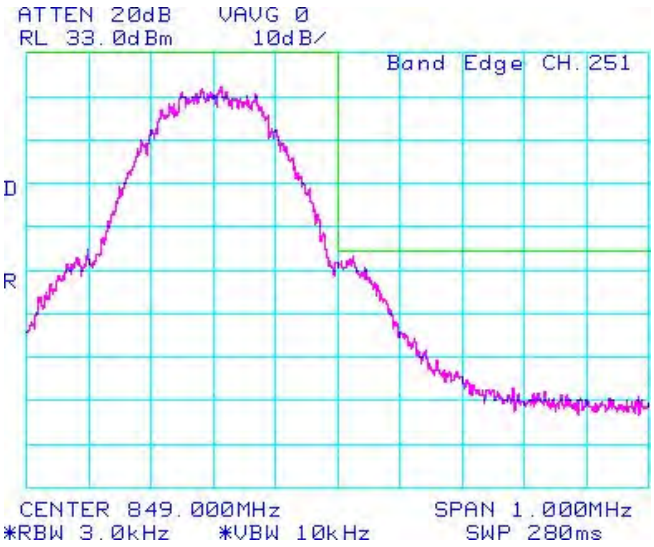


Figure 1-38a: PCS1900 Band, High Channel Mask in EDGE mode



GSM Conducted RF Emission Test Data cont'd

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

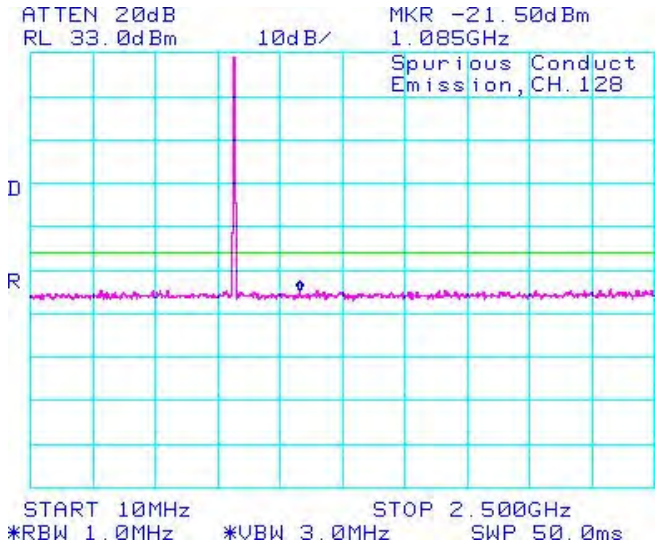


Figure 1-40a: GSM850 band, Spurious Conducted Emissions, Low channel in Edge Mode

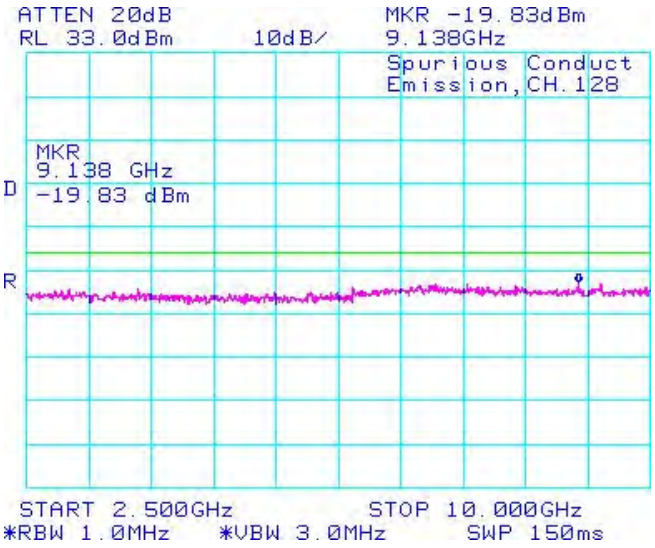


Figure 1-41a: GSM850 band, Spurious Conducted Emissions, Middle channel in Edge Mode

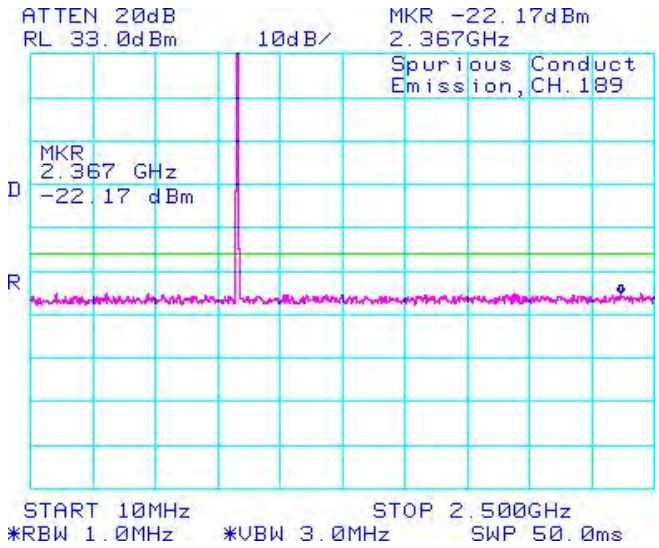
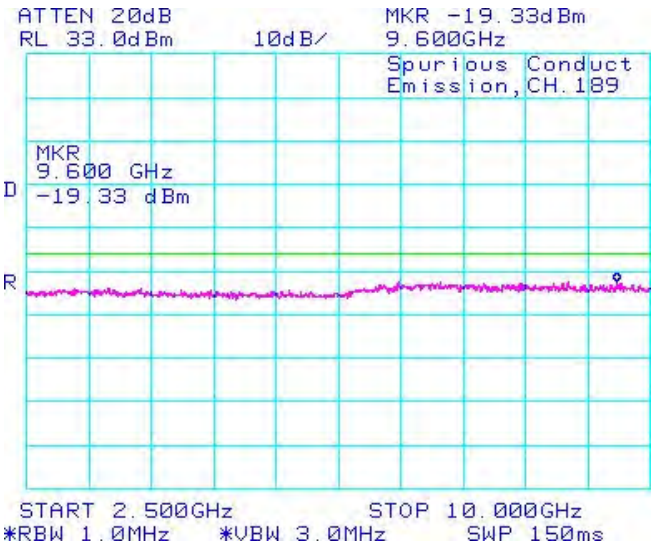


Figure 1-42a: GSM850 band, Spurious Conducted Emissions, Middle channel in Edge Mode



GSM Conducted RF Emission Test Data cont'd

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

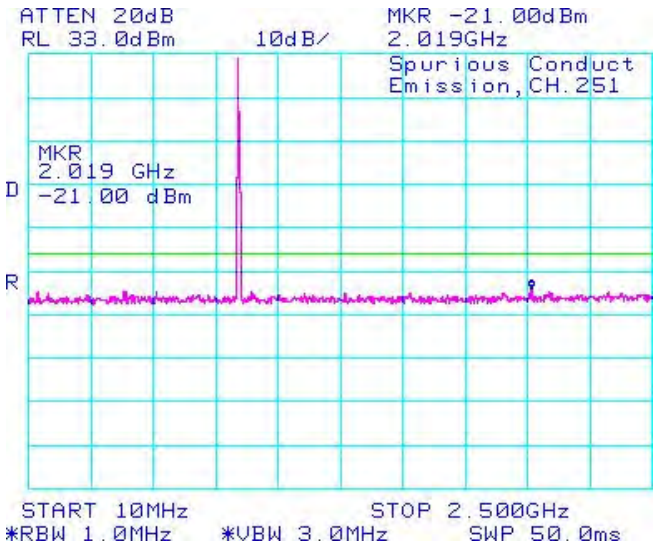


Figure 1-44a: GSM850 band, Spurious Conducted Emissions, High channel in Edge Mode

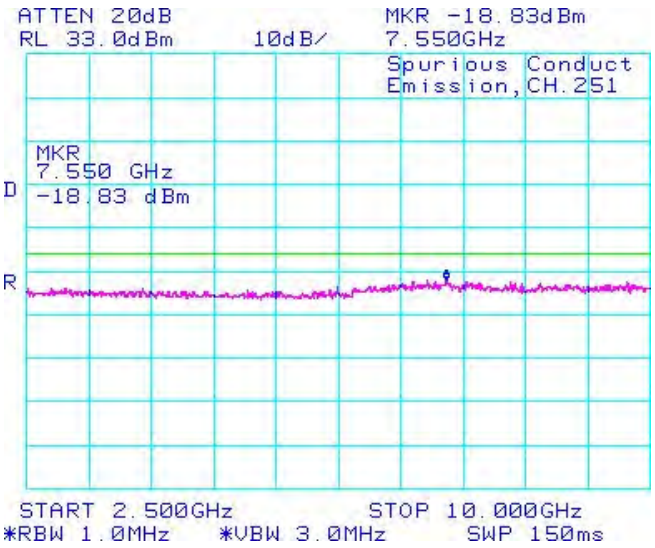


Figure 1-45a: PCS1900 band, Spurious Conducted Emissions, Low channel in Edge Mode

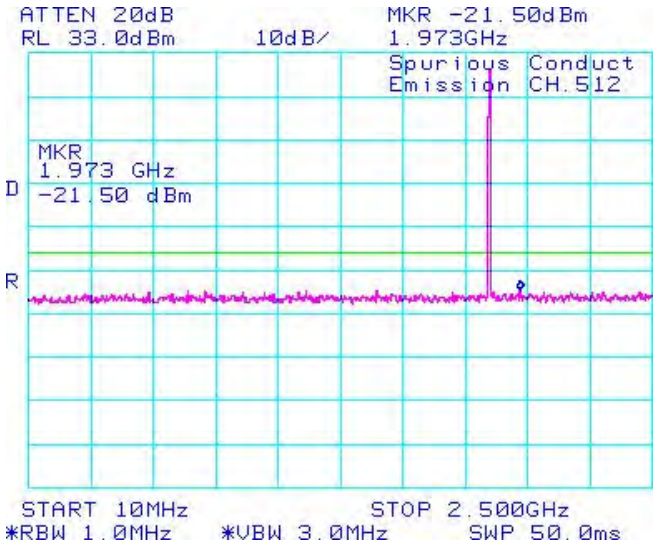
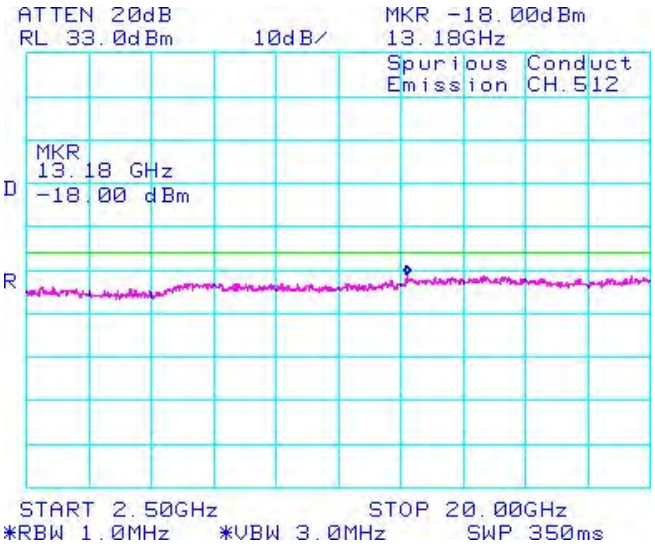


Figure 1-46a: PCS1900 band, Spurious Conducted Emissions, Low channel in Edge Mode



GSM Conducted RF Emission Test Data cont'd

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

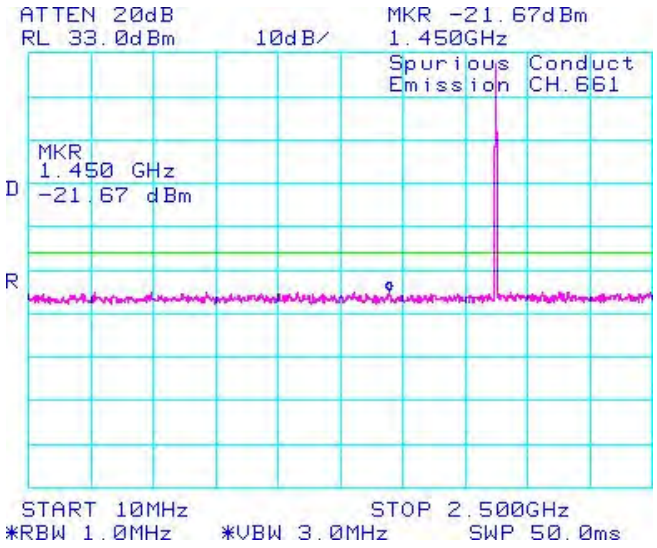


Figure 1-48a: PCS1900 band, Spurious Conducted Emissions, middle channel in Edge Mode

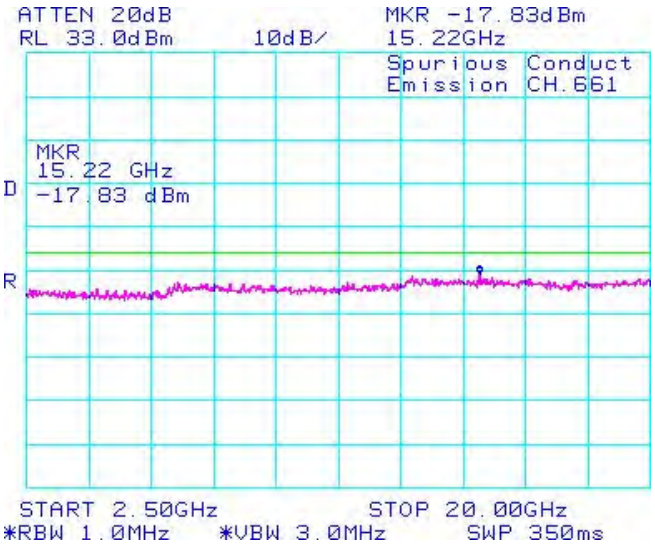


Figure 1-49a: PCS1900 band, Spurious Conducted Emissions, High channel in Edge Mode

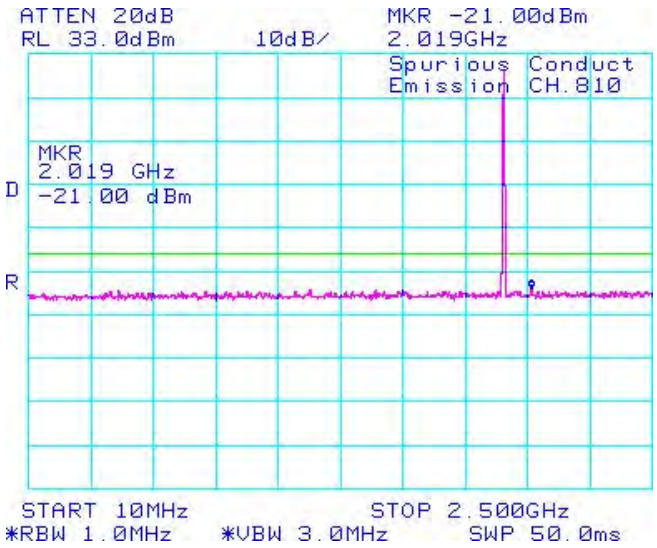
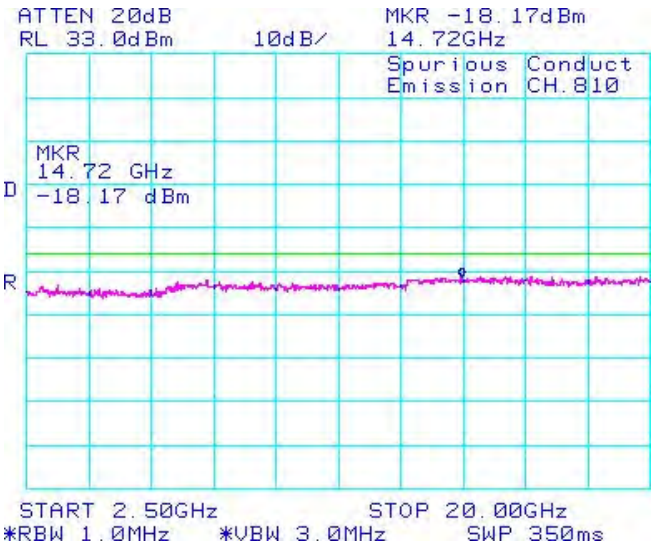


Figure 1-50a: PCS1900 band, Spurious Conducted Emissions, High channel in Edge Mode

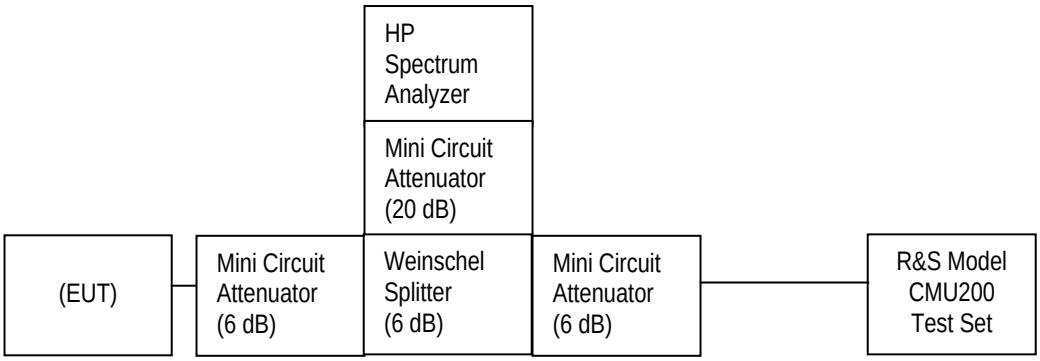


APPENDIX 1B– WCDMA Band II/V CONDUCTED RF EMISSIONS TEST DATA/PLOTS

WCDMA BAND II/V Conducted RF Emission Test Data

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

Test Setup Diagram



Date of Test: August 15, 2012

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

The following measurements were performed by Berkin Can.

WCDMA Conducted RF Emission Test Data cont'd

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 24.238(a), CFR 4.202, CFR 22 Subpart H, RSS-132 and RSS - 133 were measured from 10 MHz to 20 GHz.

–26 dBc Bandwidth and Occupied Bandwidth (99%)

For each 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 4.683 MHz, and for the PCS1900 band was measured to be 4.700 MHz as shown below. Results were derived in a 3.0 kHz resolution bandwidth.
On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

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

WCDMA Band V Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
826.400	4.683	4.167
836.400	4.675	4.167
846.600	4.675	4.158

WCDMA Band II Frequency (MHz)	26dBc Occupied Bandwidth (MHz	99% Occupied Bandwidth (MHz)
1852.400	4.700	4.167
1880.000	4.683	4.117
1907.600	4.692	4.175

Measurement Plots for WCDMA Band V and WCDMA BAND II in Loopback mode
Refer to the following measurement plots for more detail:

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

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

WCDMA Conducted RF Emission Test Data cont'd

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

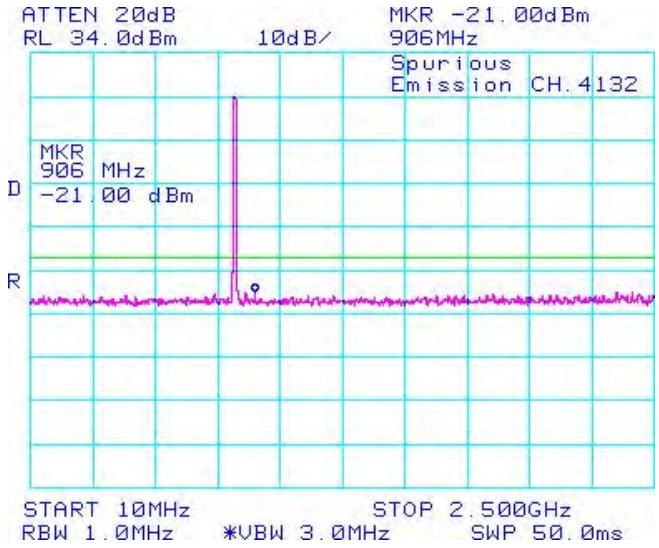


Figure 1-2b: Band V, Spurious Conducted Emissions, Low channel

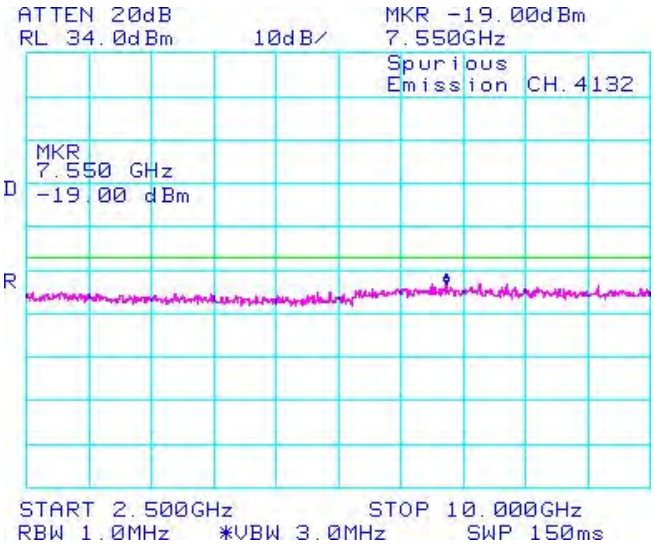


Figure 1-3b: Band V, Spurious Conducted Emissions, Middle channel

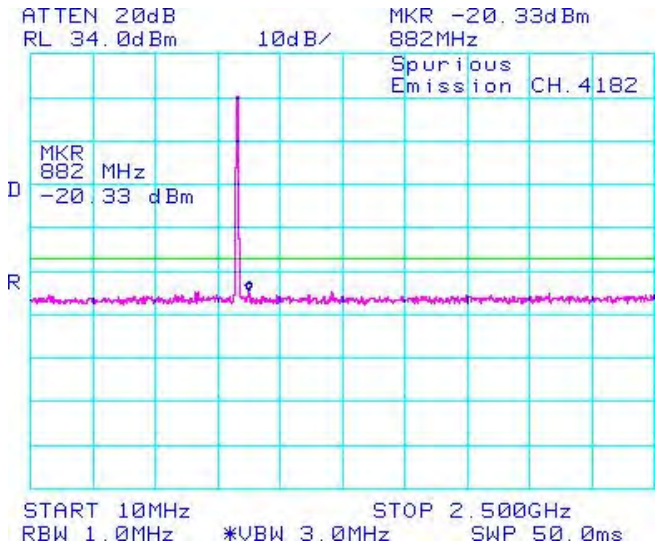
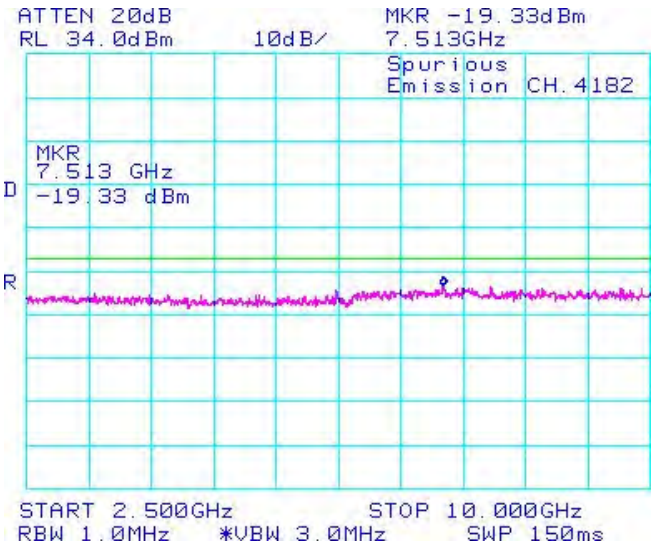


Figure 1-4b: Band V, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

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

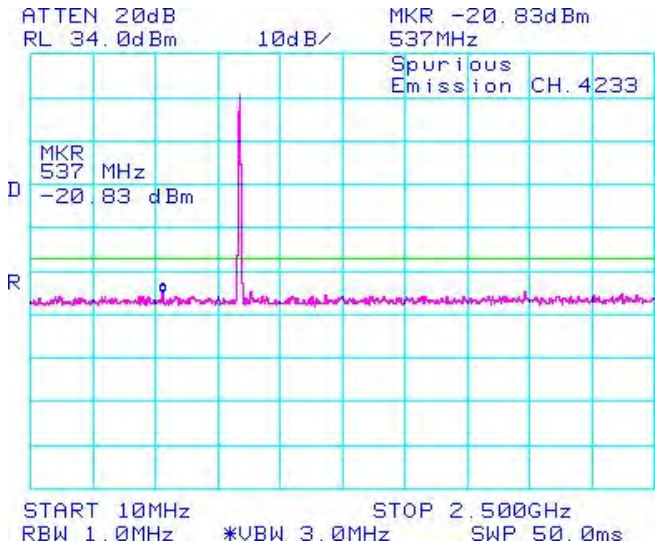


Figure 1-6b: Band V, Spurious Conducted Emissions, High Channel

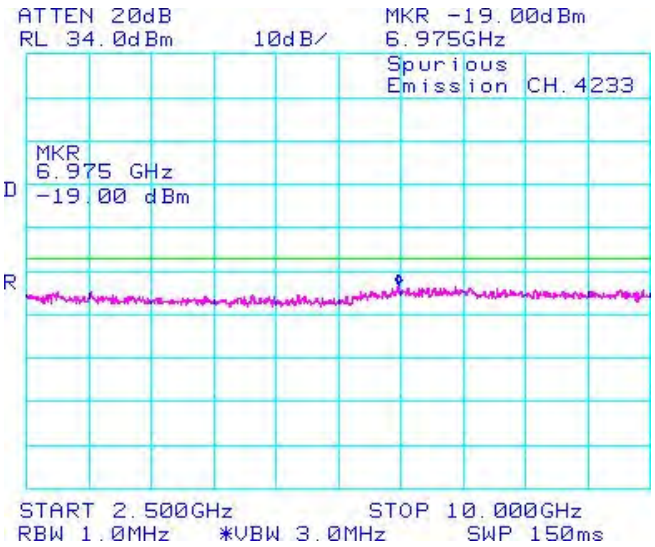


Figure 1-7b:, BAND II Spurious Conducted Emissions, Low Channel

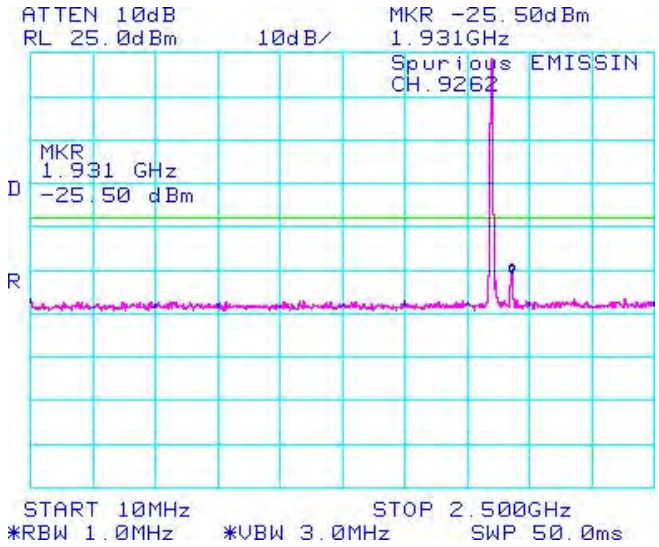
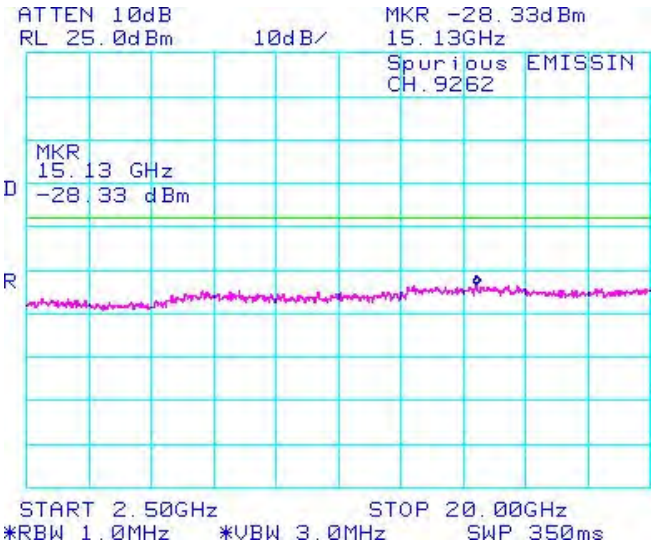


Figure 1-8b: BAND II, Spurious Conducted Emissions, Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

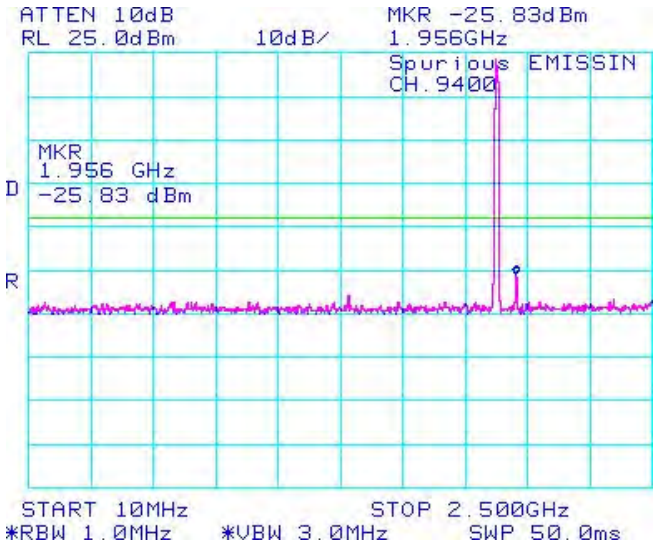


Figure 1-10b: BAND II, Spurious Conducted Emissions, Middle Channel

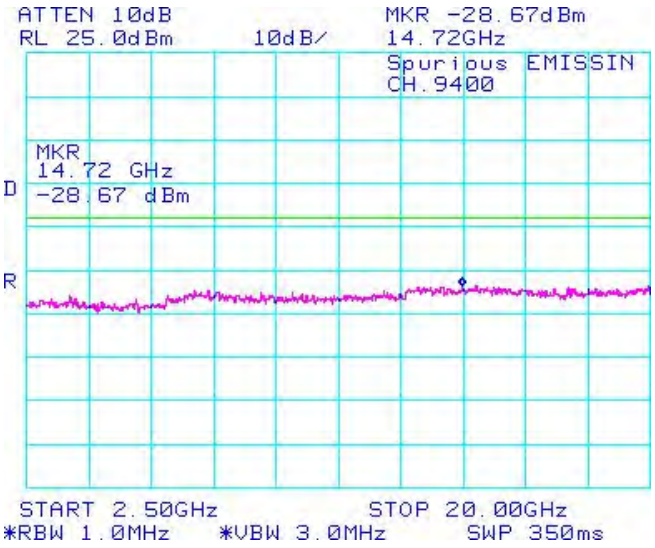


Figure 1-11b: BAND II, Spurious Conducted Emissions, High Channel

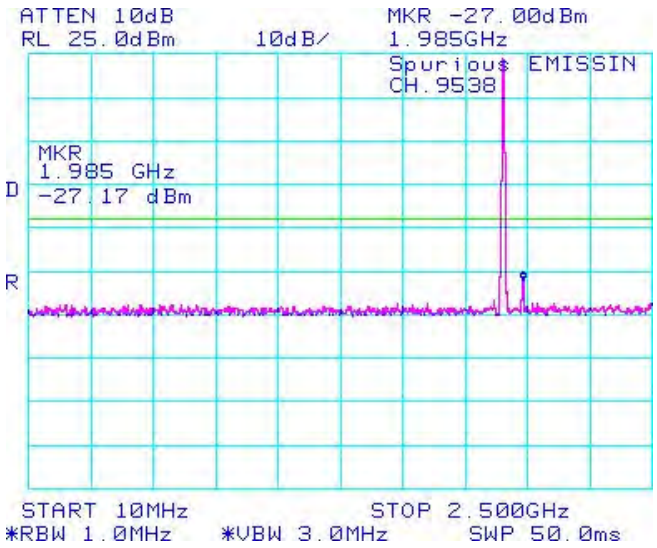
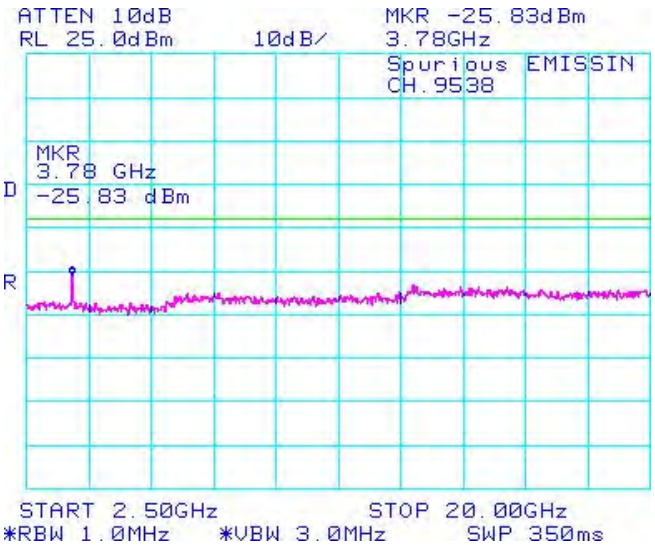


Figure 1-12b: BAND II, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

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

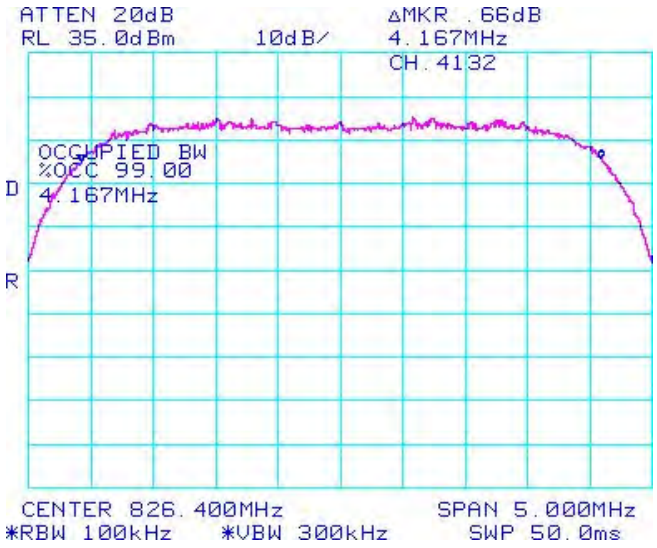


Figure 1-14b: Occupied Bandwidth, Band V Middle Channel

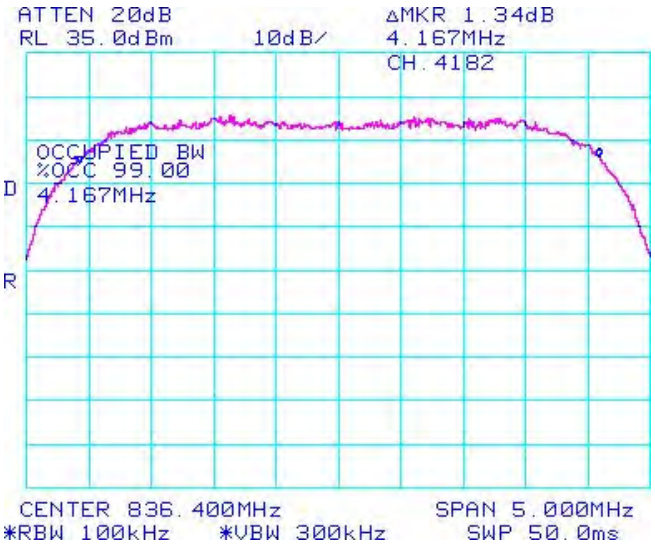
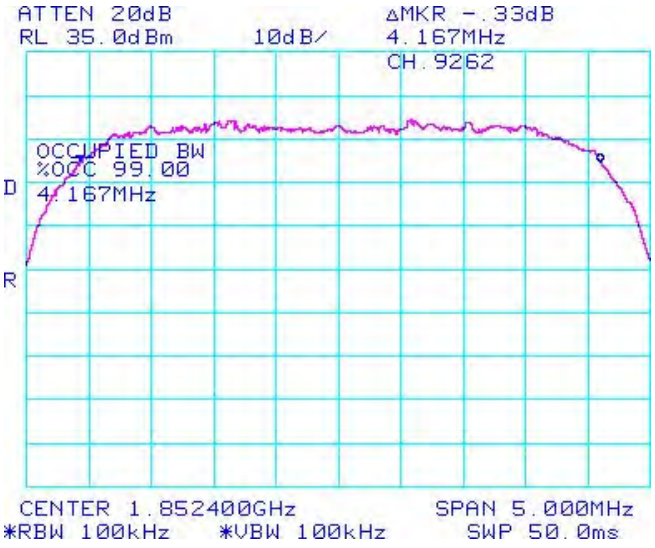


Figure 1-15b: Occupied Bandwidth, Band V High Channel

Figure 1-16b: Occupied Bandwidth, BAND II Low Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-17b: Occupied Bandwidth, BAND II Middle Channel

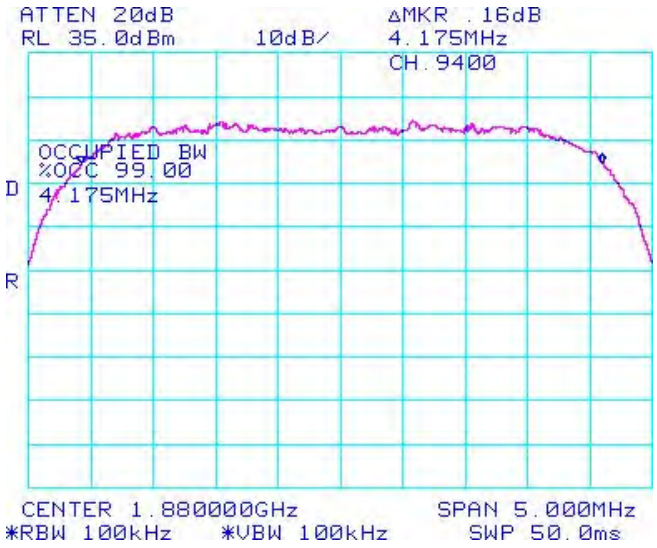


Figure 1-18b: Occupied Bandwidth, BAND II High Channel

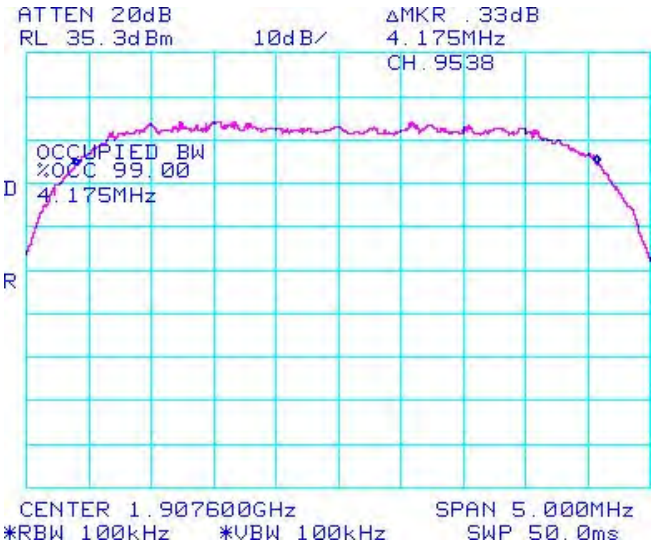


Figure 1-19b: -26 dBc Bandwidth, Band V Low Channel

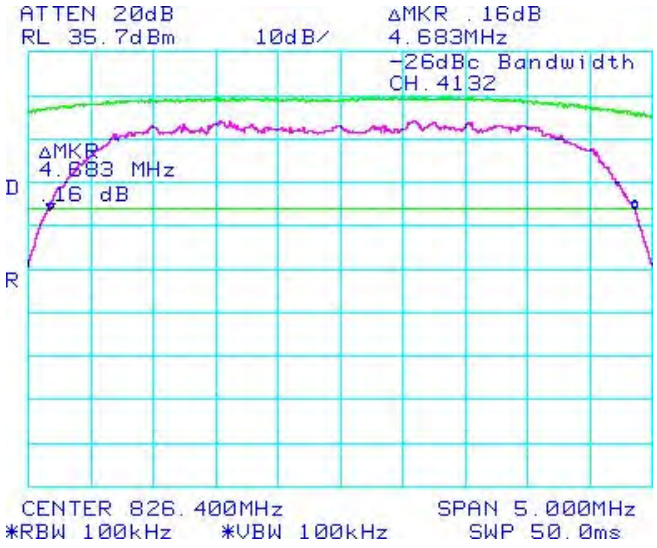
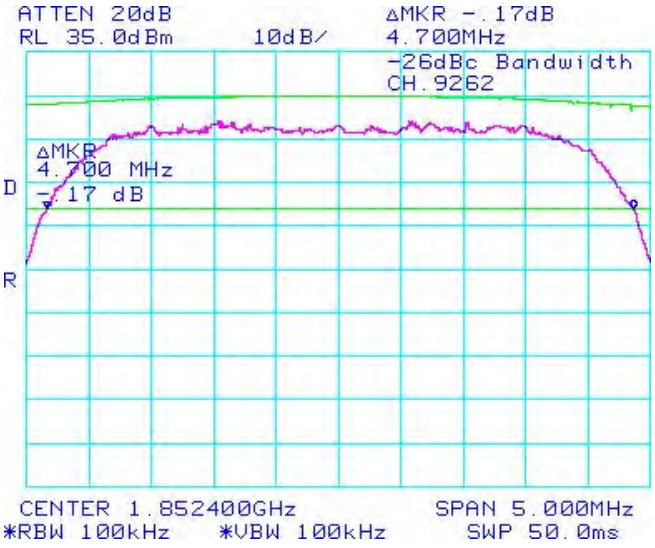


Figure 1-20b: -26 dBc Bandwidth, Band II Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

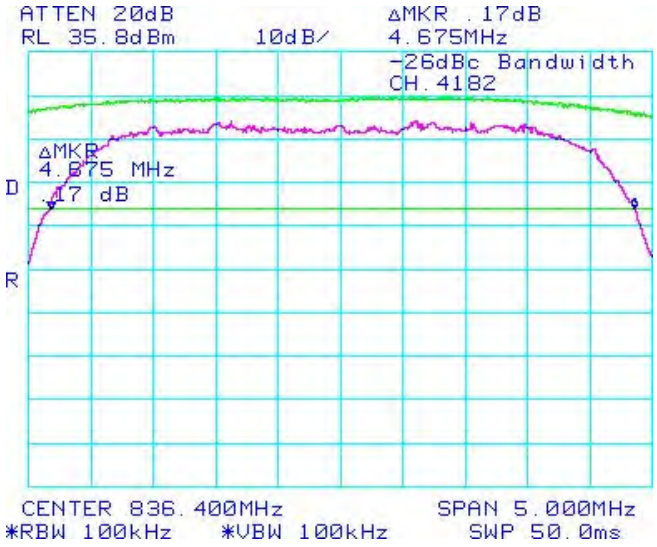


Figure 1-22b: -26 dBc Bandwidth, Band II Middle Channel

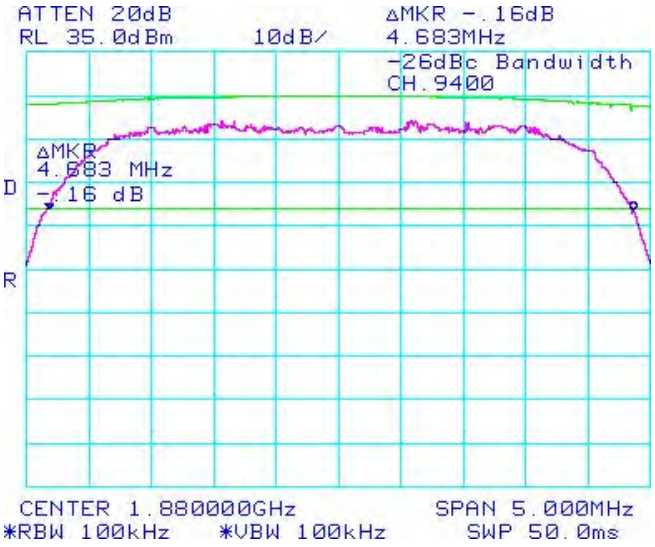


Figure 1-23b: -26 dBc Bandwidth, Band V High Channel

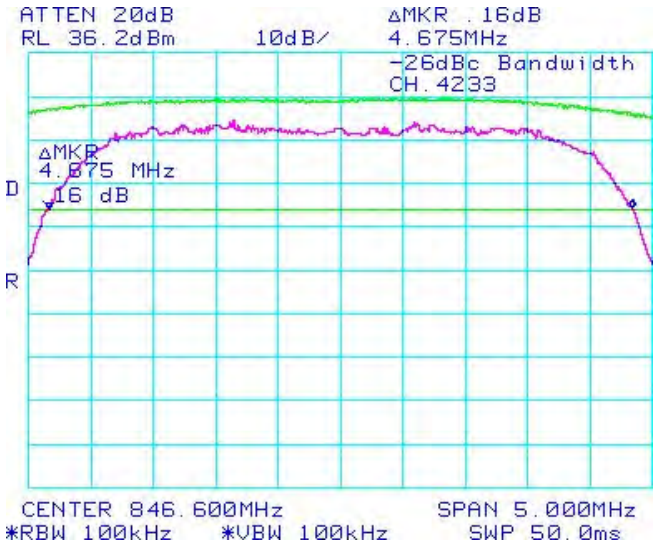
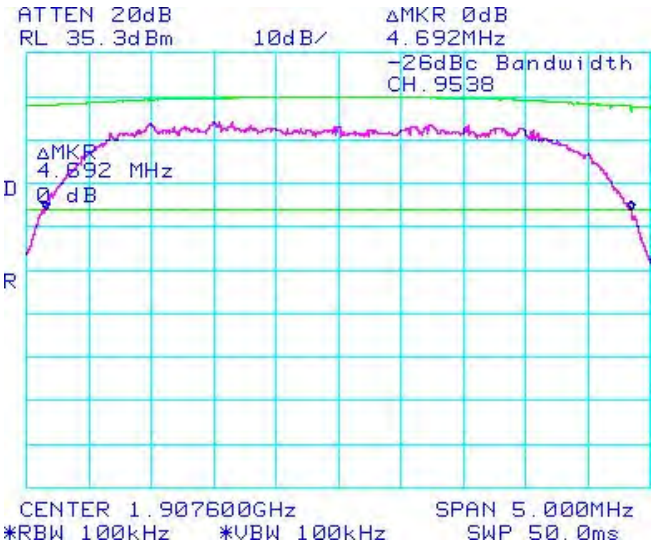


Figure 1-24b: -26 dBc Bandwidth, Band II High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-25b: Band II Low Channel Mask

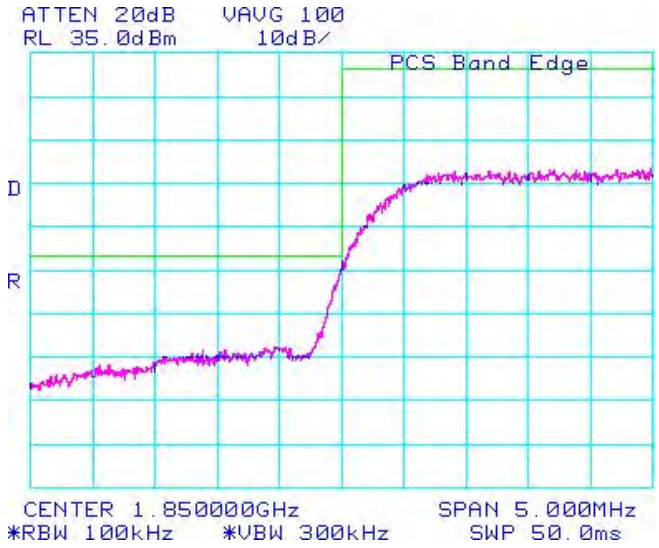


Figure 1-26b: Band II High Channel Mask

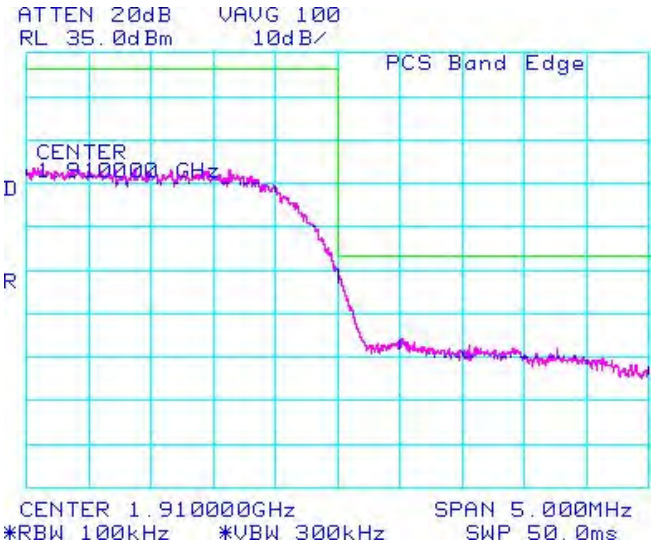


Figure 1-27b: Band V Low Channel Mask

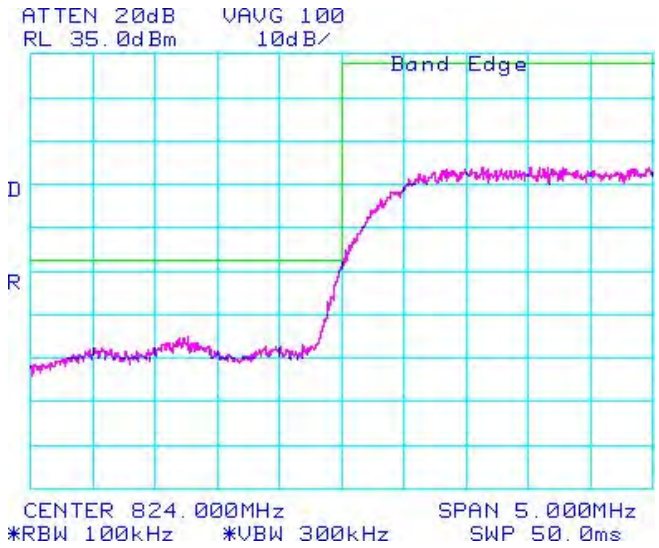
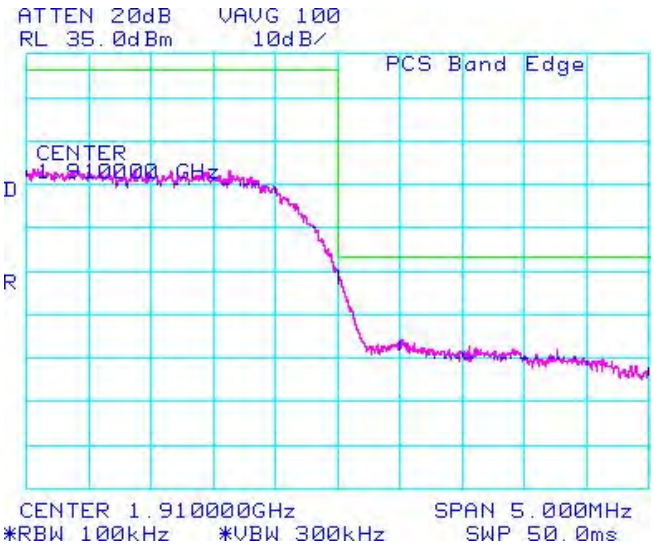


Figure 1-28b: Band V High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

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

Date of Test: August 15, 2012

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

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

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

BAND II Frequency (MHz)	99% Occupied Bandwidth (MHz)
1852.400	4.175
1880.000	4.175
1907.600	4.158

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

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

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

WCDMA Conducted RF Emission Test Data cont'd

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

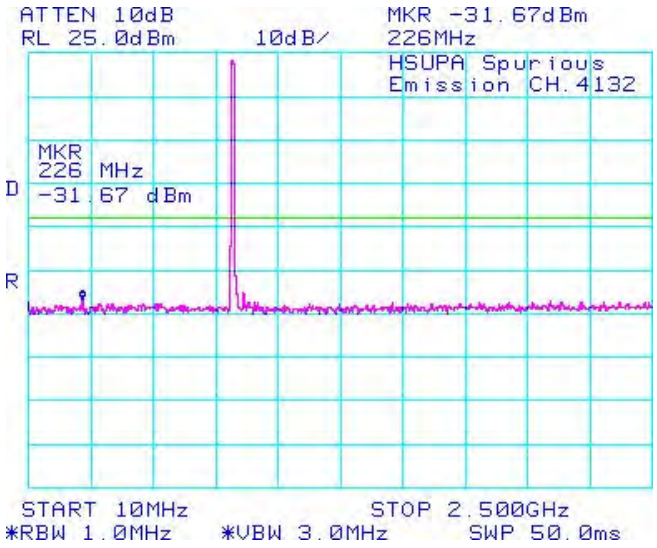


Figure 1-30b: Band V, Spurious Conducted Emissions, Low channel

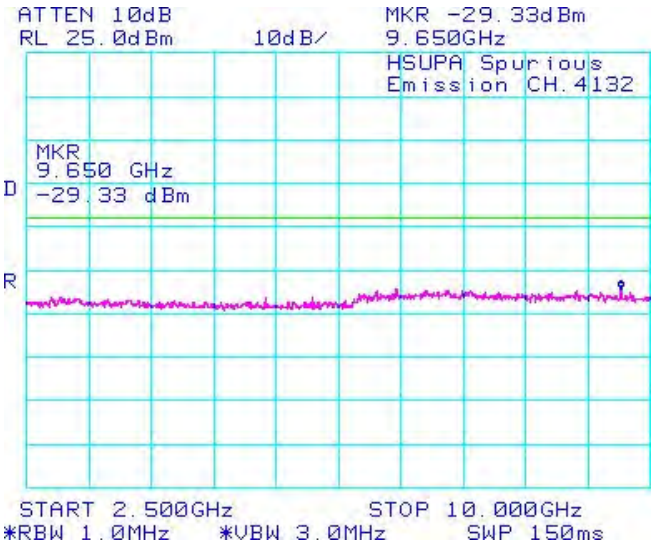


Figure 1-31b: Band V , Spurious Conducted Emissions, Middle channel

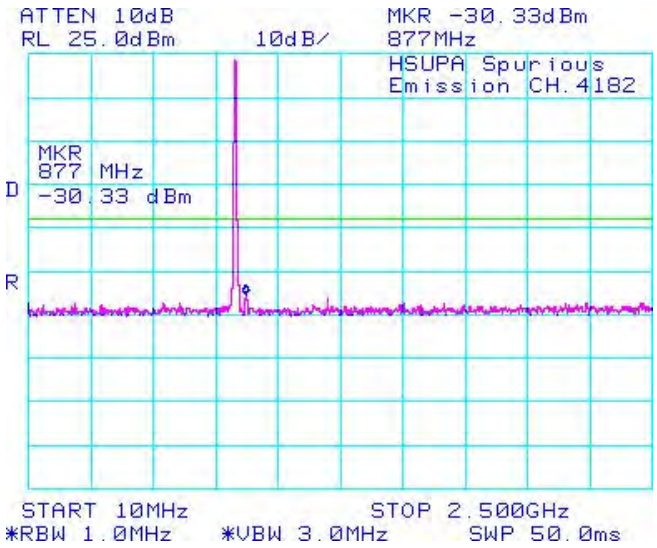
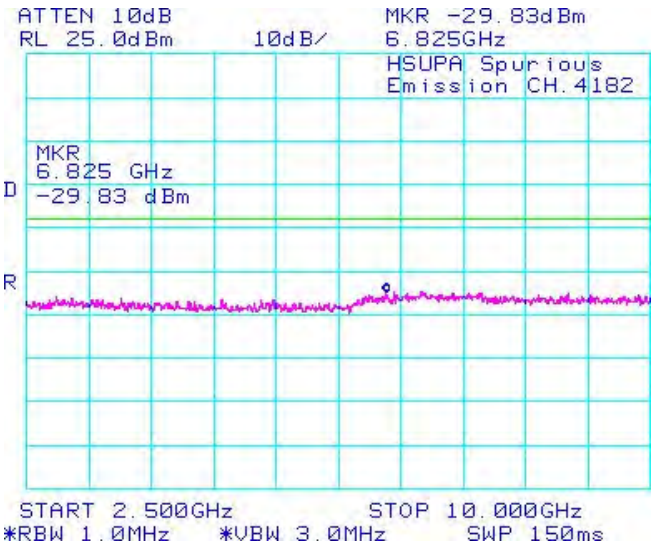


Figure 1-32b: Band V , Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

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

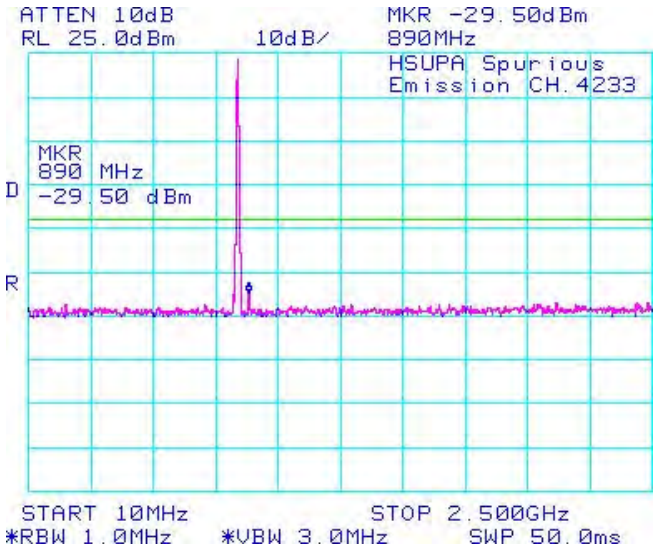


Figure 1-34b: Band V , Spurious Conducted Emissions, High Channel

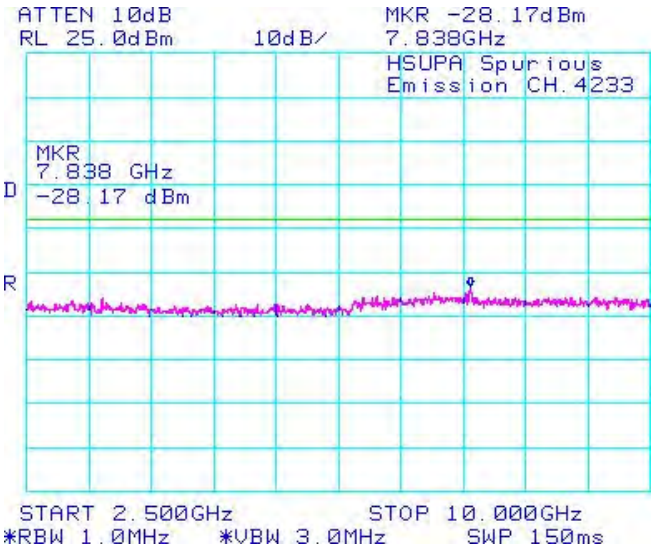


Figure 1-35b: Band II, Spurious Conducted Emissions, Low Channel

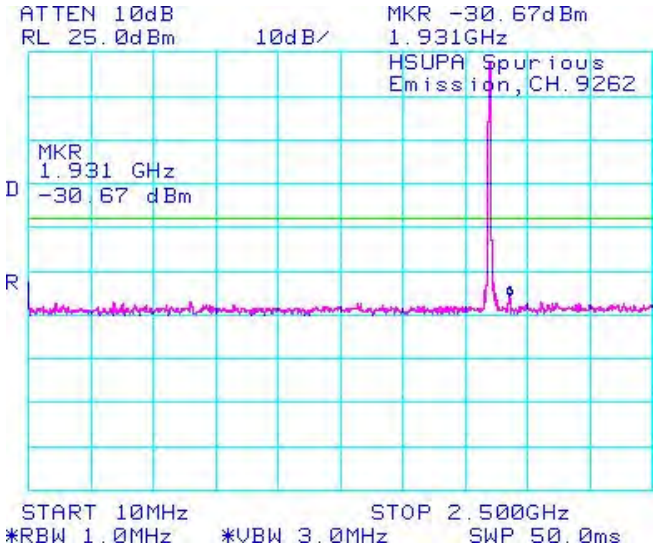
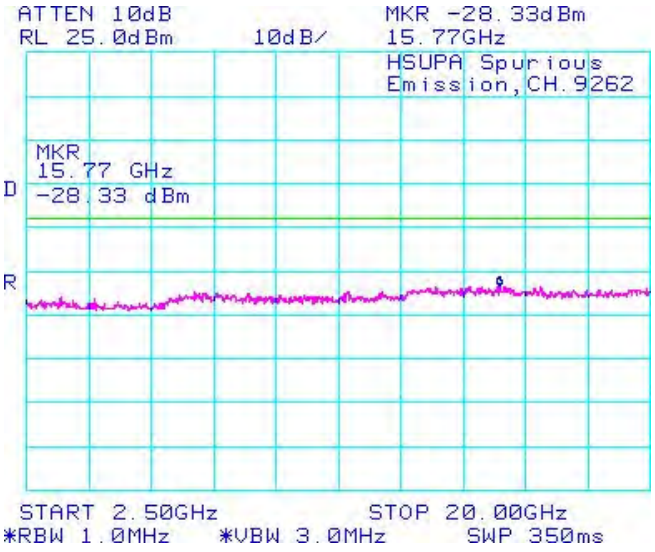


Figure 1-36b: Band II, Spurious Conducted Emissions, Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

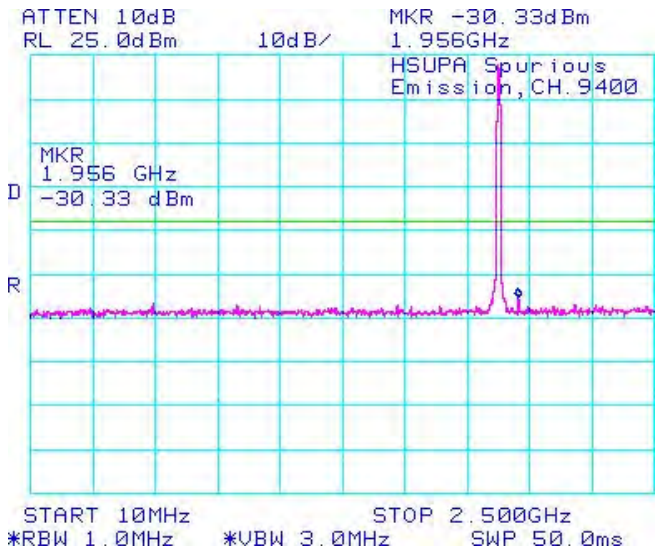


Figure 1-38b: Band II, Spurious Conducted Emissions, Middle Channel

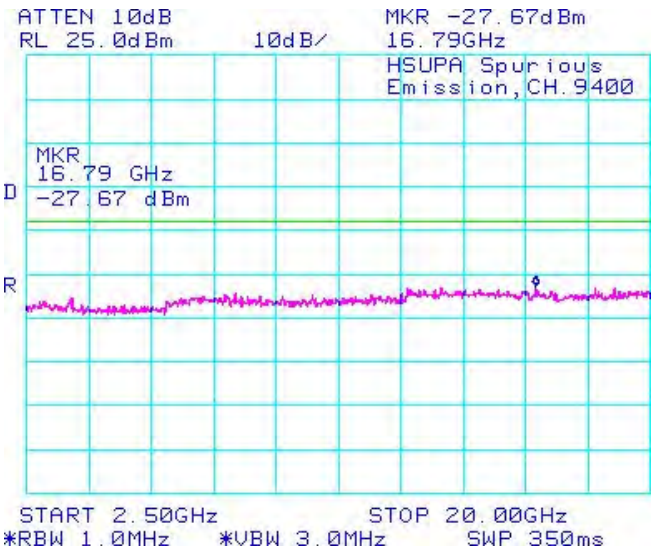


Figure 1-39b: Band II, Spurious Conducted Emissions, High Channel

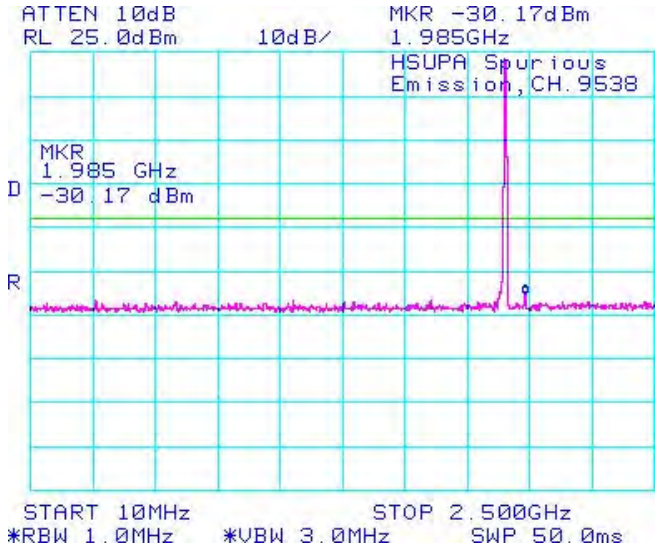
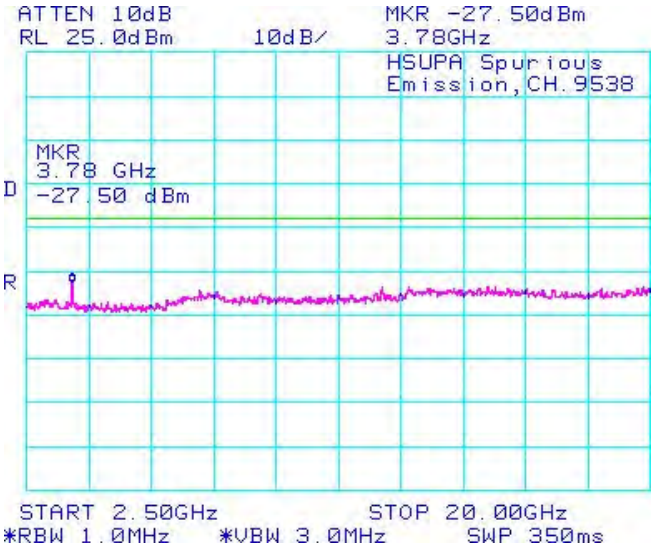


Figure 1-40b: Band II, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

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

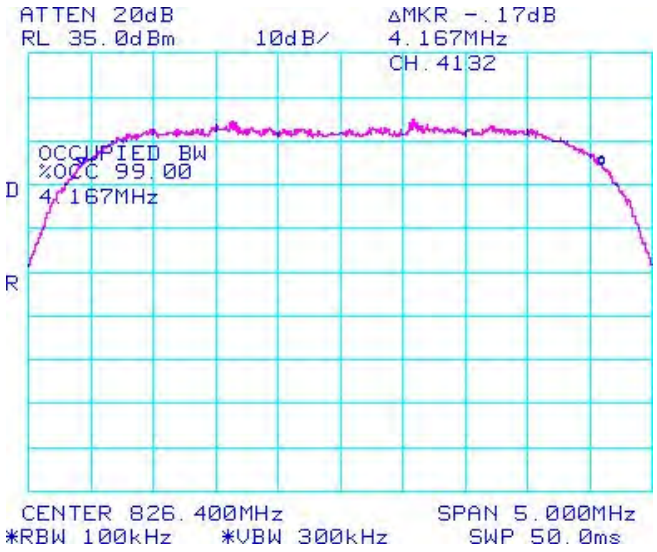


Figure 1-42b: Occupied Bandwidth, Band V Middle Channel

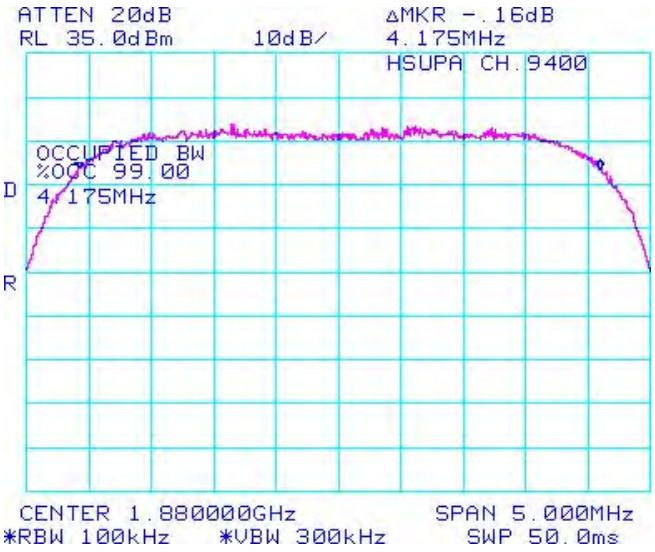


Figure 1-43b: Occupied Bandwidth, Band V High Channel

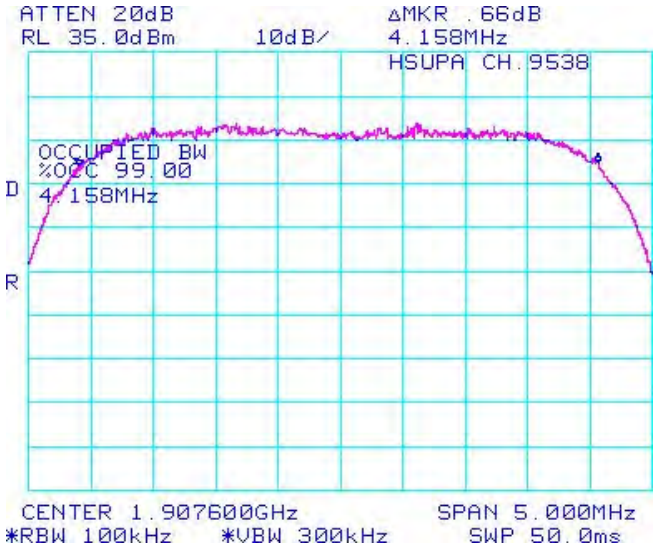
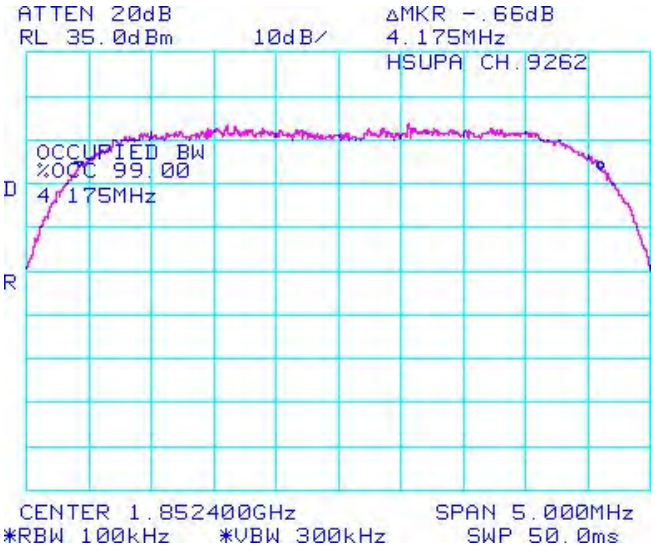


Figure 1-44b: Occupied Bandwidth, BAND II Low Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-45b: Occupied Bandwidth, BAND II Middle Channel

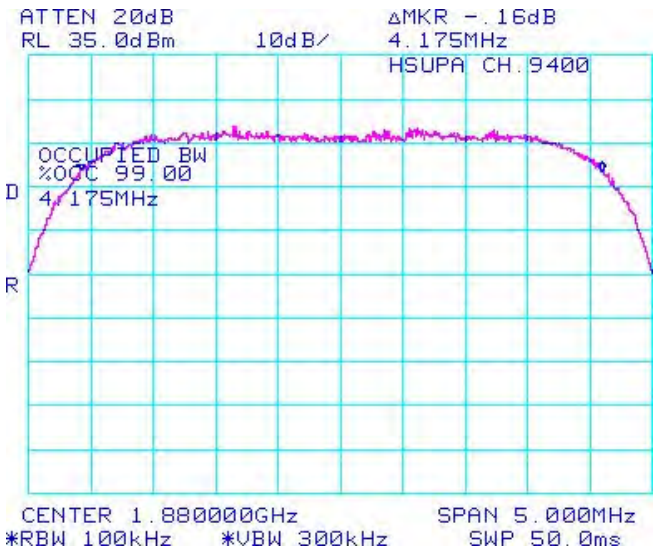


Figure 1-46b: Occupied Bandwidth, BAND II High Channel

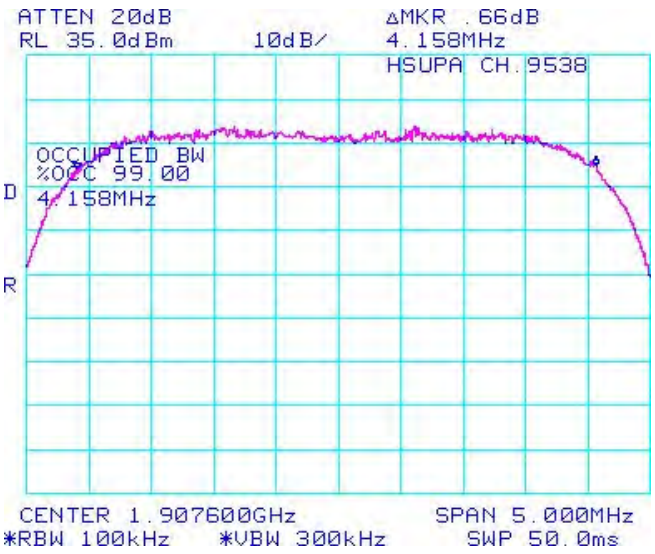


Figure 1-47b: Band V , Low Channel Mask

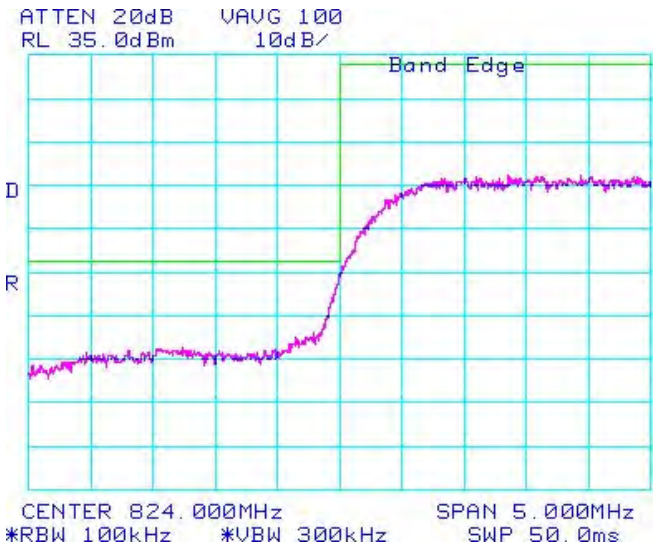
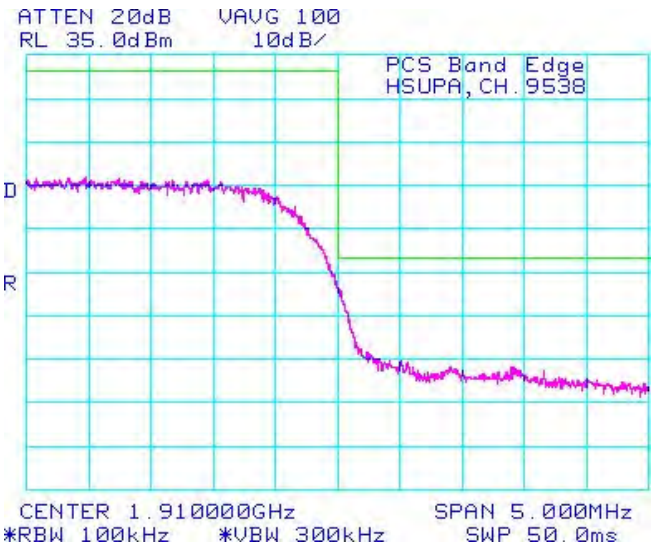


Figure 1-48b: Band V , High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

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

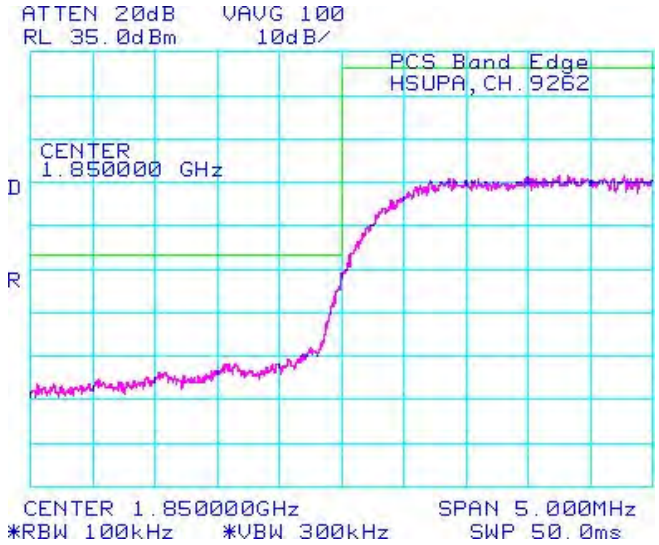
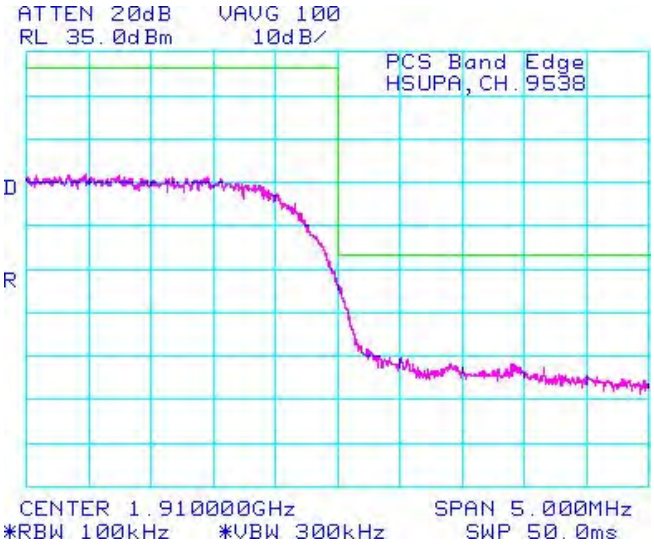


Figure 1-50b: Band II, High Channel Mask



APPENDIX 2A – GSM CONDUCTED RF OUTPUT POWER TEST DATA

GSM Conducted RF Output Power Test Data

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

Date of Test: July 19, 2012

The environmental conditions were: Temperature: 23.0 °C
Humidity: 40.7 %

The measurements were performed by Daoud Attayi

Channel	Frequency (MHz)	Maximum Output Power (dBm)	Maximum Output Power (Watts)	Channel	Frequency (MHz)	Maximum Output Power (dBm)	Maximum Output Power (Watts)
GSM850				GSM850 EDGE			
128	824.20	32.1	1.62	128	824.20	30.2	1.05
189	837.60	33.3	2.14	189	837.60	30.1	1.02
251	848.80	32.0	1.58	251	848.80	30.2	1.05
PCS				PCS EDGE			
512	1850.2	28.8	0.76	512	1850.2	26.9	0.49
661	1880.0	30.2	1.05	661	1880.0	26.8	0.48
810	1909.8	28.6	0.72	810	1909.8	26.8	0.48

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

WCDMA Band II/V Conducted RF Output Power Test Data

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

Date of Test: July 19, 2012

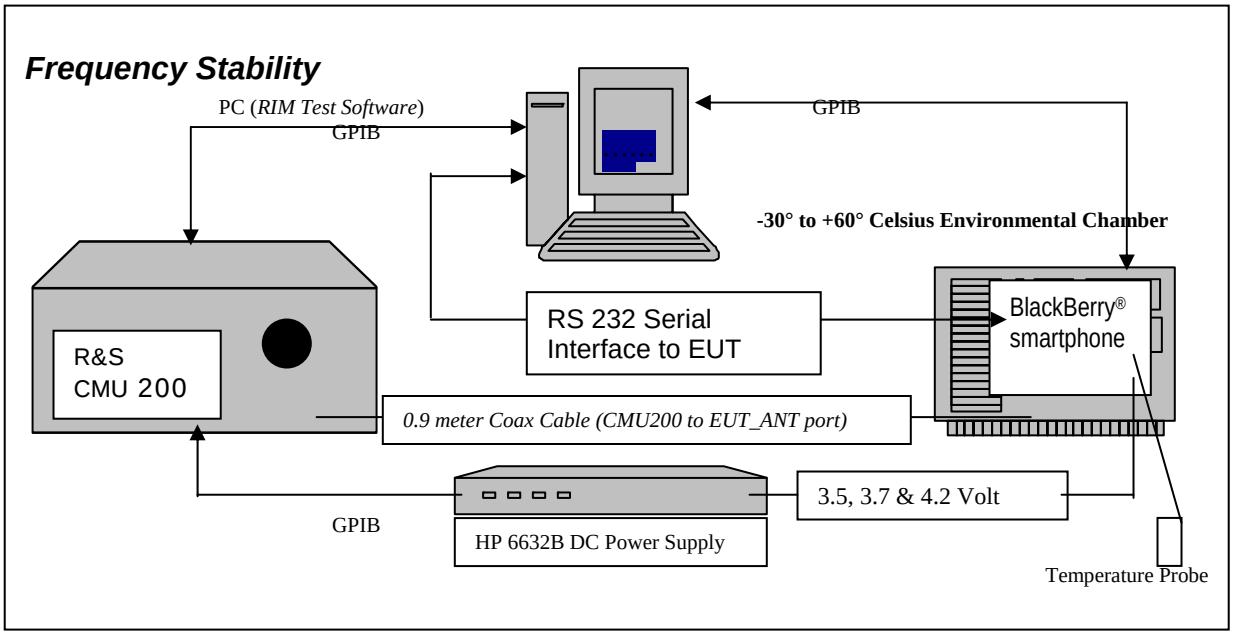
The environmental conditions were: Temperature: 23.0 °C
Humidity: 40.7 %

The measurements were performed by Daoud Attayi.

	Band	**FDD V (850)**			**FDD II (1900)**		
	Channel	4132	4182	4233	9262	9400	9538
	Freq (MHz)	826.4	836.4	846.6	1852.4	1880.0	1907.6
Mode	**Subtest**	**Max burst averaged conducted power (dBm)**			**Max burst averaged conducted power (dBm)**		
Rel99	12.2 kbps RMC	24.3	24.5	24.4	24.0	24.0	24.0
Rel99	12.2 kbps, Voice, AMR, SRB 3.4 kbps	24.3	24.5	24.5	23.8	23.8	23.9
Rel7 HSDPA	1	23.5	23.3	23.1	22.9	23.1	23.1
Rel7 HSDPA	2	22.6	22.8	23.0	22.5	22.5	22.8
Rel7 HSDPA	3	23.0	23.2	23.2	22.6	22.4	22.3
Rel7 HSDPA	4	21.8	21.9	22.1	21.3	21.5	21.4
Rel6 HSUPA	1	22.9	23.0	22.9	22.5	22.5	22.6
Rel6 HSUPA	2	23.5	23.6	23.5	22.8	22.8	23.0
Rel6 HSUPA	3	22.5	22.7	22.5	21.9	21.9	21.9
Rel6 HSUPA	4	21.5	21.6	21.6	20.8	20.9	20.9
Rel6 HSUPA	5	22.6	22.7	22.6	21.9	21.9	22.0

APPENDIX 3A – GSM FREQUENCY STABILITY TEST DATA

GSM Frequency Stability Test Data



The measurements were performed by Kevin Guo.

CFR 47 Chapter 1 - Federal Communications Commission Rules

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

24.235/22.917 *Frequency Stability*.
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.
The EUT meets the requirements as stated in CFR 47 chapter 1, Section 24.235, CFR 47 chapter 1, Section 22.917 RSS-132, 4.3 Frequency Stability, and RSS-133, 6.3 Frequency Stability.
Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, power, data, temperatures, and stepped voltages controlled via a GPIB interface linked to the Environmental chamber, a DC power supply, and the Communications Test Set. A 0.9-metre coax cable was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input/output of the CMU 200 and the EUT antenna port.
Calibration for the Cable Loss was performed in the RF Laboratory using the Agilent power meter and Agilent Signal Generator.

Test setup:

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

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

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

The EUT repetitively transmitted 100 bursts for each set of programmed parameters recording temperature, voltage settings, and systematically selected frequencies. The power supply was cycled from minimum voltage 3.6 volts, to 3.8 volts 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 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 maximum frequency error in the GSM850 band measured was -**0.0556 PPM**.
The maximum frequency error in the PCS1900 band measured was **0.0500 PPM**.

Date of Test: August 13, 2012

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

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	3.6	20	42	0.0510
189	836.40	3.6	20	-42	-0.0510
251	848.60	3.6	20	-39	-0.0473

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	3.8	20	46	0.0550
189	836.40	3.8	20	42	0.0502
251	848.60	3.8	20	35	0.0418

Traffic Channel Number	GSM850 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.35	20	20	0.0236
189	836.40	4.35	20	-32	-0.0377
251	848.60	4.35	20	-39	-0.0459

GSM850 Results: channel 128 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	3.6	-30	-19	-0.0231
128	824.20	3.6	-20	-21	-0.0255
128	824.20	3.6	-10	25	0.0303
128	824.20	3.6	0	27	0.0328
128	824.20	3.6	10	38	0.0461
128	824.20	3.6	20	42	0.0510
128	824.20	3.6	30	25	0.0303
128	824.20	3.6	40	32	0.0388
128	824.20	3.6	50	-35	-0.0425
128	824.20	3.6	60	-38	-0.0461

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	3.8	-30	-32	-0.0388
128	824.20	3.8	-20	-28	-0.0340
128	824.20	3.8	-10	19	0.0231
128	824.20	3.8	0	21	0.0255
128	824.20	3.8	10	-35	-0.0425
128	824.20	3.8	20	-42	-0.0510
128	824.20	3.8	30	19	0.0231
128	824.20	3.8	40	25	0.0303
128	824.20	3.8	50	-28	-0.0340
128	824.20	3.8	60	-30	-0.0364

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
128	824.20	4.35	-30	42	0.0510
128	824.20	4.35	-20	32	0.0388
128	824.20	4.35	-10	-23	-0.0279
128	824.20	4.35	0	-20	-0.0243
128	824.20	4.35	10	-38	-0.0461
128	824.20	4.35	20	-39	-0.0473
128	824.20	4.35	30	24	0.0291
128	824.20	4.35	40	28	0.0340
128	824.20	4.35	50	33	0.0400
128	824.20	4.35	60	32	0.0388

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	31	0.0371
189	836.40	3.6	-20	-28	-0.0335
189	836.40	3.6	-10	-22	-0.0263
189	836.40	3.6	0	-25	-0.0299
189	836.40	3.6	10	35	0.0418
189	836.40	3.6	20	46	0.0550
189	836.40	3.6	30	31	0.0371
189	836.40	3.6	40	31	0.0371
189	836.40	3.6	50	-22	-0.0263
189	836.40	3.6	60	-25	-0.0299

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
189	836.40	3.8	-30	26	0.0311
189	836.40	3.8	-20	31	0.0371
189	836.40	3.8	-10	18	0.0215
189	836.40	3.8	0	18	0.0215
189	836.40	3.8	10	41	0.0490
189	836.40	3.8	20	42	0.0502
189	836.40	3.8	30	25	0.0299
189	836.40	3.8	40	21	0.0251
189	836.40	3.8	50	-26	-0.0311
189	836.40	3.8	60	-27	-0.0323

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
189	836.40	4.35	-30	36	0.0430
189	836.40	4.35	-20	-25	-0.0299
189	836.40	4.35	-10	-23	-0.0275
189	836.40	4.35	0	-24	-0.0287
189	836.40	4.35	10	38	0.0454
189	836.40	4.35	20	35	0.0418
189	836.40	4.35	30	-30	-0.0359
189	836.40	4.35	40	-33	-0.0395
189	836.40	4.35	50	24	0.0287
189	836.40	4.35	60	25	0.0299

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	32	0.0377
251	848.8	3.6	-20	21	0.0247
251	848.8	3.6	-10	19	0.0224
251	848.8	3.6	0	22	0.0259
251	848.8	3.6	10	22	0.0259
251	848.8	3.6	20	20	0.0236
251	848.8	3.6	30	25	0.0295
251	848.8	3.6	40	26	0.0306
251	848.8	3.6	50	-25	-0.0295
251	848.8	3.6	60	-25	-0.0295

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
251	848.8	3.8	-30	-48	**-0.0566**
251	848.8	3.8	-20	27	0.0318
251	848.8	3.8	-10	22	0.0259
251	848.8	3.8	0	25	0.0295
251	848.8	3.8	10	-31	-0.0365
251	848.8	3.8	20	-32	-0.0377
251	848.8	3.8	30	-10	-0.0118
251	848.8	3.8	40	-11	-0.0130
251	848.8	3.8	50	-30	-0.0353
251	848.8	3.8	60	-27	-0.0318

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
251	848.8	4.35	-30	37	0.0436
251	848.8	4.35	-20	-25	-0.0295
251	848.8	4.35	-10	-33	-0.0389
251	848.8	4.35	0	-38	-0.0448
251	848.8	4.35	10	-28	-0.0330
251	848.8	4.35	20	-39	-0.0459
251	848.8	4.35	30	-18	-0.0212
251	848.8	4.35	40	-22	-0.0259
251	848.8	4.35	50	-27	-0.0318
251	848.8	4.35	60	-22	-0.0259

PCS Channel 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	-46.00	-0.0249
661	1880.00	3.6	20	-53.00	-0.0282
810	1909.80	3.6	20	-66.00	-0.0346

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	3.8	20	-77.00	-0.0416
661	1880.00	3.8	20	-53.00	-0.0282
810	1909.80	3.8	20	-75.00	-0.0393

Traffic Channel Number	PCS Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.35	20	-71.00	-0.0384
661	1880.00	4.35	20	-79.00	-0.0420
810	1909.80	4.35	20	-71.00	-0.0372

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	83.00	0.0449
512	1850.20	3.6	-20	-69.00	-0.0373
512	1850.20	3.6	-10	-58.00	-0.0313
512	1850.20	3.6	0	-48.00	-0.0259
512	1850.20	3.6	10	-29.00	-0.0157
512	1850.20	3.6	20	-46.00	-0.0249
512	1850.20	3.6	30	-56.00	-0.0303
512	1850.20	3.6	40	-42.00	-0.0227
512	1850.20	3.6	50	-52.00	-0.0281
512	1850.20	3.6	60	-75.00	-0.0405

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	3.8	-30	-80.00	-0.0432
512	1850.20	3.8	-20	-65.00	-0.0351
512	1850.20	3.8	-10	-51.00	-0.0276
512	1850.20	3.8	0	-44.00	-0.0238
512	1850.20	3.8	10	-23.00	-0.0124
512	1850.20	3.8	20	-77.00	-0.0416
512	1850.20	3.8	30	-68.00	-0.0368
512	1850.20	3.8	40	-52.00	-0.0281
512	1850.20	3.8	50	-64.00	-0.0346
512	1850.20	3.8	60	27.00	0.0146

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
512	1850.20	4.35	-30	46.00	0.0249
512	1850.20	4.35	-20	56.00	0.0303
512	1850.20	4.35	-10	46.00	0.0249
512	1850.20	4.35	0	-29.00	-0.0157
512	1850.20	4.35	10	-37.00	-0.0200
512	1850.20	4.35	20	-71.00	-0.0384
512	1850.20	4.35	30	-68.00	-0.0368
512	1850.20	4.35	40	-73.00	-0.0395
512	1850.20	4.35	50	-77.00	-0.0416
512	1850.20	4.35	60	43.00	0.0232

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	29.00	0.0154
661	1880.00	3.6	-20	-43.00	-0.0229
661	1880.00	3.6	-10	-38.00	-0.0202
661	1880.00	3.6	0	-43.00	-0.0229
661	1880.00	3.6	10	54.00	0.0287
661	1880.00	3.6	20	-53.00	-0.0282
661	1880.00	3.6	30	-51.00	-0.0271
661	1880.00	3.6	40	-65.00	-0.0346
661	1880.00	3.6	50	-71.00	-0.0378
661	1880.00	3.6	60	-67.00	-0.0356

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
661	1880.00	3.7	-30	67.00	0.0356
661	1880.00	3.7	-20	-32.00	-0.0170
661	1880.00	3.7	-10	-48.00	-0.0255
661	1880.00	3.7	0	-28.00	-0.0149
661	1880.00	3.7	10	26.00	0.0138
661	1880.00	3.7	20	-53.00	-0.0282
661	1880.00	3.7	30	-49.00	-0.0261
661	1880.00	3.7	40	-78.00	-0.0415
661	1880.00	3.7	50	-77.00	-0.0410
661	1880.00	3.7	60	31.00	0.0165

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
661	1880.00	4.2	-30	-94.00	**-0.0500**
661	1880.00	4.2	-20	61.00	0.0324
661	1880.00	4.2	-10	51.00	0.0271
661	1880.00	4.2	0	32.00	0.0170
661	1880.00	4.2	10	-43.00	-0.0229
661	1880.00	4.2	20	-79.00	-0.0420
661	1880.00	4.2	30	-72.00	-0.0383
661	1880.00	4.2	40	-71.00	-0.0378
661	1880.00	4.2	50	-78.00	-0.0415
661	1880.00	4.2	60	-27.00	-0.0144

PCS1900 Results: channel 810 @ maximum transmitted power

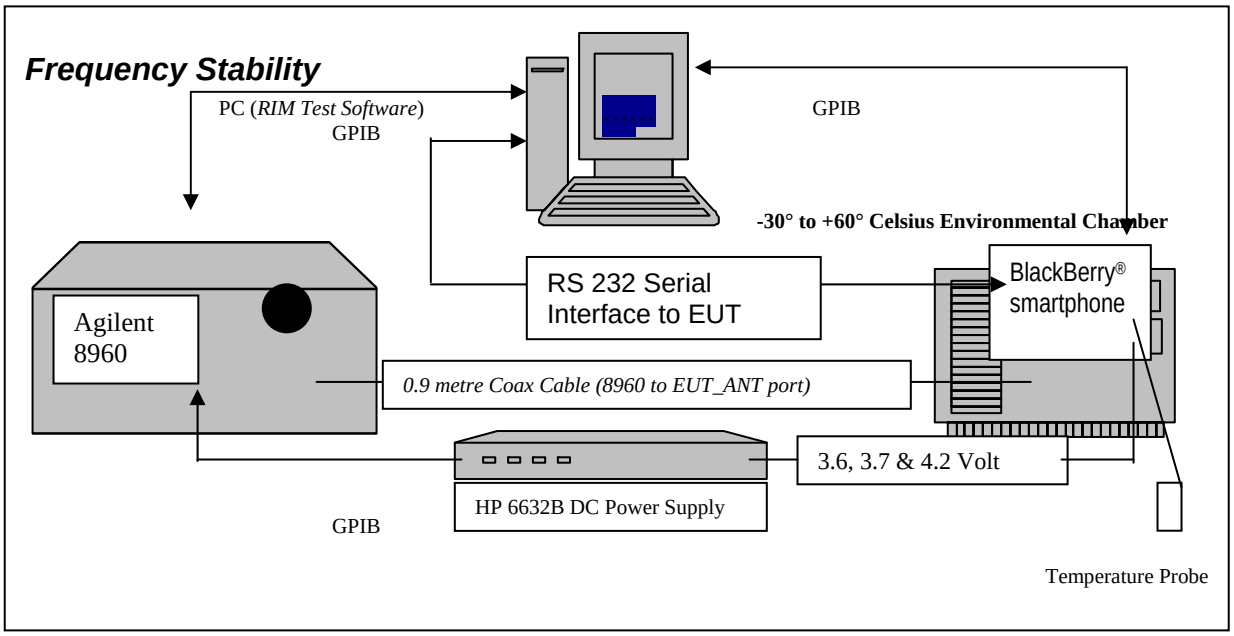
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
810	1909.80	3.6	-30	-29.00	-0.0152
810	1909.80	3.6	-20	-79.00	-0.0414
810	1909.80	3.6	-10	-26.00	-0.0136
810	1909.80	3.6	0	-35.00	-0.0183
810	1909.80	3.6	10	32.00	0.0168
810	1909.80	3.6	20	-66.00	-0.0346
810	1909.80	3.6	30	-48.00	-0.0251
810	1909.80	3.6	40	-68.00	-0.0356
810	1909.80	3.6	50	-69.00	-0.0361
810	1909.80	3.6	60	-77.00	-0.0403

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
810	1909.80	3.7	-30	-74.00	-0.0387
810	1909.80	3.7	-20	-30.00	-0.0157
810	1909.80	3.7	-10	-33.00	-0.0173
810	1909.80	3.7	0	-35.00	-0.0183
810	1909.80	3.7	10	35.00	0.0183
810	1909.80	3.7	20	-75.00	-0.0393
810	1909.80	3.7	30	-65.00	-0.0340
810	1909.80	3.7	40	-78.00	-0.0408
810	1909.80	3.7	50	-69.00	-0.0361
810	1909.80	3.7	60	36.00	0.0189

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
810	1909.80	4.2	-30	-27.00	-0.0141
810	1909.80	4.2	-20	-41.00	-0.0215
810	1909.80	4.2	-10	-43.00	-0.0225
810	1909.80	4.2	0	-43.00	-0.0225
810	1909.80	4.2	10	-69.00	-0.0361
810	1909.80	4.2	20	-71.00	-0.0372
810	1909.80	4.2	30	-75.00	-0.0393
810	1909.80	4.2	40	-56.00	-0.0293
810	1909.80	4.2	50	-68.00	-0.0356
810	1909.80	4.2	60	28.00	0.0147

APPENDIX 3B – WCDMA Band II/V FREQUENCY STABILITY TEST DATA

WCDMA Frequency Stability Test Data



The following measurements were performed by Berkin Can.

CFR 47 Chapter 1 - Federal Communications Commission Rules

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

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

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

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

Test Setup:

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

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

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

The EUT repetitively transmitted 100 bursts for each set of programmed parameters recording temperature, voltage settings, and systematically selected frequencies. The power supply was cycled from minimum voltage 3.6 volts, to 3.8 volts 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 1852.4, 1880.0 and 1907.6 MHz for the WCDMA Band II. 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, 3.7 and 4.2 volts

The maximum frequency error in the WCDMA Band V measured was **0.0203 PPM**.
The maximum frequency error in the WCDMA Band II measured was **0.0133 PPM.**

Date of Test: August 10, 2012

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	6	0.0073
4182	836.4	3.6	20	9	0.0108
4233	846.6	3.6	20	11	0.0130

Traffic Channel Number	WCDMA Band V Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	3.8	20	10	0.0121
4182	836.4	3.8	20	13	0.0155
4233	846.6	3.8	20	-12	-0.0142

Traffic Channel Number	WCDMA Band V Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.35	20	-10	-0.0121
4182	836.4	4.35	20	13	0.0155
4233	846.6	4.35	20	9	0.0106

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	9	0.0109
4132	826.4	3.6	-20	13	0.0157
4132	826.4	3.6	-10	-12	-0.0145
4132	826.4	3.6	0	-12	-0.0145
4132	826.4	3.6	10	11	0.0133
4132	826.4	3.6	20	6	0.0073
4132	826.4	3.6	30	9	0.0109
4132	826.4	3.6	40	9	0.0109
4132	826.4	3.6	50	-8	-0.0097
4132	826.4	3.6	60	-10	-0.0121

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	3.8	-30	11	0.0133
4132	826.4	3.8	-20	13	0.0157
4132	826.4	3.8	-10	13	0.0157
4132	826.4	3.8	0	12	0.0145
4132	826.4	3.8	10	13	0.0157
4132	826.4	3.8	20	10	0.0121
4132	826.4	3.8	30	8	0.0097
4132	826.4	3.8	40	12	0.0145
4132	826.4	3.8	50	13	0.0157
4132	826.4	3.8	60	11	0.0133

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.35	-30	-14	-0.0169
4132	826.4	4.35	-20	13	0.0157
4132	826.4	4.35	-10	-15	-0.0182
4132	826.4	4.35	0	-15	-0.0182
4132	826.4	4.35	10	-11	-0.0133
4132	826.4	4.35	20	-10	-0.0121
4132	826.4	4.35	30	7	0.0085
4132	826.4	4.35	40	12	0.0145
4132	826.4	4.35	50	-10	-0.0121
4132	826.4	4.35	60	11	0.0133

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	16	0.0191
4182	836.4	3.6	-20	11	0.0132
4182	836.4	3.6	-10	11	0.0132
4182	836.4	3.6	0	13	0.0155
4182	836.4	3.6	10	9	0.0108
4182	836.4	3.6	20	9	0.0108
4182	836.4	3.6	30	-11	-0.0132
4182	836.4	3.6	40	10	0.0120
4182	836.4	3.6	50	11	0.0132
4182	836.4	3.6	60	16	0.0191

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4182	836.4	3.8	-30	14	0.0167
4182	836.4	3.8	-20	11	0.0132
4182	836.4	3.8	-10	9	0.0108
4182	836.4	3.8	0	11	0.0132
4182	836.4	3.8	10	9	0.0108
4182	836.4	3.8	20	13	0.0155
4182	836.4	3.8	30	11	0.0132
4182	836.4	3.8	40	11	0.0132
4182	836.4	3.8	50	11	0.0132
4182	836.4	3.8	60	15	0.0179

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4182	836.4	4.35	-30	11	0.0132
4182	836.4	4.35	-20	12	0.0143
4182	836.4	4.35	-10	15	0.0179
4182	836.4	4.35	0	12	0.0143
4182	836.4	4.35	10	14	0.0167
4182	836.4	4.35	20	13	0.0155
4182	836.4	4.35	30	11	0.0132
4182	836.4	4.35	40	14	0.0167
4182	836.4	4.35	50	16	0.0191
4182	836.4	4.35	60	17	**0.0203**

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	12	0.0142
4233	846.6	3.6	-20	-13	-0.0154
4233	846.6	3.6	-10	-14	-0.0165
4233	846.6	3.6	0	-17	-0.0201
4233	846.6	3.6	10	12	0.0142
4233	846.6	3.6	20	11	0.0130
4233	846.6	3.6	30	13	0.0154
4233	846.6	3.6	40	11	0.0130
4233	846.6	3.6	50	-9	-0.0106
4233	846.6	3.6	60	-8	-0.0094

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4233	846.6	3.8	-30	13	0.0154
4233	846.6	3.8	-20	-8	-0.0094
4233	846.6	3.8	-10	12	0.0142
4233	846.6	3.8	0	9	0.0106
4233	846.6	3.8	10	-12	-0.0142
4233	846.6	3.8	20	-12	-0.0142
4233	846.6	3.8	30	-14	-0.0165
4233	846.6	3.8	40	10	0.0118
4233	846.6	3.8	50	12	0.0142
4233	846.6	3.8	60	16	0.0189

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4233	846.6	4.35	-30	16	0.0189
4233	846.6	4.35	-20	-9	-0.0106
4233	846.6	4.35	-10	-11	-0.0130
4233	846.6	4.35	0	-14	-0.0165
4233	846.6	4.35	10	-7	-0.0083
4233	846.6	4.35	20	9	0.0106
4233	846.6	4.35	30	9	0.0106
4233	846.6	4.35	40	12	0.0142
4233	846.6	4.35	50	11	0.0130
4233	846.6	4.35	60	8	0.0094

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	14	0.0076
9400	1880.00	3.6	20	-12	-0.0064
9538	1907.60	3.6	20	-15	-0.0079

Traffic Channel Number	WCDMA1900 Frequency (MHz	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	3.8	20	-11	-0.0059
9400	1880.00	3.8	20	14	0.0074
9538	1907.60	3.8	20	-17	-0.0089

Traffic Channel Number	WCDMA1900 Frequency (MHz	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.35	20	-13	-0.0070
9400	1880.00	4.35	20	-15	-0.0080
9538	1907.60	4.35	20	-14	-0.0073

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	-13	-0.0070
9262	1852.40	3.6	-20	-7	-0.0038
9262	1852.40	3.6	-10	12	0.0065
9262	1852.40	3.6	0	-12	-0.0065
9262	1852.40	3.6	10	-13	-0.0070
9262	1852.40	3.6	20	14	0.0076
9262	1852.40	3.6	30	-17	-0.0092
9262	1852.40	3.6	40	11	0.0059
9262	1852.40	3.6	50	10	0.0054
9262	1852.40	3.6	60	-10	-0.0054

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	3.8	-30	13	0.0070
9262	1852.40	3.8	-20	-10	-0.0054
9262	1852.40	3.8	-10	-12	-0.0065
9262	1852.40	3.8	0	-12	-0.0065
9262	1852.40	3.8	10	12	0.0065
9262	1852.40	3.8	20	-11	-0.0059
9262	1852.40	3.8	30	-7	-0.0038
9262	1852.40	3.8	40	-10	-0.0054
9262	1852.40	3.8	50	-11	-0.0059
9262	1852.40	3.8	60	22	0.0119

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.35	-30	-17	-0.0092
9262	1852.40	4.35	-20	-9	-0.0049
9262	1852.40	4.35	-10	-14	-0.0076
9262	1852.40	4.35	0	-12	-0.0065
9262	1852.40	4.35	10	15	0.0081
9262	1852.40	4.35	20	-13	-0.0070
9262	1852.40	4.35	30	-9	-0.0049
9262	1852.40	4.35	40	14	0.0076
9262	1852.40	4.35	50	14	0.0076
9262	1852.40	4.35	60	-12	-0.0065

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	9	0.0048
9400	1880.00	3.6	-20	12	0.0064
9400	1880.00	3.6	-10	-14	-0.0074
9400	1880.00	3.6	0	16	0.0085
9400	1880.00	3.6	10	11	0.0059
9400	1880.00	3.6	20	-12	-0.0064
9400	1880.00	3.6	30	12	0.0064
9400	1880.00	3.6	40	-6	-0.0032
9400	1880.00	3.6	50	-9	-0.0048
9400	1880.00	3.6	60	25	**0.0133**

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9400	1880.00	3.8	-30	8	0.0043
9400	1880.00	3.8	-20	-11	-0.0059
9400	1880.00	3.8	-10	-13	-0.0069
9400	1880.00	3.8	0	12	0.0064
9400	1880.00	3.8	10	-10	-0.0053
9400	1880.00	3.8	20	14	0.0074
9400	1880.00	3.8	30	12	0.0064
9400	1880.00	3.8	40	16	0.0085
9400	1880.00	3.8	50	13	0.0069
9400	1880.00	3.8	60	-12	-0.0064

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9400	1880.00	4.35	-30	9	0.0048
9400	1880.00	4.35	-20	10	0.0053
9400	1880.00	4.35	-10	9	0.0048
9400	1880.00	4.35	0	9	0.0048
9400	1880.00	4.35	10	-12	-0.0064
9400	1880.00	4.35	20	-15	-0.0080
9400	1880.00	4.35	30	11	0.0059
9400	1880.00	4.35	40	-9	-0.0048
9400	1880.00	4.35	50	-11	-0.0059
9400	1880.00	4.35	60	25	**0.0133**

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	11	0.0058
9538	1907.60	3.6	-20	-11	-0.0058
9538	1907.60	3.6	-10	-13	-0.0068
9538	1907.60	3.6	0	12	0.0063
9538	1907.60	3.6	10	-12	-0.0063
9538	1907.60	3.6	20	-15	-0.0079
9538	1907.60	3.6	30	10	0.0052
9538	1907.60	3.6	40	13	0.0068
9538	1907.60	3.6	50	12	0.0063
9538	1907.60	3.6	60	-13	-0.0068

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9538	1907.60	3.8	-30	12	0.0063
9538	1907.60	3.8	-20	9	0.0047
9538	1907.60	3.8	-10	14	0.0073
9538	1907.60	3.8	0	13	0.0068
9538	1907.60	3.8	10	11	0.0058
9538	1907.60	3.8	20	-17	-0.0089
9538	1907.60	3.8	30	-12	-0.0063
9538	1907.60	3.8	40	-8	-0.0042
9538	1907.60	3.8	50	-7	-0.0037
9538	1907.60	3.8	60	-14	-0.0073

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9538	1907.60	4.35	-30	-13	-0.0068
9538	1907.60	4.35	-20	-12	-0.0063
9538	1907.60	4.35	-10	11	0.0058
9538	1907.60	4.35	0	12	0.0063
9538	1907.60	4.35	10	13	0.0068
9538	1907.60	4.35	20	-14	-0.0073
9538	1907.60	4.35	30	9	0.0047
9538	1907.60	4.35	40	-13	-0.0068
9538	1907.60	4.35	50	-13	-0.0068
9538	1907.60	4.35	60	-13	-0.0068