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-6045-1306-11

PRODUCT MODEL NO.:	RFU81UW
TYPE NAME:	BlackBerry® smartphone
FCC ID:	L6ARFU80UW
IC:	2503A-RFU80UW

DATE: June 25, 2013

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

592

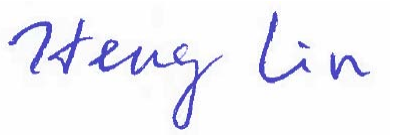
Statement of Performance:

The BlackBerry® smartphone, model RFU81UW, part number CER 56900-001 Rev 1-x03-00 (903) 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:



Heng. Lin
Regulatory Compliance Specialist

Reviewed by:

Berkin Can
Regulatory Compliance Associate

Reviewed and Approved by:

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

Table of Contents

A. Scope

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

- FCC CFR 47 Part 2, Subpart J, Equipment Authorization Procedures, Oct 2012.
- FCC CFR 47 Part 22, Subpart H, Cellular Radiotelephone Services, Oct 2012.
- FCC CFR 47 Part 24 Subpart E, Broadband PCS, Oct 2012.
- 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 3, December 2010, General Requirements and Information for the Certification of Radio communication Equipment.

B. Associated Documents

Cetecom Test Report: 1-6234_13-01-02

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 May 17 to June 3, 2013.

BlackBerry® smartphone Samples Tested

Sample	Model	CER NUMBER	PIN	Software Information
1	RFU81UW	CER 56900-001 Rev 1-x03-00 (903)	2ADAED7E	OS: 127.0.1.2678

RF Conducted Emissions testing was performed on samples 1.

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 22.917 Part 24.238	RSS-Gen, 4.9 RSS-132, 5.5 RSS-133, 6.5	GSM850 / PCS1900 Conducted Spurious Emissions	Pass	1A
Part 2.1049 Part 22.917 Part 24.238	RSS-GEN, 4.6	GSM 850 / PCS1900 Occupied Bandwidth and Channel Mask	Pass	1A
Part 2.1055 Part 24.235	RSS-132, 5.3 RSS-133, 6.3	GSM 850 /PCS 1900 Frequency Stability vs. Temperature and Voltage	Pass	1B
Part 22.913(a)(2) Part 24.232(c)	RSS-132, 5.4 RSS-133, 6.4	GSM850 ERP PCS1900 EIRP	Pass	1-6234_13-01-02
Part 2.1053 Part 22.917 Part 24.238	RSS-Gen, 4.9 RSS-132, 5.5 RSS-133, 6.5	GSM850 / PCS1900 Radiated Spurious/Harmonic Emissions	Pass	1-6234_13-01-02
Part 2.1051 Part 22.917 Part 24.238	RSS-GEN, 4.9 RSS-132, 5.5 RSS-133, 6.5	WCDMA Band 2/5 Conducted Spurious Emissions	Pass	2A
Part 2.1049 Part 22.917 Part 24.238	RSS-GEN, 4.6	WCDMA Band 2/5 Occupied Bandwidth and Channel Mask	Pass	2A
Part 2.1055(a)(d) Part 24.235	RSS-132, 5.3 RSS-133, 6.3	WCDMA Band 2/5 Frequency Stability vs. Temperature and Voltage	Pass	2B
Part 22.913(a)(2) Part 24.232(c)	RSS-132, 5.4 RSS-133, 6.4	WCDMA Band 5 ERP WCDMA Band 2 EIRP	Pass	1-6234_13-01-02
Part 2.1053 Part 22.917 Part 24.238	RSS-GEN, 4.9 RSS-132, 5.5 RSS-133, 6.5	WCDMA Band 2/5 Radiated Spurious/Harmonic Emissions	Pass	1-6234_13-01-02

F. Summary of Results

1) Conducted Emission Measurements

- The BlackBerry® smartphone met the requirements of the Tx Conducted Spurious Emissions in the GSM850 as per 47 CFR 2.1051, CFR 22.917, 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, CFR 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 channel mask in the GSM850 as per 47 CFR 2.1049, 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 247.5 kHz on mid channel in CALL mode, and 243.1 kHz on low and high channels in EDGE mode.
See APPENDIX 1A for test data.

The EUT met the requirements of the Occupied Bandwidth and channel mask in the PCS1900 as per 47 CFR 2.1049, 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 244.6 kHz on mid and high channels in CALL mode, and 244.6 kHz on low channel in EDGE mode.
See APPENDIX 1A for test data.

- The EUT met the requirements of the Frequency Stability in the GSM850 as per 47 CFR 2.1055 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 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 5 as per 47 CFR 2.1051, CFR 22.917, CFR 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 2 as per 47 CFR 2.1051, CFR 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 Occupied Bandwidth and channel mask in the WCDMA Band 5 as per 47 CFR 2.202, CFR 22.917 and RSS-GEN, 4.6. The EUT was measured in Loopback and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.067 MHz on all channels in Voice mode, and 4.153 MHz on low 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 2 as per 47 CFR 2.202, CFR 24.238 and RSS-GEN, 4.6. The EUT was measured in Loopback and HSUPA mode on the low, middle and high channels. The worst case occupied bandwidth was 4.059 MHz on all channels in Voice mode, and 4.161 MHz on the low and mid channels in HSUPA mode.
See APPENDIX 2A for test data.

- The EUT met the requirements of the Frequency Stability in the WCDMA Band 5 as per 47 CFR 2.1055, and RSS-132, 5.3. The EUT was measured on the low, middle and high channels.
See APPENDIX 2Bfor test data.

The EUT met the requirements of the Frequency Stability in the WCDMA Band 2 as per 47 CFR 2.1055, CFR 24.235 and RSS-133, 6.3. The EUT was measured in mode on the low, middle and high channels.
See APPENDIX 2B for test data.

G. Compliance Test Equipment Used

UNIT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL DUE DATE (YY MM DD)	USE
Preamplifier	Sonoma	310N/11909A	185831	13-10-10	Radiated Emissions
Preamplifier system	TDK RF Solutions	PA-02	080010	13-10-10	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA4-SP	001	13-09-01	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	13-09-01	Radiated Emissions
Hybrid Log Antenna	EMC Automation	HLP-3003C	017301	13-08-23	Radiated Emissions
Horn Antenna	EMC Automation	HRN-0118	030101	14-08-07	Radiated Emissions
Horn Antenna	EMC Automation	HRN-0118	030201	15-05-07	Radiated Emissions
Horn Antenna	Emco	3117	47563	13-08-04	Radiated Emissions
Horn Antenna	ETS	3116	2538	14-09-29	Radiated Emissions
Dipole Antenna	Schwarzbeck	UHAP	974	14-11-27	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	837493/073	13-11-26	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	112394	13-11-25	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	109747	13-10-18	RF Conducted Emissions
EMI Receiver	Rohde & Schwarz	ESIB-40	100255	13-11-30	Radiated Emissions
EMI Receiver	Rohde & Schwarz	ESU-40	100162	13-11-30	Radiated Emissions
DC Power Supply	HP	6632B	US37472178	13-09-25	RF Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0380567	13-10-30	Radiated Emissions
Environment Monitor	Omega	iTHX-SD	0340060	13-10-30	RF Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0380561	13-10-30	Radiated Emissions
Signal Generator	Agilent	E8257D	MY45140527	14-12-10	Radiated Emissions
Signal Generator	Agilent	83630B	3844A00927	14-11-23	Radiated Emissions
Spectrum Analyzer	Rohde & Schwarz	FSV	101820	13-11-28	RF Conducted Emissions
Spectrum Analyzer	Rohde & Schwarz	FSP	100884	13-11-22	RF Conducted Emissions

H. Test Software used

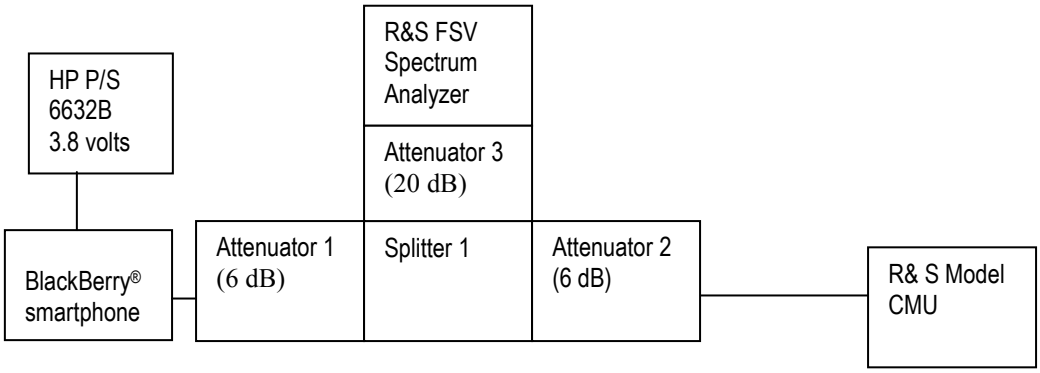
SOFTWARE	COMPANY	VERSION	USE
EMC32	Rohde & Schwarz	8.52.0	Radiated Emissions
TDK Standard Emission Test	TDK RF Solutions	8.53.1.62	Radiated Emissions

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

Date of Test: May 17 to June 3, 2013

The environmental conditions were: Temperature: 22.5 - 23.9 °C
Humidity: 24.8 – 31.6 %

The following measurements were performed by Berkin Can.

GSM Conducted RF Emission Test Data cont'd

The following measurements were performed on product RFU81UW.

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 22.917, CFR 24.238 and RSS-132 4.5 and RSS-133, 6.5 were measured from 30 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 273.5 kHz, and for the PCS1900 band was measured to be 273.5 kHz as shown below. Results were derived in a 3.0 kHz resolution bandwidth.
On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.

Test Data for GSM850 band and PCS1900 band in Call mode

GSM850 band Frequency (MHz)	-26dBc Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
824.2	267.7	243.1
837.6	272.1	**247.5**
848.8	273.5	244.6

PCS1900 band Frequency (MHz)	-26dBc Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
1850.2	273.5	243.1
1880.0	272.1	**244.6**
1909.8	267.7	**244.6**

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 1-29a to 1-31a for the plots of Peak to Average Ratio (PCS1900 Band only)

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	**243.13**
837.6	240.23
848.8	**243.13**

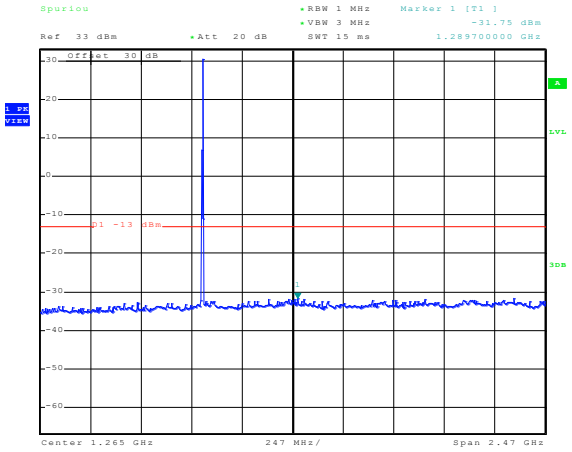
PCS1900 band Frequency (MHz)	99% Occupied Bandwidth (kHz)
1850.2	**244.57**
1880.0	243.13
1909.8	243.13

Measurement Plots for GSM850 and PCS1900 bands in EDGE mode

See Figures 1-32a to 1-37a for the plots of the 99% Occupied Bandwidth EDGE results.
See Figures 1-38a to 1-41a for the plots of channel mask EDGE results.
See Figures 1-42a to 1-53a for the plots of the conducted spurious emissions EDGE results

GSM Conducted RF Emission Test Data cont'd

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



Date: 3.JUN.2013 16:04:32

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

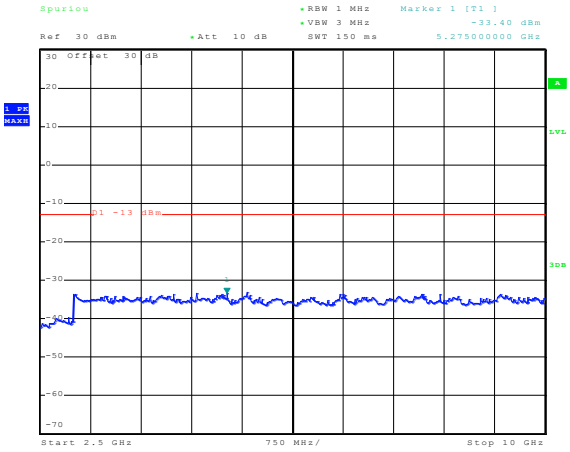


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Figure 1-3a: GSM850 band, Spurious Conducted Emissions, Middle Channel

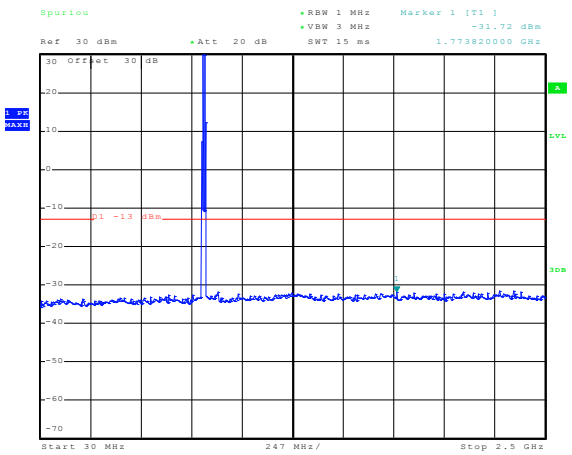

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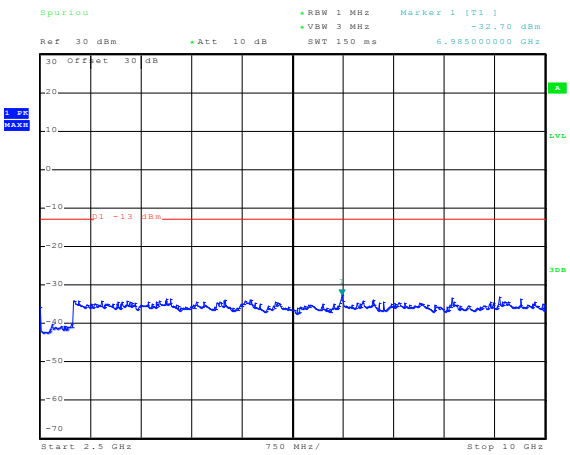
Figure 1-4a: GSM850 band, Spurious Conducted Emissions, Middle Channel



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GSM Conducted RF Emission Test Data cont'd

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

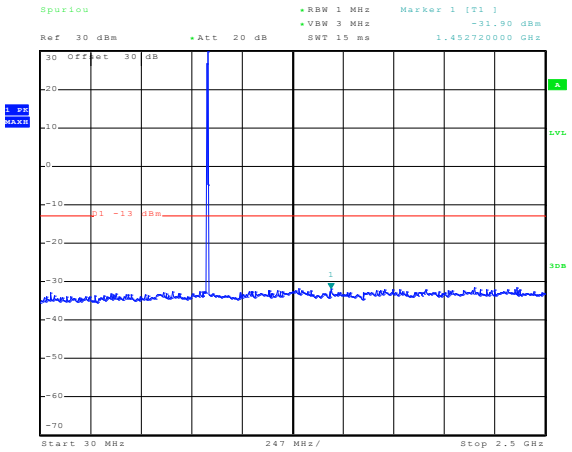


Figure 1-6a: GSM850 band, Spurious Conducted Emissions, High Channel

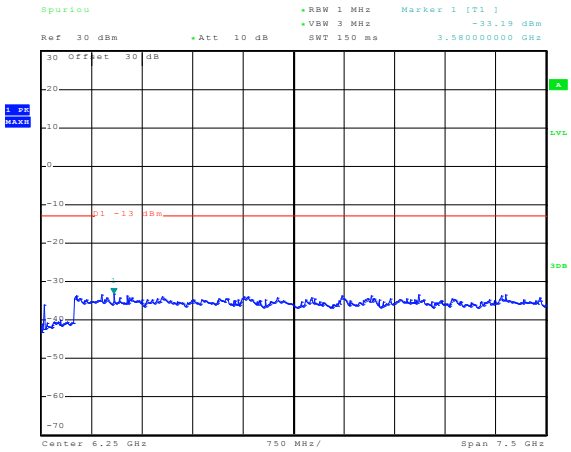


Figure 1-7a: PCS1900 band, Spurious Conducted Emissions, Low Channel

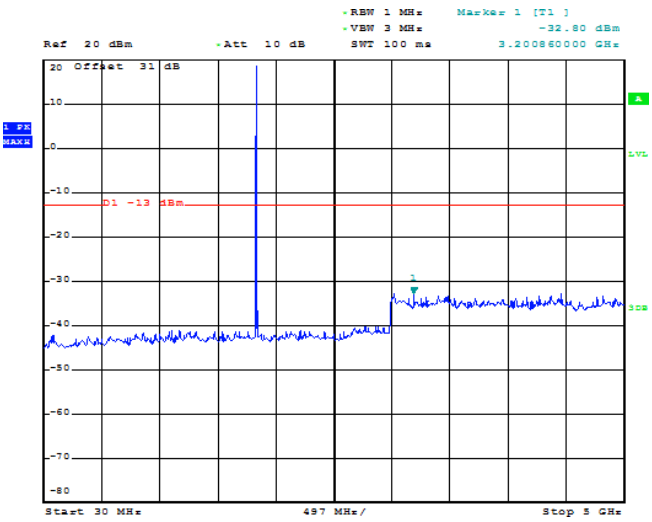
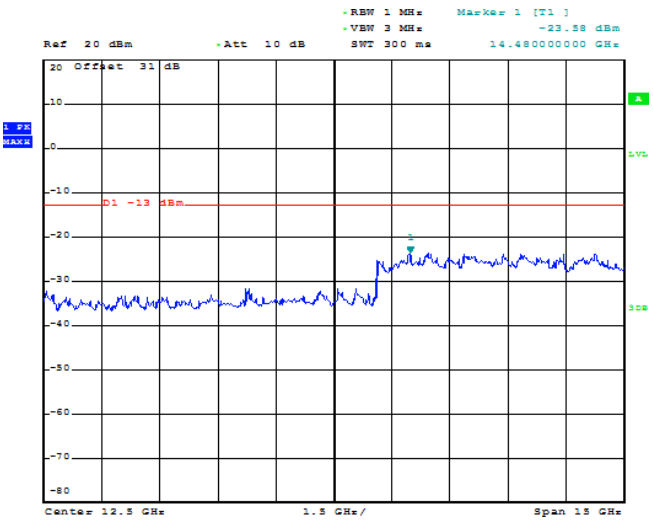


Figure 1-8a: PCS1900 band, Spurious Conducted Emissions, Low Channel



GSM Conducted RF Emission Test Data cont'd

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

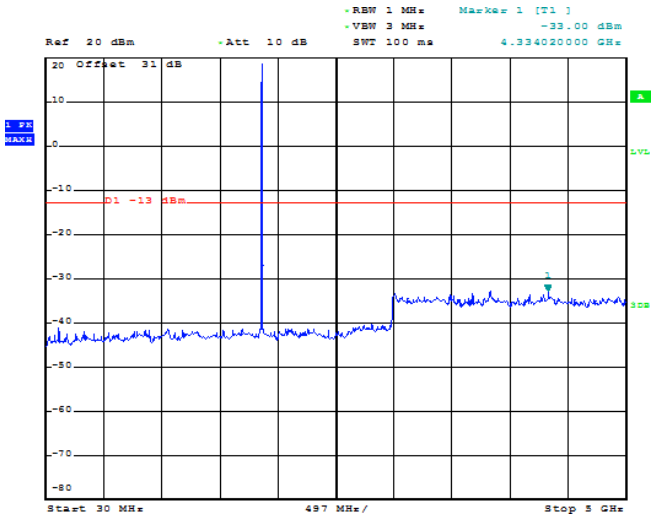


Figure 1-10a: PCS1900 band, Spurious Conducted Emissions, Middle Channel

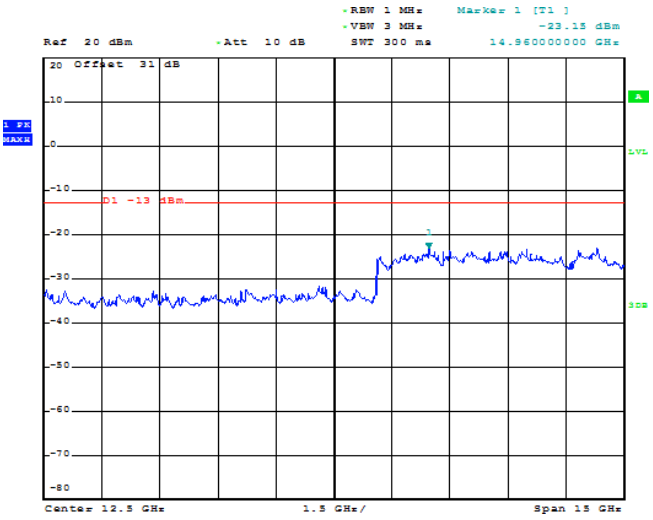


Figure 1-11a: PCS1900 band, Spurious Conducted Emissions, High Channel

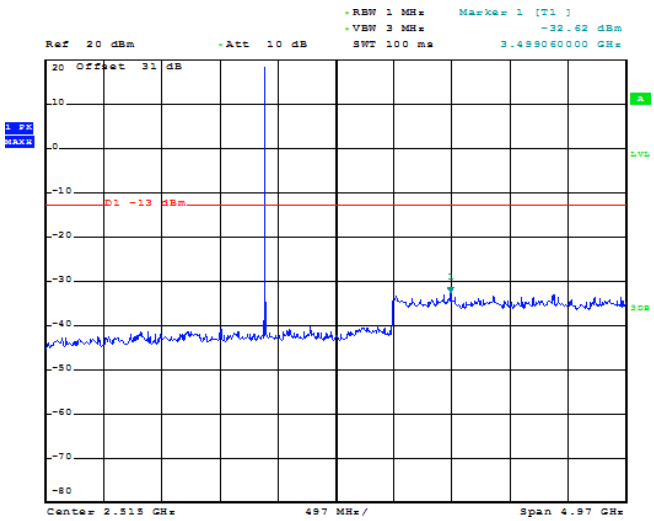
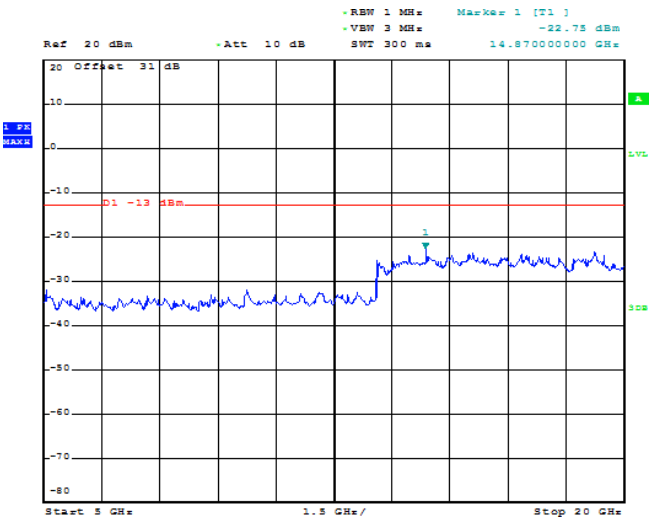


Figure 1-12a: PCS1900 band, Spurious Conducted Emissions, High Channel



GSM Conducted RF Emission Test Data cont'd

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

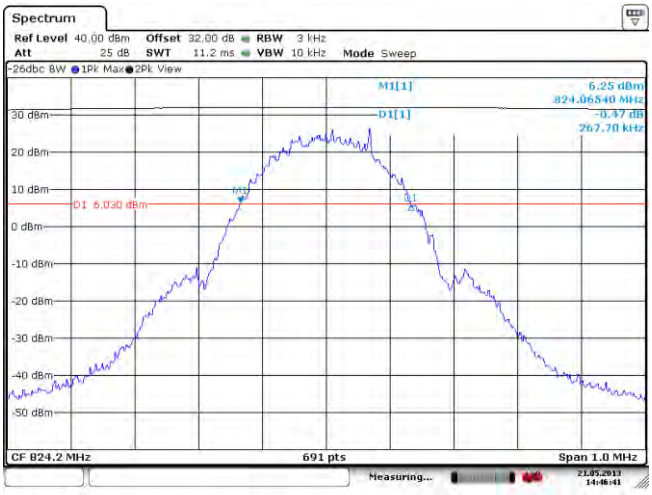


Figure 1-14a: -26dBc bandwidth, GSM850 band Middle Channel in GSM mode

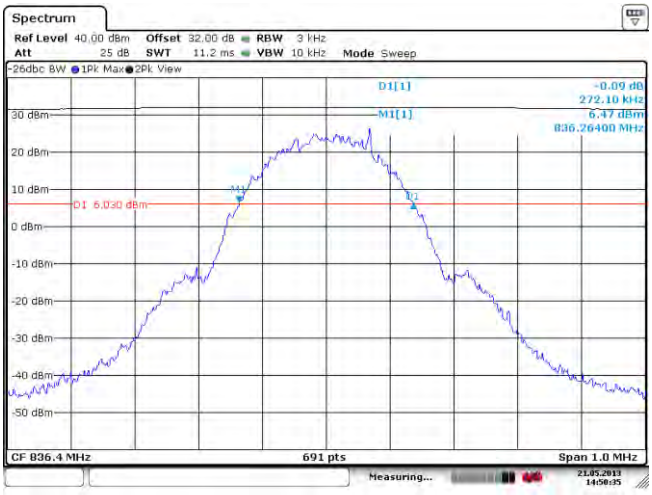


Figure 1-15a: -26dBc bandwidth, GSM850 band High Channel in GSM mode

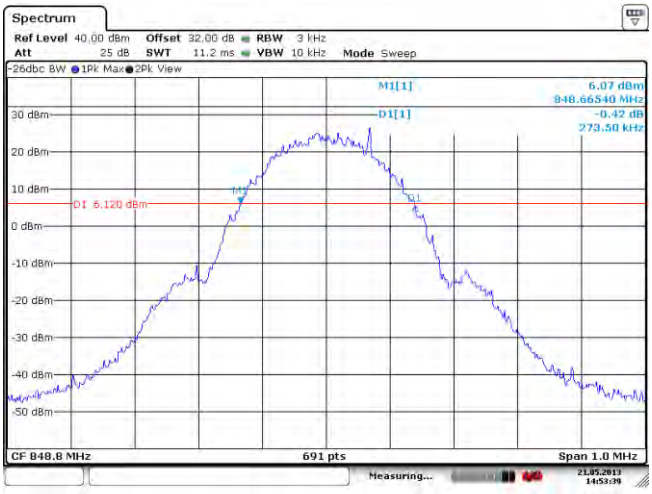
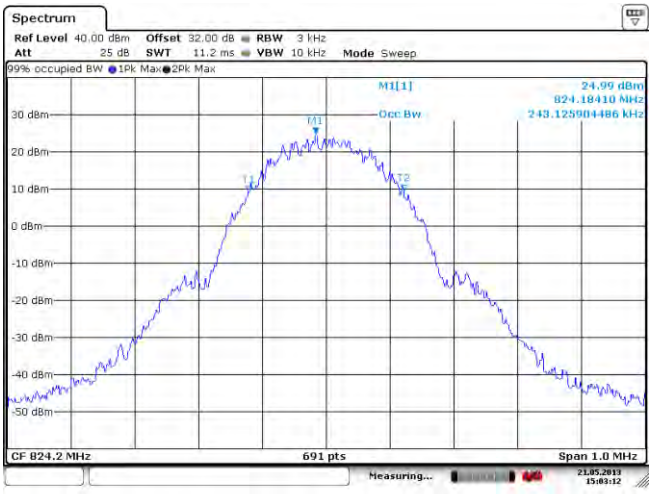


Figure 1-16a: Occupied Bandwidth, GSM850 band Low Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

Figure 1-17a: - Occupied Bandwidth, GSM850 band Middle Channel in GSM mode

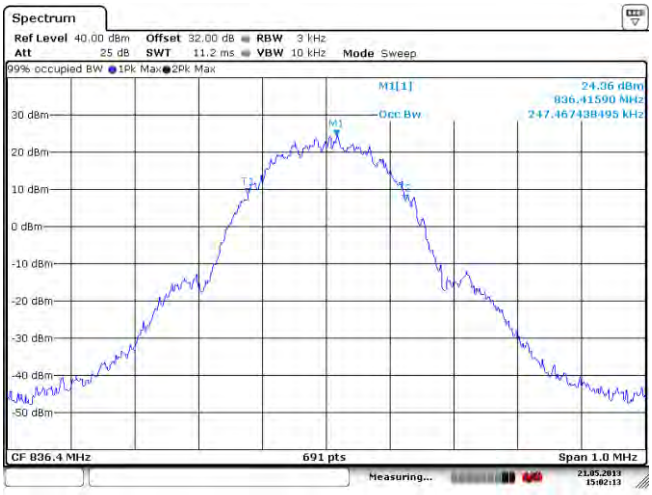


Figure 1-18a: Occupied Bandwidth, GSM850 band High Channel in GSM mode

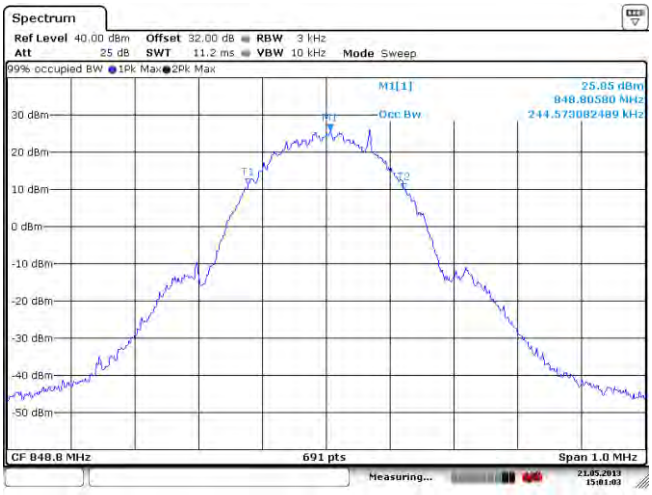


Figure 1-19a: -26dBc bandwidth, PCS1900 Low Channel in GSM mode

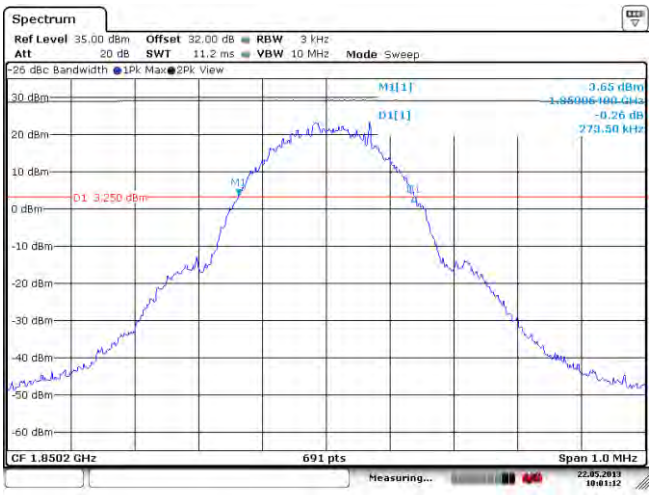
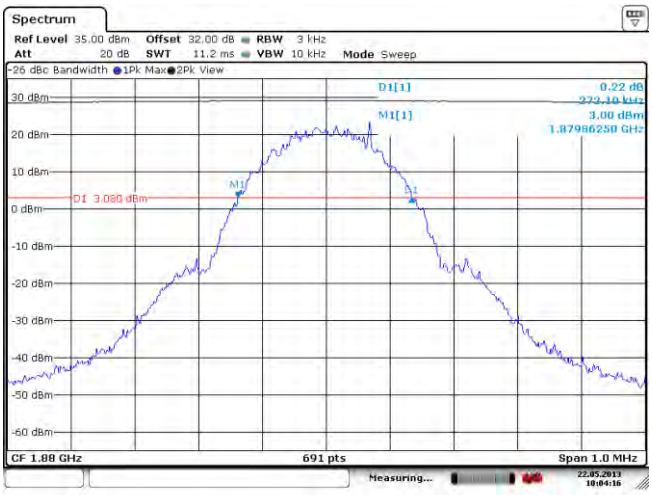


Figure 1-20a: -26dBc bandwidth, PCS1900 Middle Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

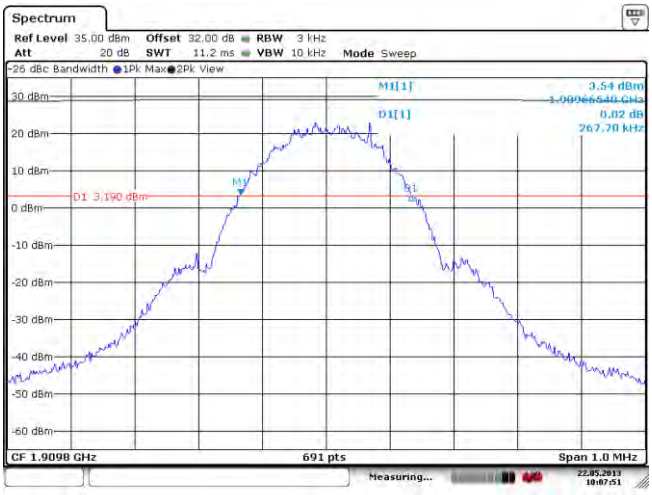


Figure 1-22a: Occupied Bandwidth, PCS1900 Low Channel in GSM mode

Figure 1-23a: Occupied Bandwidth, PCS1900 Middle Channel in GSM mode

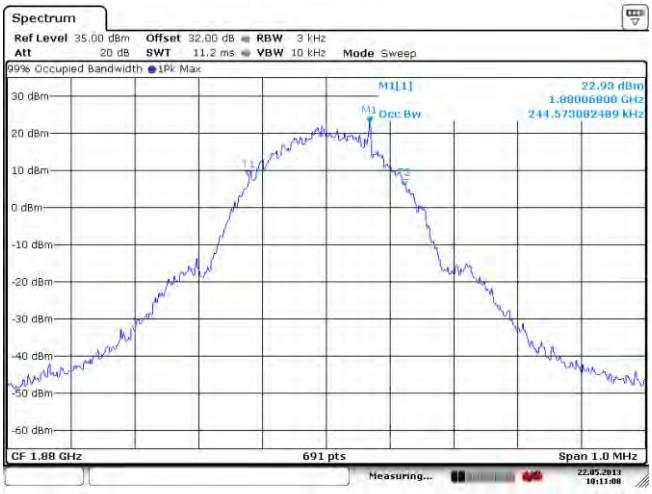
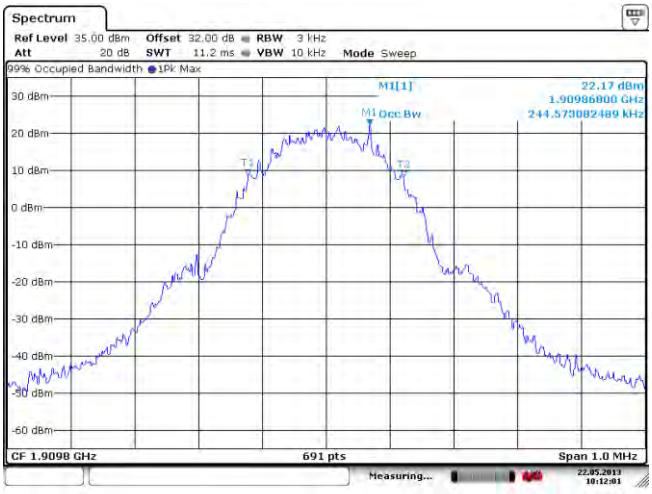


Figure 1-24a: Occupied Bandwidth, PCS1900 High Channel in GSM mode



GSM Conducted RF Emission Test Data cont'd

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

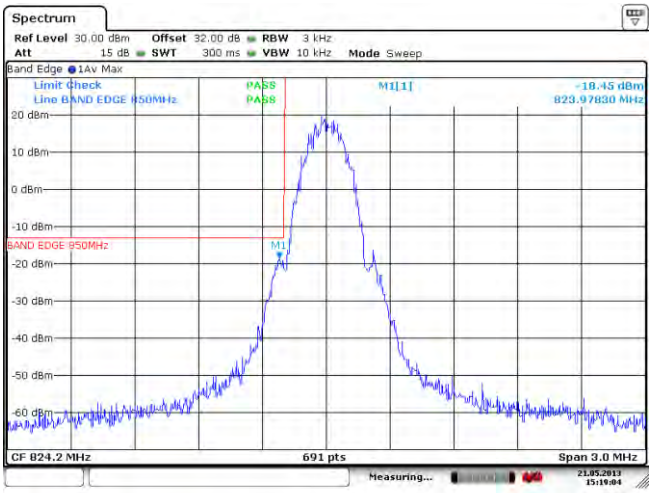


Figure 1-26a: GSM850 band High Channel Mask in GSM mode

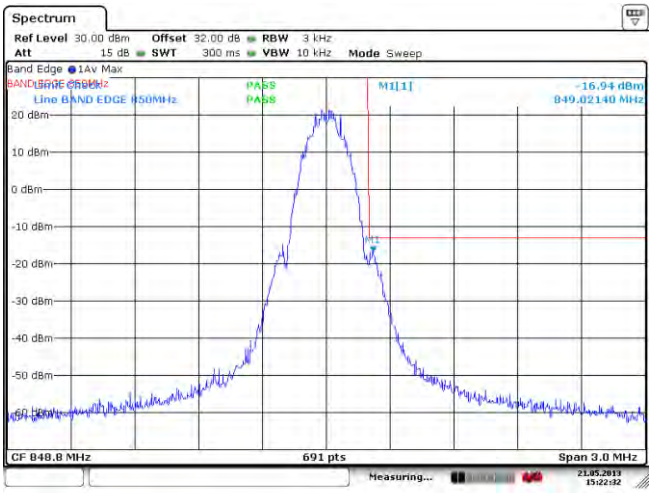


Figure 1-27a: PCS1900, Low Channel Mask in GSM mode

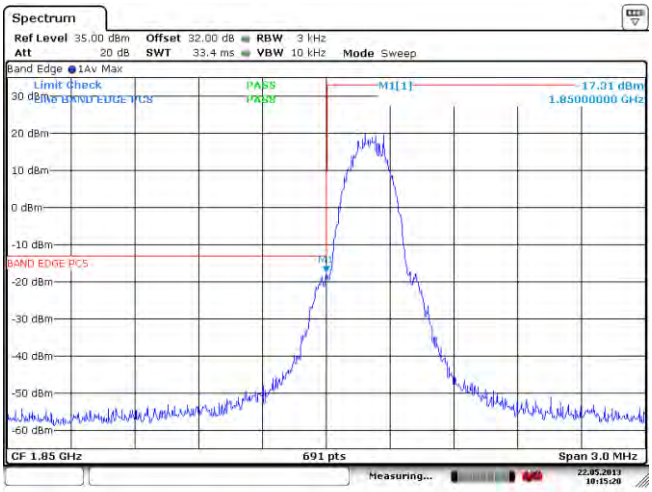
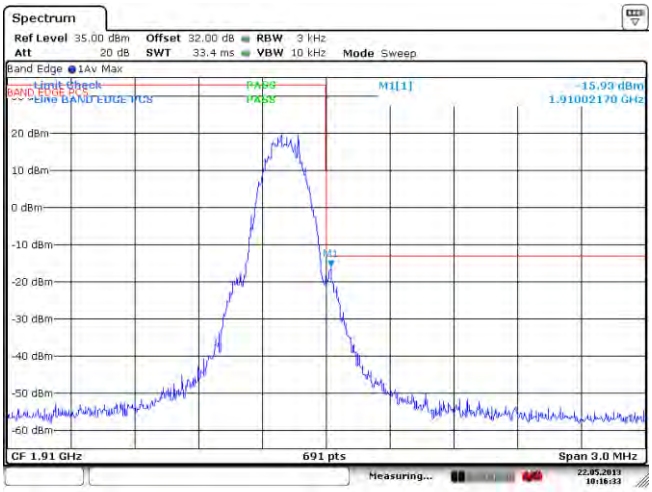


Figure 1-28a: PCS1900, High Channel Mask in GSM mode



GSM Conducted RF Emission Test Data cont'd

Figure 1-29a: PCS1900 Band, PAR Low Channel

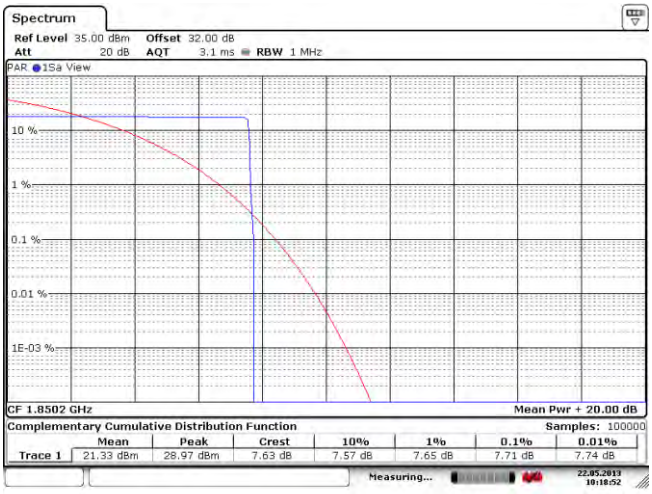


Figure 1-30a: PCS1900 Band, PAR Mid Channel

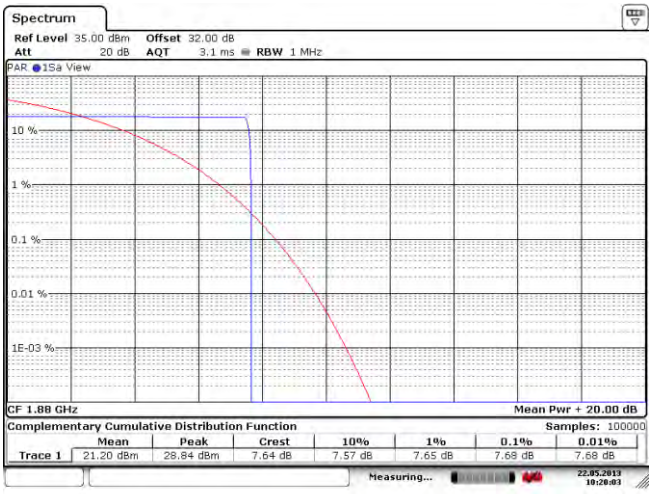


Figure 1-31a: PCS1900 Band, PAR High Channel

GSM Conducted RF Emission Test Data cont'd

Figure 1-32a: Occupied Bandwidth, GSM850 Band, Low Channel in EDGE mode

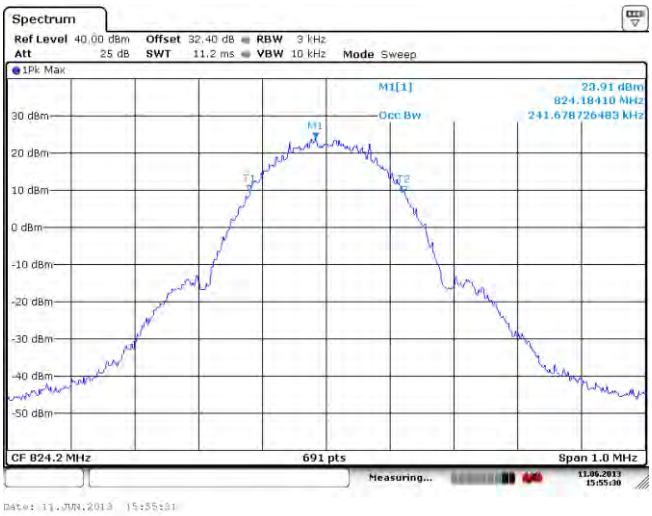


Figure 1-33a: Occupied Bandwidth, GSM850 Band, Middle Channel in EDGE mode

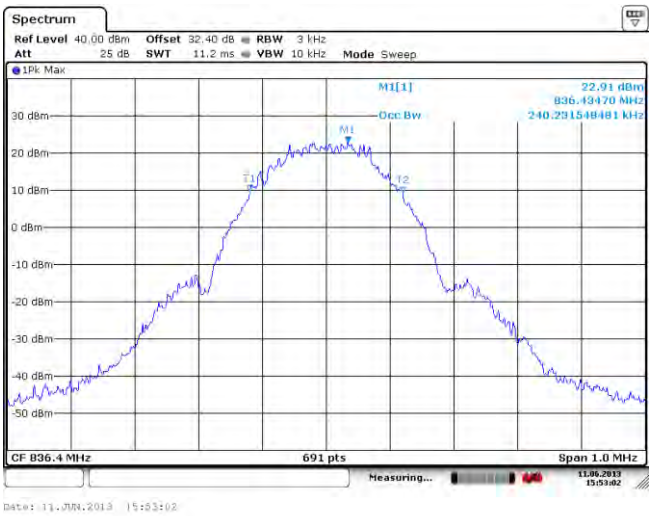


Figure 1-34a: Occupied Bandwidth, GSM850 band, High Channel in EDGE mode

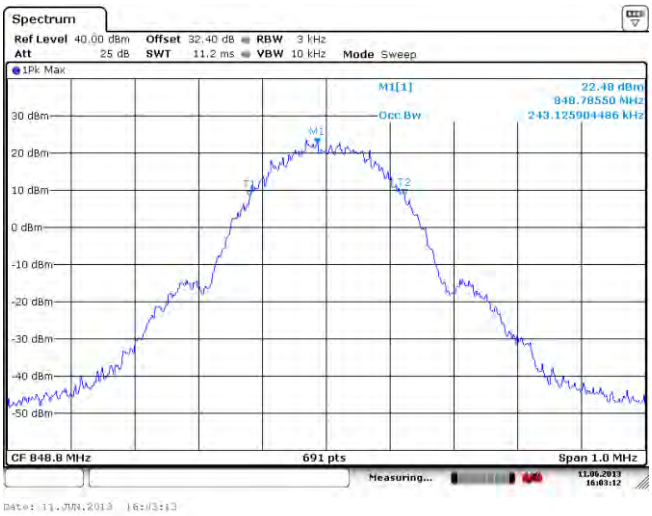
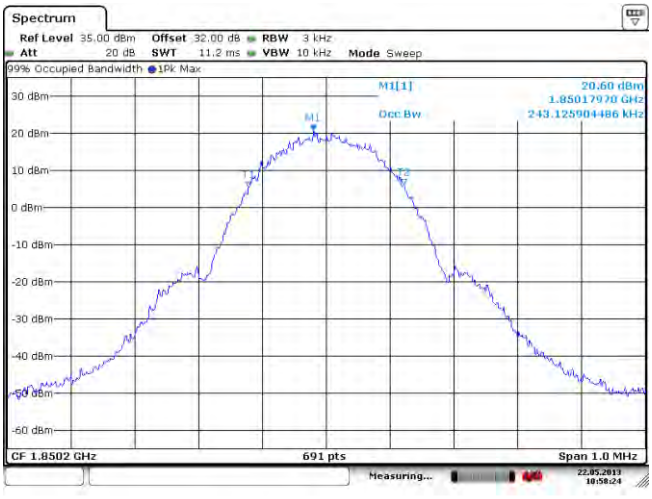


Figure 1-35a: Occupied Bandwidth, PCS1900 Band, Low Channel in EDGE mode



GSM Conducted RF Emission Test Data cont'd

Figure 1-36a: Occupied Bandwidth, PCS1900 Band, Middle Channel in EDGE mode

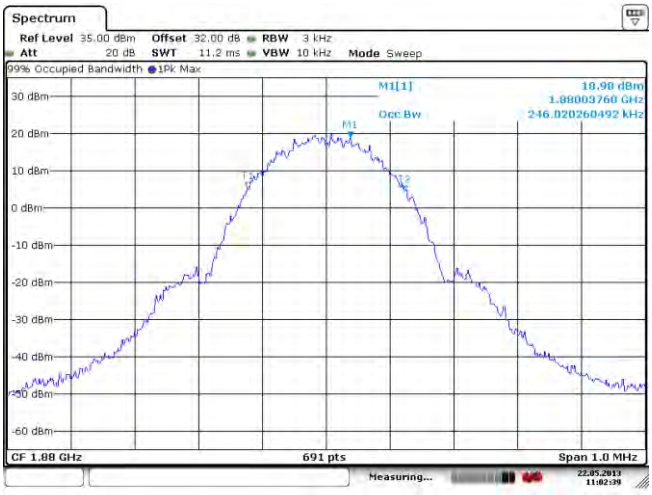


Figure 1-37a: Occupied Bandwidth, PCS1900 Band, High Channel in EDGE mode

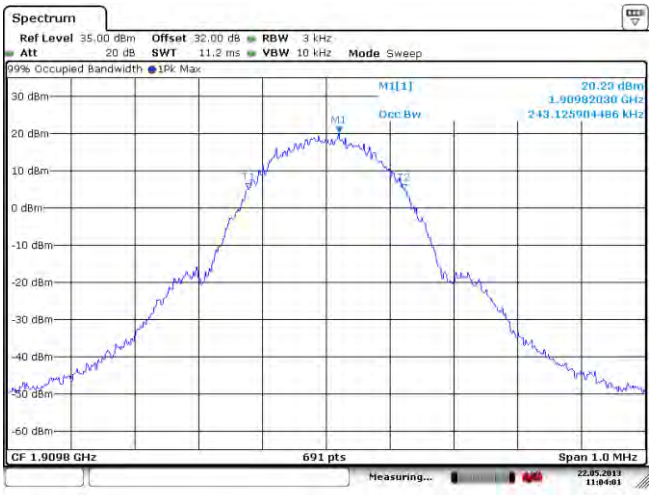


Figure 1-38a: GSM850 Band, Low Channel Mask in EDGE mode

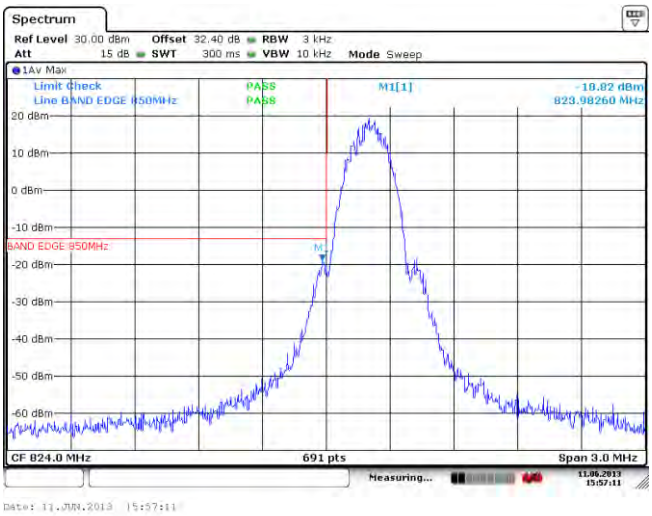
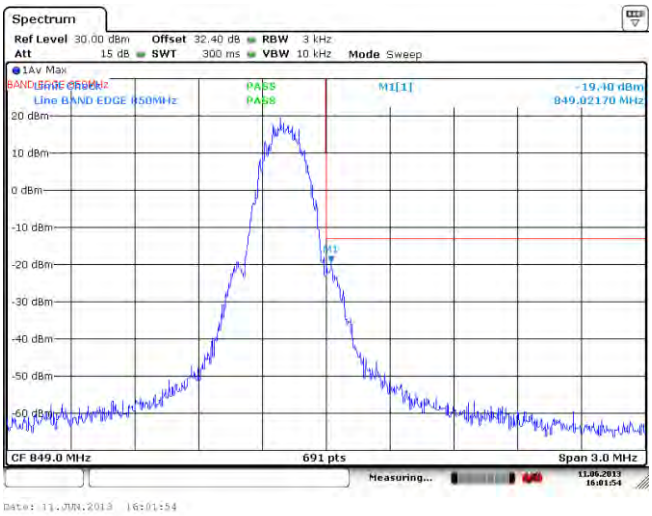


Figure 1-39a: GSM850 Band, High Channel Mask in EDGE mode



GSM Conducted RF Emission Test Data cont'd

Figure 1-40a: PCS1900 Band, Low Channel Mask in EDGE mode

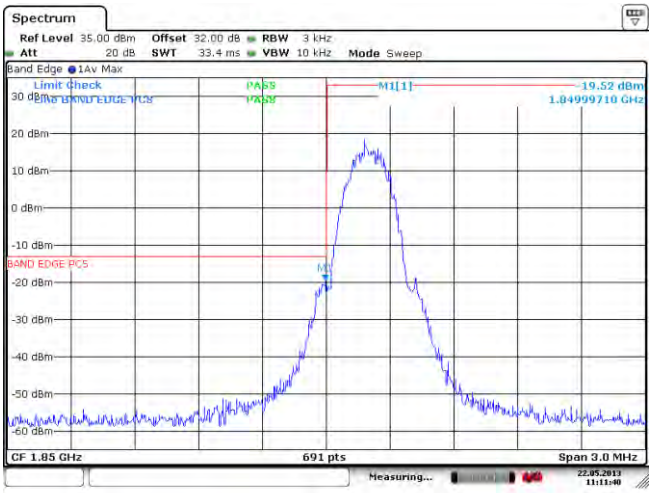
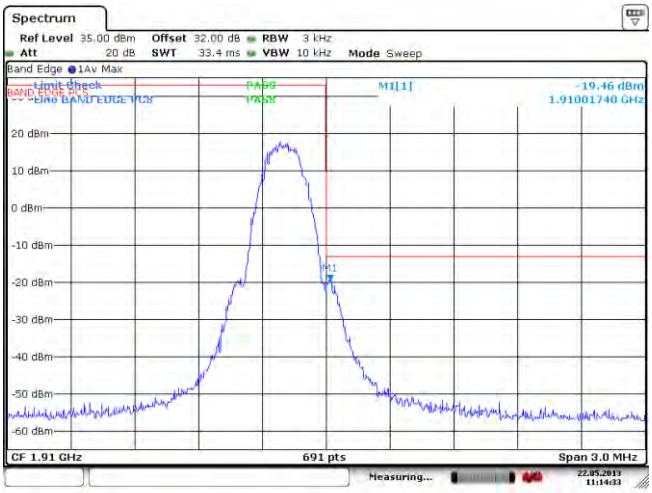


Figure 1-41a: PCS1900 Band, High Channel Mask in EDGE mode



GSM Conducted RF Emission Test Data cont'd

Figure 1-42a: GSM850 band, Spurious Conducted Emissions, Low channel in EDGE Mode

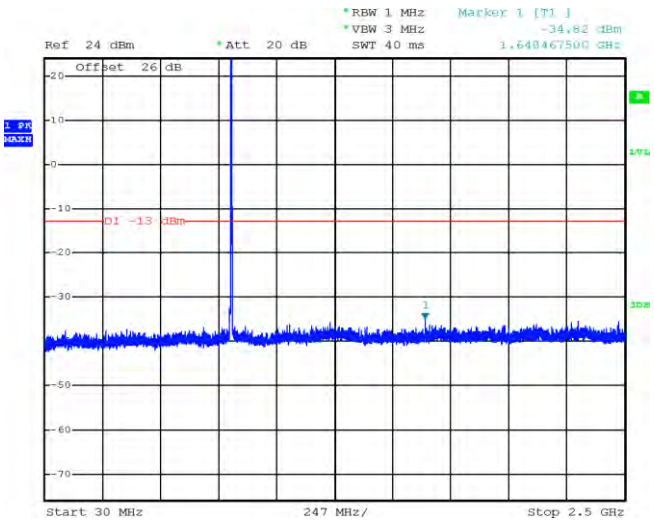


Figure 1-43a: GSM850 band, Spurious Conducted Emissions, Low channel in EDGE Mode

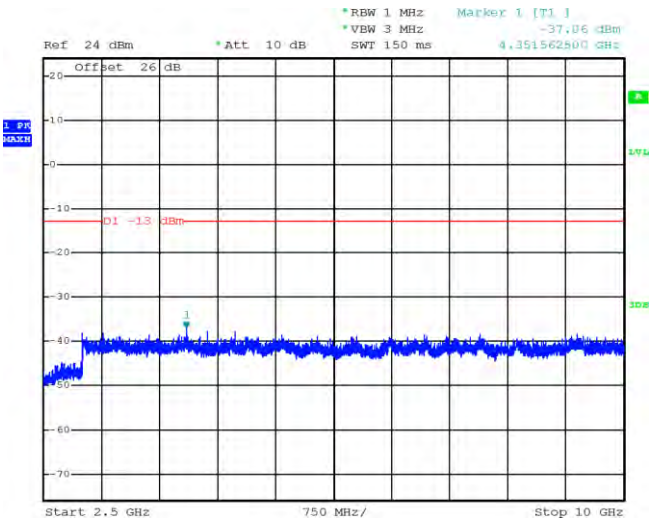


Figure 1-44a: GSM850 band, Spurious Conducted Emissions, Middle channel in EDGE Mode

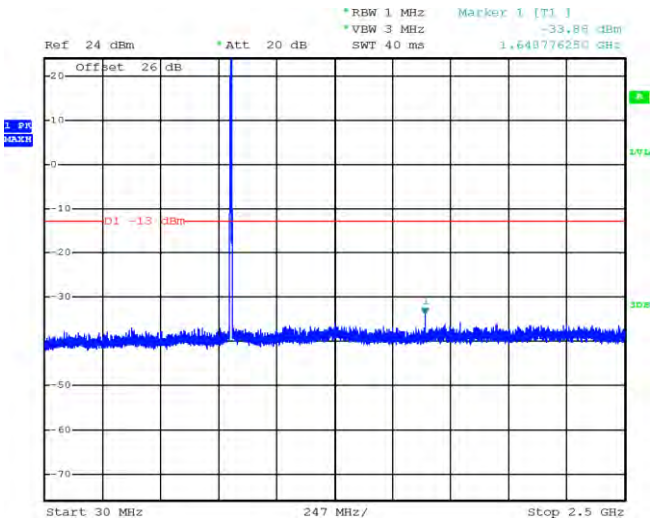
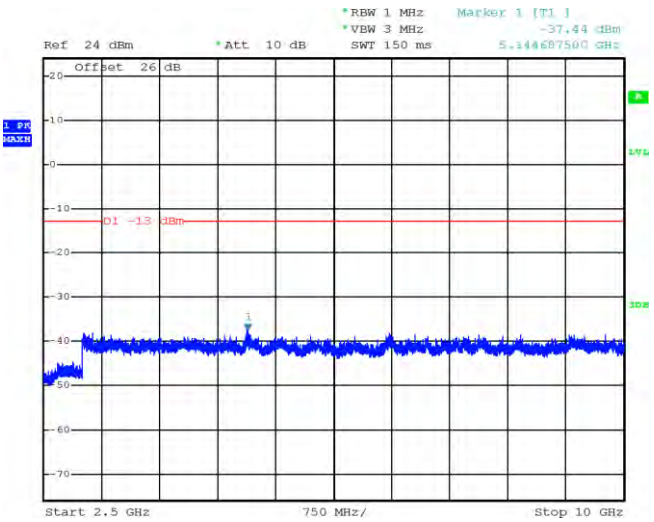


Figure 1-45a: GSM850 band, Spurious Conducted Emissions, Middle channel in EDGE Mode



GSM Conducted RF Emission Test Data cont'd

Figure 1-46a: GSM850 band, Spurious Conducted Emissions, High channel in EDGE Mode

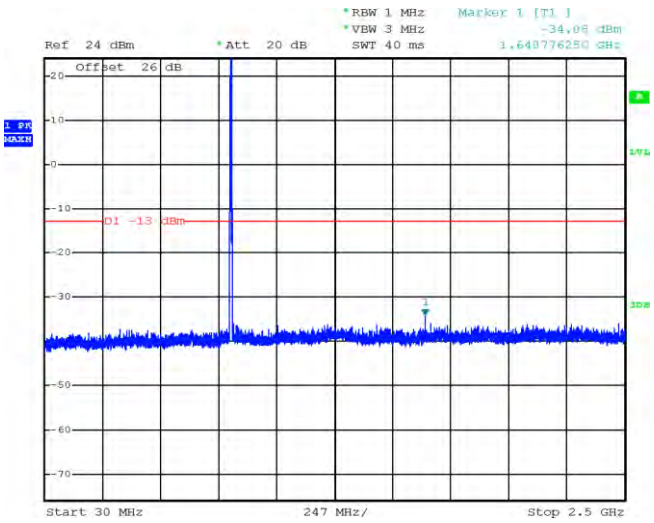


Figure 1-47a: GSM850 band, Spurious Conducted Emissions, High channel in EDGE Mode

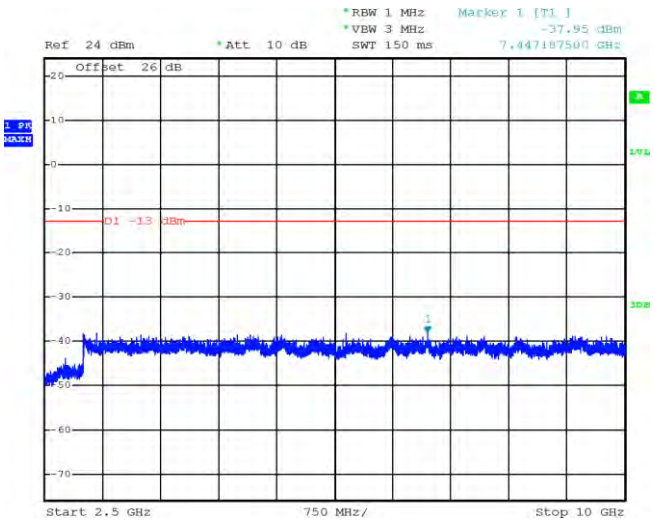


Figure 1-48a: PCS1900 band, Spurious Conducted Emissions, Low channel in EDGE Mode

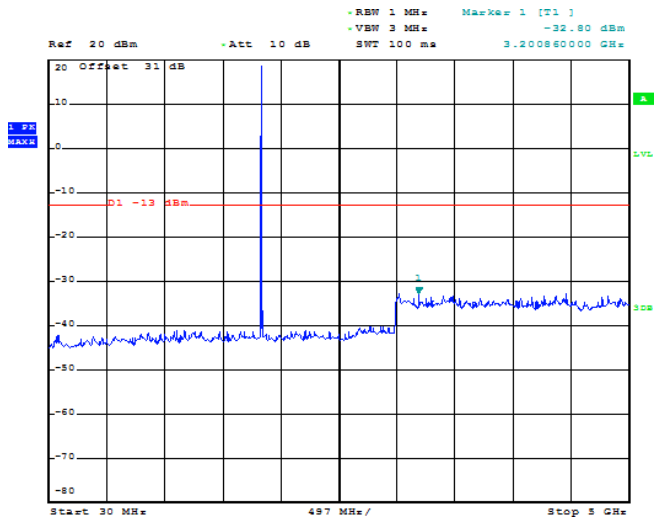
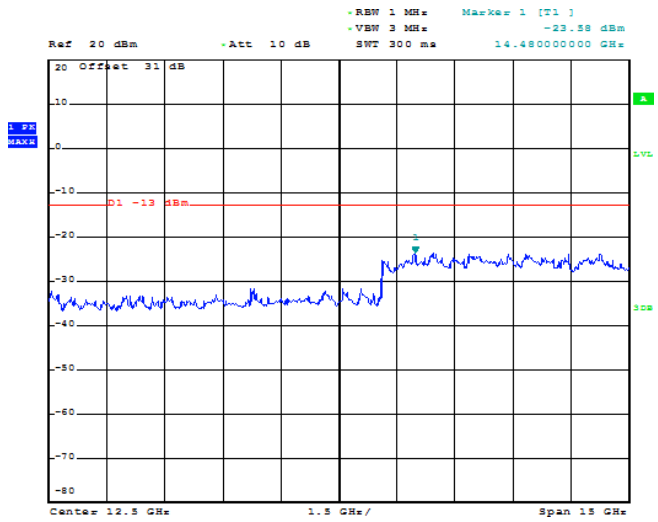


Figure 1-49a: PCS1900 band, Spurious Conducted Emissions, Low channel in EDGE Mode



GSM Conducted RF Emission Test Data cont'd

Figure 1-50a: PCS1900 band, Spurious Conducted Emissions, middle channel in EDGE Mode

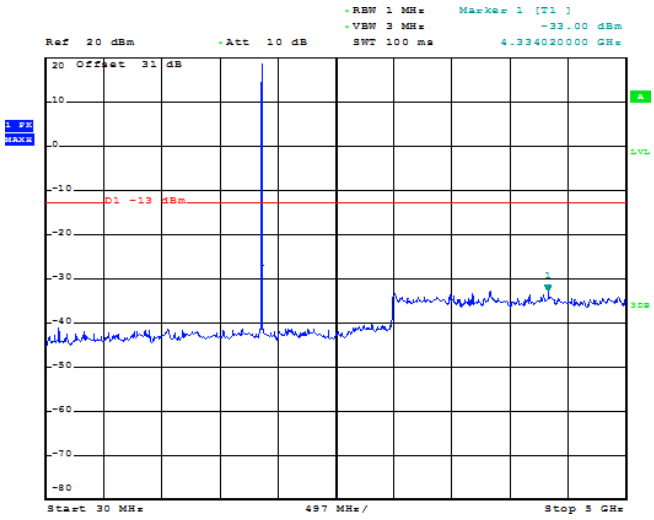


Figure 1-51a: PCS1900 band, Spurious Conducted Emissions, middle channel in EDGE Mode

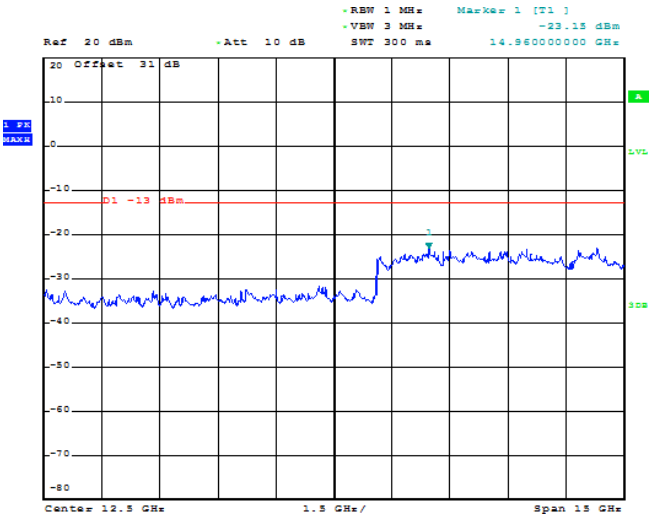


Figure 1-52a: PCS1900 band, Spurious Conducted Emissions, High channel in EDGE Mode

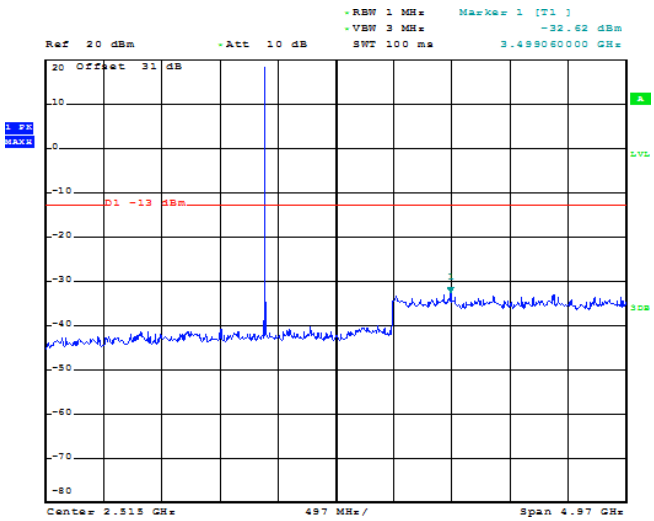
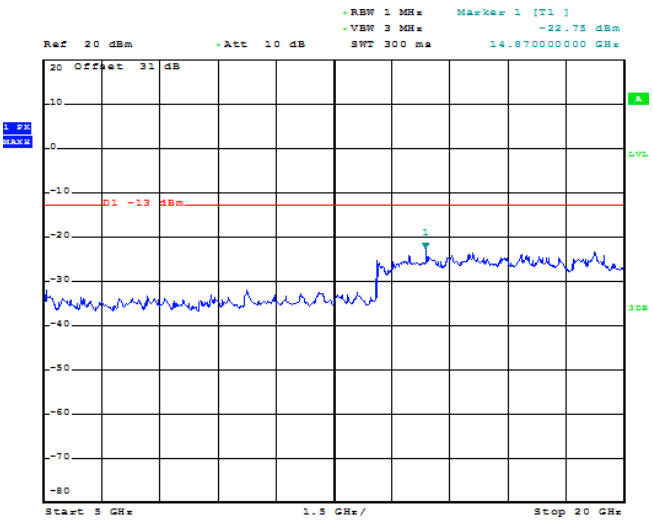
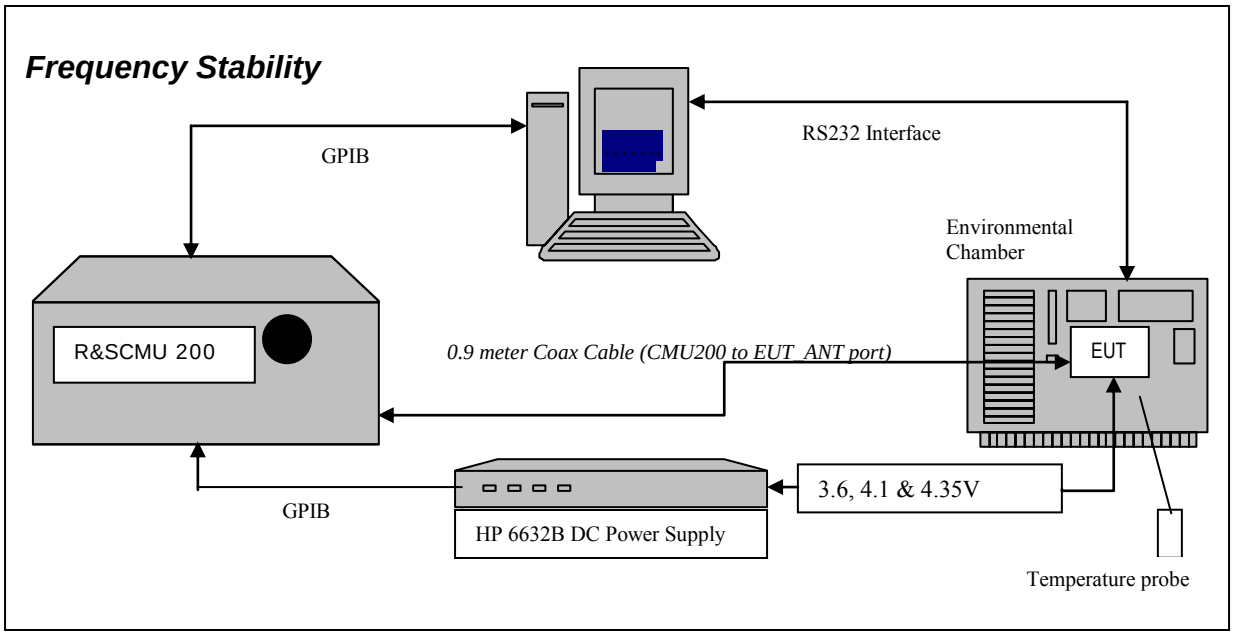


Figure 1-53a: PCS1900 band, Spurious Conducted Emissions, High channel in EDGE Mode



APPENDIX 1B – GSM FREQUENCY STABILITY TEST DATA

GSM Frequency Stability Test Data



The measurements were performed by 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

The EUT meets the requirements as stated in CFR 47 chapter 1, RSS-132, 4.3 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 4.1 and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

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

Procedure:

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

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

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

The maximum frequency error in the GSM850 band measured was -**0.0390 PPM**.
The maximum frequency error in the PCS1900 band measured was -**0.0257PPM**.

The following measurements were performed on product RFU81UW.

Date of Test: May 27, 2013

The environmental conditions were: Temperature: 23.4 °C
Humidity: 32.1 %

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	-17.18	-0.0208
189	836.40	3.6	20	-18.60	-0.0222
251	848.60	3.6	20	-16.79	-0.0198
Traffic Channel Number	**GSM850 Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
128	824.20	4.1	20	-19.37	-0.0235
189	836.40	4.1	20	-21.95	-0.0262
251	848.60	4.1	20	-24.34	-0.0287
Traffic Channel Number	**GSM850 Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
128	824.20	4.35	20	-27.25	-0.0331
189	836.40	4.35	20	-28.35	-0.0339
251	848.60	4.35	20	-28.86	-0.0340

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	-22.02	-0.0267
128	824.20	3.6	-20	-17.18	-0.0208
128	824.20	3.6	-10	10.20	0.0124
128	824.20	3.6	0	-3.81	-0.0046
128	824.20	3.6	10	-10.91	-0.0132
128	824.20	3.6	20	-5.36	-0.0065
128	824.20	3.6	30	-5.49	-0.0067
128	824.20	3.6	40	7.75	0.0094
128	824.20	3.6	50	4.00	0.0049
128	824.20	3.6	60	5.94	0.0072
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
128	824.20	4.1	-30	-29.19	-0.0354
128	824.20	4.1	-20	-19.37	-0.0235
128	824.20	4.1	-10	10.59	0.0128
128	824.20	4.1	0	-9.56	-0.0116
128	824.20	4.1	10	-9.04	-0.0110
128	824.20	4.1	20	4.91	0.0060
128	824.20	4.1	30	-22.73	-0.0276
128	824.20	4.1	40	-4.71	-0.0057
128	824.20	4.1	50	-5.68	-0.0069
128	824.20	4.1	60	-6.26	-0.0076
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
128	824.20	4.35	-30	-31.45	-0.0382
128	824.20	4.35	-20	-27.25	-0.0331
128	824.20	4.35	-10	14.79	0.0179
128	824.20	4.35	0	-4.39	-0.0053
128	824.20	4.35	10	-11.69	-0.0142
128	824.20	4.35	20	6.78	0.0082
128	824.20	4.35	30	-15.05	-0.0183
128	824.20	4.35	40	4.52	0.0055
128	824.20	4.35	50	-10.14	-0.0123
128	824.20	4.35	60	-9.10	-0.0110

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	-22.73	-0.0272
189	836.40	3.6	-20	-18.60	-0.0222
189	836.40	3.6	-10	12.66	0.0151
189	836.40	3.6	0	-4.58	-0.0055
189	836.40	3.6	10	-9.62	-0.0115
189	836.40	3.6	20	4.26	0.0051
189	836.40	3.6	30	-9.17	-0.0110
189	836.40	3.6	40	6.72	0.0080
189	836.40	3.6	50	-4.13	-0.0049
189	836.40	3.6	60	5.23	0.0063
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
189	836.40	4.1	-30	-24.54	-0.0293
189	836.40	4.1	-20	-21.95	-0.0262
189	836.40	4.1	-10	14.98	0.0179
189	836.40	4.1	0	-8.20	-0.0098
189	836.40	4.1	10	-7.94	-0.0095
189	836.40	4.1	20	6.84	0.0082
189	836.40	4.1	30	-15.56	-0.0186
189	836.40	4.1	40	3.87	0.0046
189	836.40	4.1	50	-6.59	-0.0079
189	836.40	4.1	60	-7.81	-0.0093
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
189	836.40	4.35	-30	**-32.61**	**-0.0390**
189	836.40	4.35	-20	-28.35	-0.0339
189	836.40	4.35	-10	19.89	0.0238
189	836.40	4.35	0	-4.58	-0.0055
189	836.40	4.35	10	-12.79	-0.0153
189	836.40	4.35	20	5.36	0.0064
189	836.40	4.35	30	-20.15	-0.0241
189	836.40	4.35	40	-6.65	-0.0080
189	836.40	4.35	50	-9.56	-0.0114
189	836.40	4.35	60	-9.43	-0.0113

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	-28.67	-0.0338
251	848.8	3.6	-20	-16.79	-0.0198
251	848.8	3.6	-10	15.17	0.0179
251	848.8	3.6	0	-6.39	-0.0075
251	848.8	3.6	10	-7.55	-0.0089
251	848.8	3.6	20	5.81	0.0068
251	848.8	3.6	30	-25.31	-0.0298
251	848.8	3.6	40	8.91	0.0105
251	848.8	3.6	50	4.33	0.0051
251	848.8	3.6	60	4.39	0.0052
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
251	848.8	4.1	-30	-29.32	-0.0345
251	848.8	4.1	-20	-24.34	-0.0287
251	848.8	4.1	-10	15.82	0.0186
251	848.8	4.1	0	-11.11	-0.0131
251	848.8	4.1	10	-10.85	-0.0128
251	848.8	4.1	20	10.46	0.0123
251	848.8	4.1	30	-16.47	-0.0194
251	848.8	4.1	40	-5.29	-0.0062
251	848.8	4.1	50	-6.20	-0.0073
251	848.8	4.1	60	-6.59	-0.0078
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
251	848.8	4.35	-30	-24.92	-0.0294
251	848.8	4.35	-20	-28.86	-0.0340
251	848.8	4.35	-10	20.34	0.0240
251	848.8	4.35	0	4.78	0.0056
251	848.8	4.35	10	-10.98	-0.0129
251	848.8	4.35	20	7.55	0.0089
251	848.8	4.35	30	-14.46	-0.0170
251	848.8	4.35	40	-12.59	-0.0148
251	848.8	4.35	50	-10.72	-0.0126
251	848.8	4.35	60	-6.39	-0.0075

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	-4.84	-0.0026
661	1880.00	3.6	20	-7.49	-0.0040
810	1909.80	3.6	20	-19.57	-0.0102
Traffic Channel Number	**PCS Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
512	1850.20	4.1	20	-27.12	-0.0147
661	1880.00	4.1	20	-16.79	-0.0089
810	1909.80	4.1	20	-17.18	-0.0090
Traffic Channel Number	**PCS Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
512	1850.20	4.35	20	-14.53	-0.0079
661	1880.00	4.35	20	-13.17	-0.0070
810	1909.80	4.35	20	-16.72	-0.0088

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	-27.31	-0.0148
512	1850.20	3.6	-20	-21.50	-0.0116
512	1850.20	3.6	-10	-23.05	-0.0125
512	1850.20	3.6	0	-10.46	-0.0057
512	1850.20	3.6	10	-11.30	-0.0061
512	1850.20	3.6	20	-4.84	-0.0026
512	1850.20	3.6	30	11.24	0.0061
512	1850.20	3.6	40	-25.51	-0.0138
512	1850.20	3.6	50	11.04	0.0060
512	1850.20	3.6	60	11.11	0.0060
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
512	1850.20	4.1	-30	-40.74	-0.0220
512	1850.20	4.1	-20	-35.71	-0.0193
512	1850.20	4.1	-10	-29.70	-0.0161
512	1850.20	4.1	0	-13.30	-0.0072
512	1850.20	4.1	10	-23.31	-0.0126
512	1850.20	4.1	20	-27.12	-0.0147
512	1850.20	4.1	30	16.79	0.0091
512	1850.20	4.1	40	-27.06	-0.0146
512	1850.20	4.1	50	-9.10	-0.0049
512	1850.20	4.1	60	-7.75	-0.0042
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
512	1850.20	4.35	-30	-44.88	-0.0243
512	1850.20	4.35	-20	-42.81	-0.0231
512	1850.20	4.35	-10	-31.64	-0.0171
512	1850.20	4.35	0	-12.66	-0.0068
512	1850.20	4.35	10	-16.01	-0.0087
512	1850.20	4.35	20	-14.53	-0.0079
512	1850.20	4.35	30	13.88	0.0075
512	1850.20	4.35	40	-22.47	-0.0121
512	1850.20	4.35	50	-15.63	-0.0084
512	1850.20	4.35	60	-18.92	-0.0102

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	-25.05	-0.0133
661	1880.00	3.6	-20	-23.96	-0.0127
661	1880.00	3.6	-10	-20.99	-0.0112
661	1880.00	3.6	0	-12.07	-0.0064
661	1880.00	3.6	10	-11.36	-0.0060
661	1880.00	3.6	20	-7.49	-0.0040
661	1880.00	3.6	30	16.92	0.0090
661	1880.00	3.6	40	-22.15	-0.0118
661	1880.00	3.6	50	14.66	0.0078
661	1880.00	3.6	60	11.30	0.0060
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
661	1880.00	4.1	-30	-37.13	-0.0198
661	1880.00	4.1	-20	-33.96	-0.0181
661	1880.00	4.1	-10	-33.25	-0.0177
661	1880.00	4.1	0	-11.56	-0.0061
661	1880.00	4.1	10	-17.43	-0.0093
661	1880.00	4.1	20	-16.79	-0.0089
661	1880.00	4.1	30	19.89	0.0106
661	1880.00	4.1	40	-20.28	-0.0108
661	1880.00	4.1	50	-5.81	-0.0031
661	1880.00	4.1	60	-10.14	-0.0054
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
661	1880.00	4.35	-30	-41.91	-0.0223
661	1880.00	4.35	-20	-28.02	-0.0149
661	1880.00	4.35	-10	-32.16	-0.0171
661	1880.00	4.35	0	-12.33	-0.0066
661	1880.00	4.35	10	-18.66	-0.0099
661	1880.00	4.35	20	-13.17	-0.0070
661	1880.00	4.35	30	18.08	0.0096
661	1880.00	4.35	40	-14.98	-0.0080
661	1880.00	4.35	50	-16.53	-0.0088
661	1880.00	4.35	60	-15.11	-0.0080

PCS1900 Results: channel 810 @ maximum transmitted power

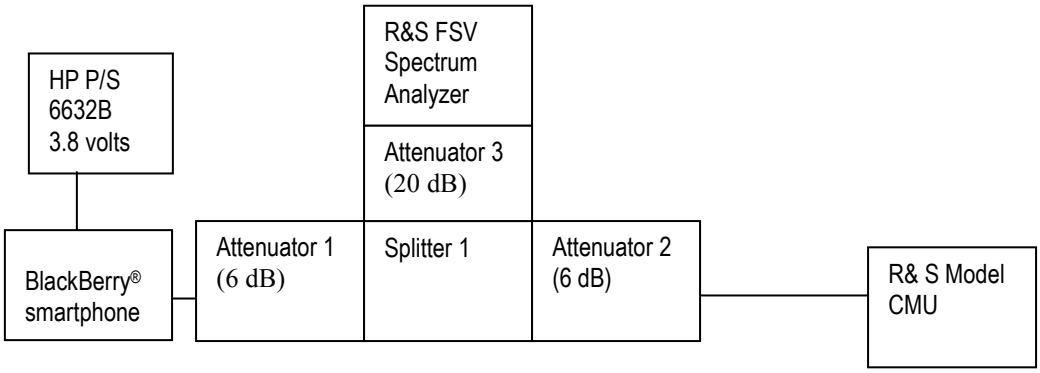
Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
810	1909.80	3.6	-30	-22.86	-0.0120
810	1909.80	3.6	-20	-28.28	-0.0148
810	1909.80	3.6	-10	-21.50	-0.0113
810	1909.80	3.6	0	6.91	0.0036
810	1909.80	3.6	10	-17.11	-0.0090
810	1909.80	3.6	20	-19.57	-0.0102
810	1909.80	3.6	30	20.02	0.0105
810	1909.80	3.6	40	-15.82	-0.0083
810	1909.80	3.6	50	16.53	0.0087
810	1909.80	3.6	60	12.20	0.0064
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
810	1909.80	4.1	-30	-39.26	-0.0206
810	1909.80	4.1	-20	-32.67	-0.0171
810	1909.80	4.1	-10	-32.93	-0.0172
810	1909.80	4.1	0	-13.17	-0.0069
810	1909.80	4.1	10	-20.21	-0.0106
810	1909.80	4.1	20	-17.18	-0.0090
810	1909.80	4.1	30	18.14	0.0095
810	1909.80	4.1	40	-24.09	-0.0126
810	1909.80	4.1	50	-11.75	-0.0062
810	1909.80	4.1	60	-12.14	-0.0064
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
810	1909.80	4.35	-30	**-49.01**	**-0.0257**
810	1909.80	4.35	-20	-24.28	-0.0127
810	1909.80	4.35	-10	-28.28	-0.0148
810	1909.80	4.35	0	4.39	0.0023
810	1909.80	4.35	10	-17.76	-0.0093
810	1909.80	4.35	20	-16.72	-0.0088
810	1909.80	4.35	30	17.11	0.0090
810	1909.80	4.35	40	-12.01	-0.0063
810	1909.80	4.35	50	-16.72	-0.0088
810	1909.80	4.35	60	-16.14	-0.0085

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

WCDMA BAND 2/5 Conducted RF Emission Test Data

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

Test Setup Diagram



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

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

Date of Test: May 17 to June 3, 2013

The environmental test conditions were: Temperature: 23.4 – 23.7 ºC
Relative Humidity: 21.9 - 26.1 %

The following measurements were performed by Berkin Can.

WCDMA Conducted RF Emission Test Data cont'd

The following measurements were performed on product RFU81UW.

The conducted spurious emissions – As per 47 CFR 2.1051, CFR 24.238(a), CFR 2.202, CFR 22 Subpart H, CFR 27.53, RSS-132 and RSS - 133 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 5 was measured to be 4.551 MHz, and for the WCDMA band 2 was measured to be 4.501 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 5/2 selected Frequencies in Loopback mode

WCDMA Band 5 Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
826.400	4.522	**4.067**
836.400	4.515	**4.067**
846.600	4.551	**4.067**

WCDMA Band 2 Frequency (MHz)	26dBc Occupied Bandwidth (MHz	99% Occupied Bandwidth (MHz)
1852.400	4.501	**4.059**
1880.000	4.495	**4.059**
1907.600	4.488	**4.059**

Peak to Average Ratio (PAR)
The peak to average ratio was measured on the low, middle and high channels.
On any frequency outside the frequency block and outside the adjacent 1 MHz bands, a resolution bandwidth of at least 1 MHz was applied.
The worst case measured was 3.54 dB on the low channel.

Measurement Plots for WCDMA Band 5 and WCDMA Band 2 in Voice mode

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

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

WCDMA Band 5 Frequency (MHz)	99% Occupied Bandwidth (MHz)
826.400	**4.153**
836.400	4.146
846.600	4.146

WCDMA Band 2 Frequency (MHz)	99% Occupied Bandwidth (MHz)
1852.400	**4.161**
1880.000	**4.161**
1907.600	4.153

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

See Figures 1-32b to 1-43b for the plots of the conducted spurious emissions.
See Figures 1-44b to 1-49b for the plots of 99% Occupied Bandwidth.
See Figures 1-50b to 1-53b for the plots of the Channel mask.

WCDMA Conducted RF Emission Test Data cont'd

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

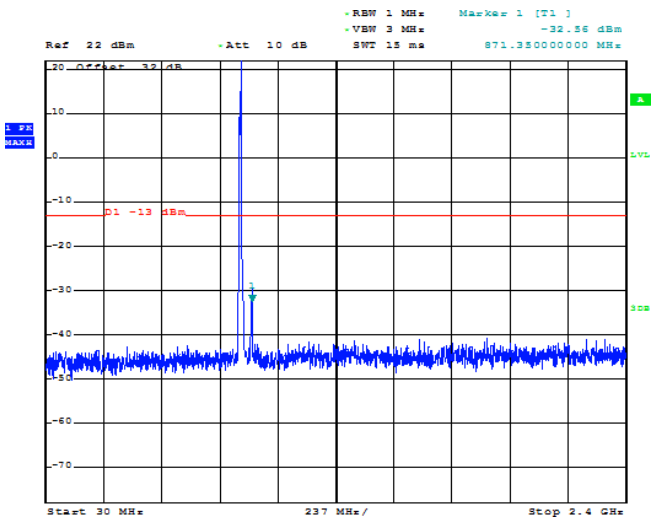


Figure 1-2b: Band 5, Spurious Conducted Emissions, Low channel

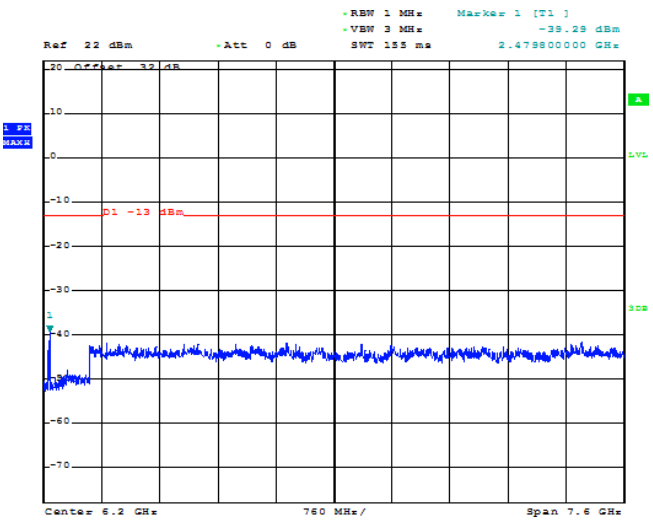


Figure 1-3b: Band 5, Spurious Conducted Emissions, Middle channel

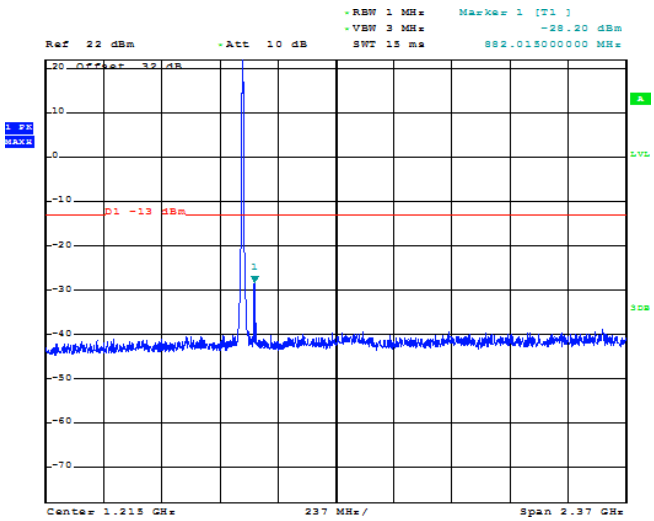
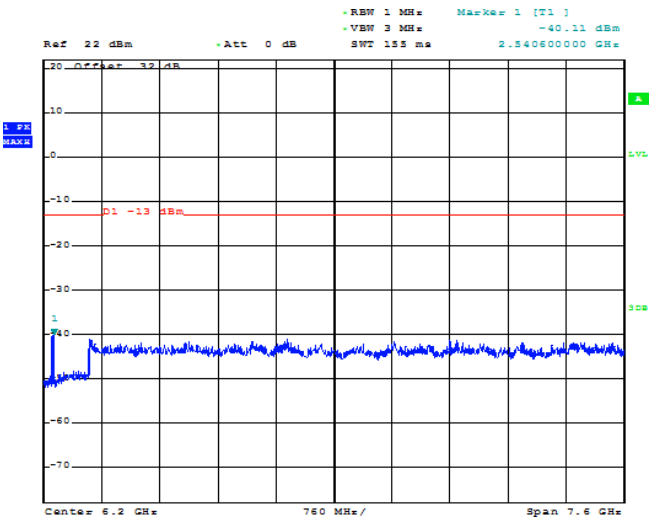


Figure 1-4b: Band 5, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

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

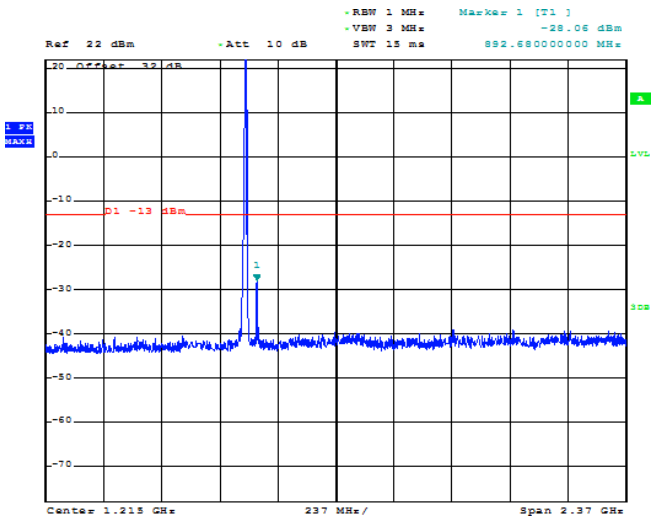


Figure 1-6b: Band 5, Spurious Conducted Emissions, High Channel

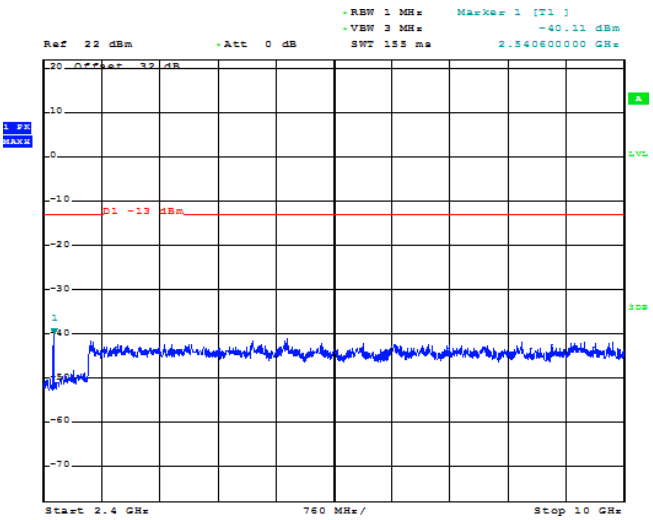


Figure 1-7b:, BAND 2 Spurious Conducted Emissions, Low Channel

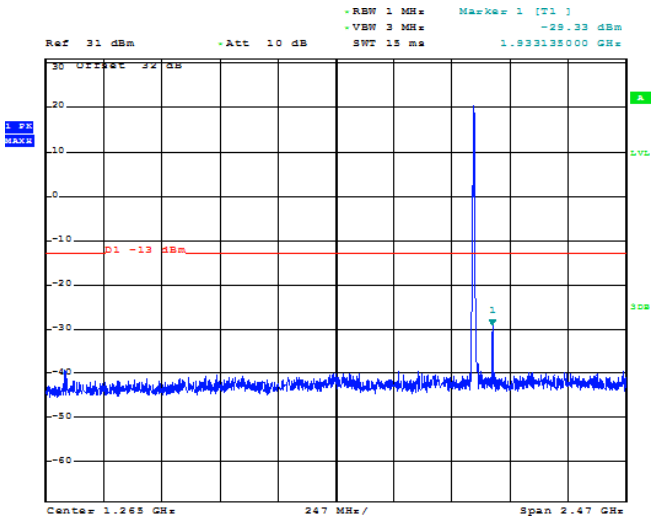
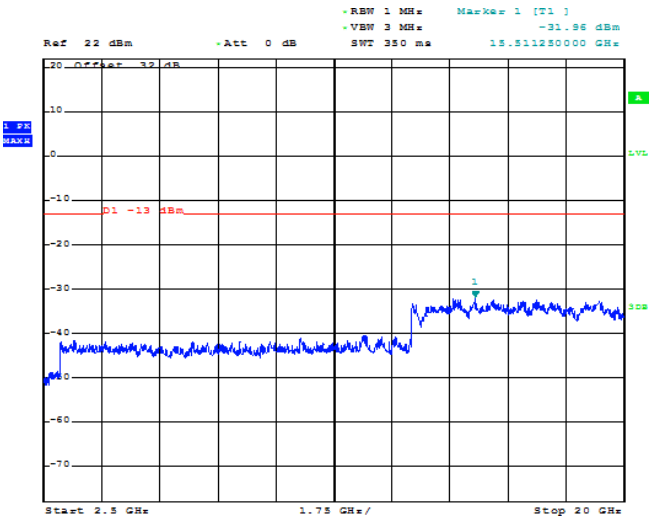


Figure 1-8b: BAND 2, Spurious Conducted Emissions, Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

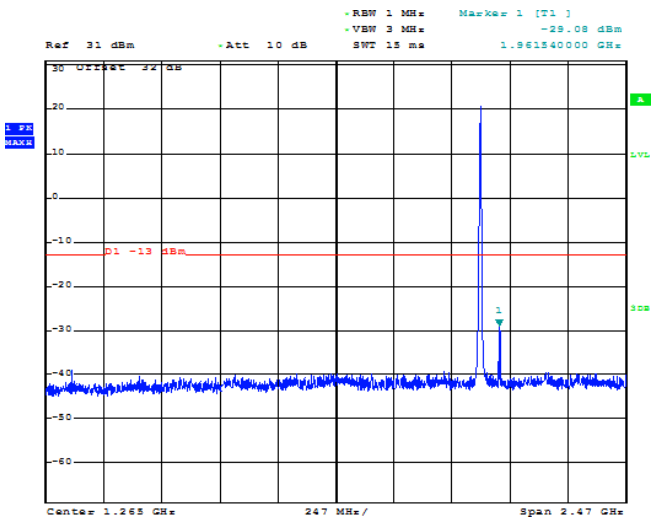


Figure 1-10b: BAND 2, Spurious Conducted Emissions, Middle Channel

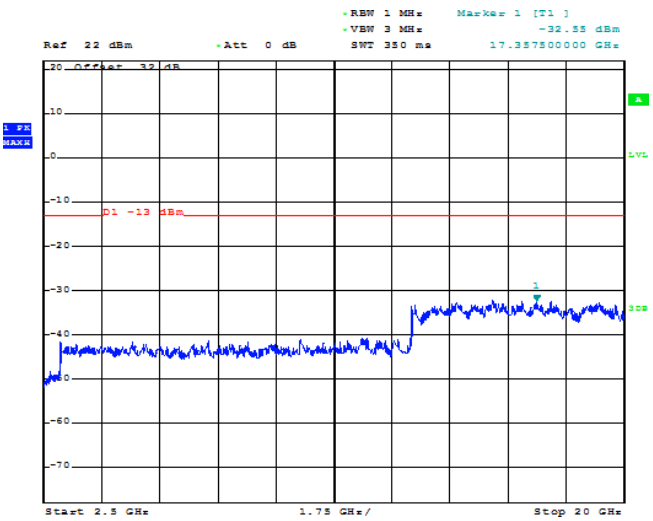


Figure 1-11b: BAND 2, Spurious Conducted Emissions, High Channel

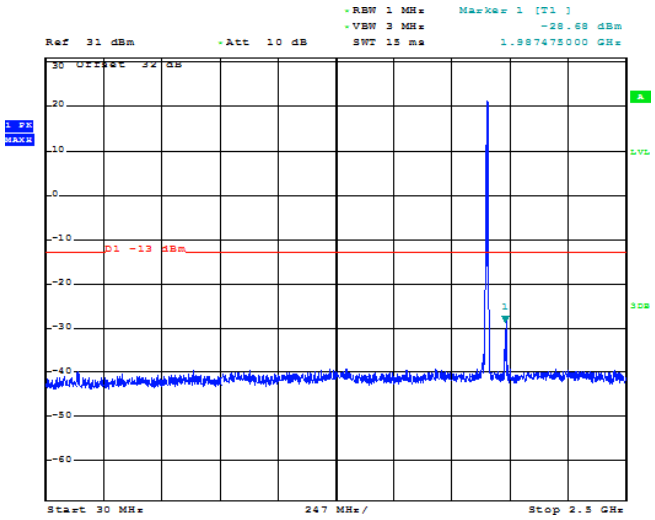
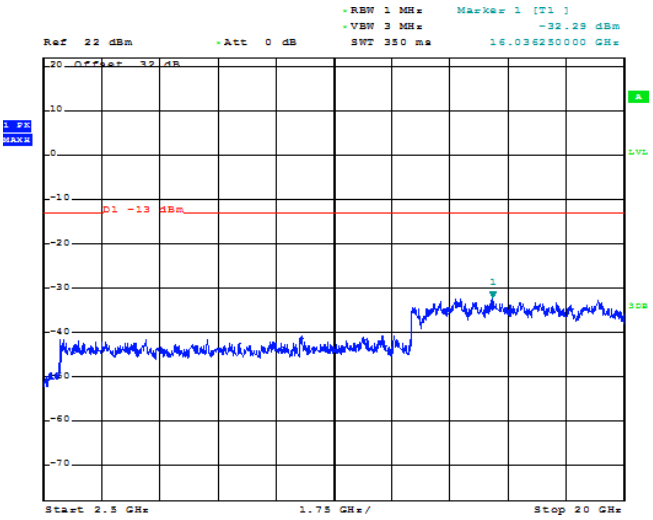


Figure 1-12b: BAND 2, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

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

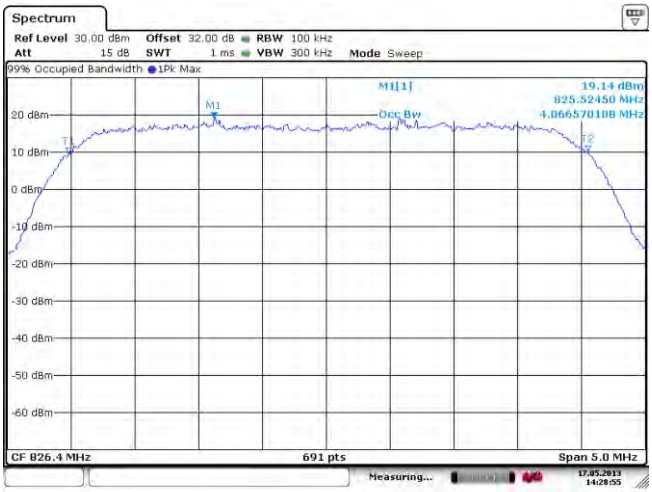


Figure 1-14b: Occupied Bandwidth, Band 5 Middle Channel

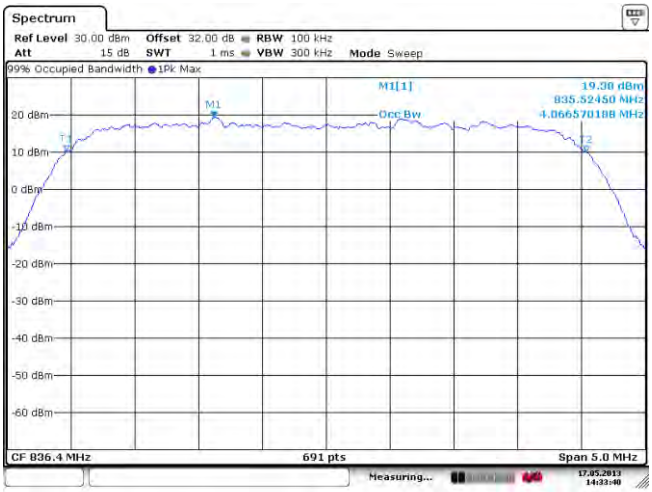


Figure 1-15b: Occupied Bandwidth, Band 5 High Channel

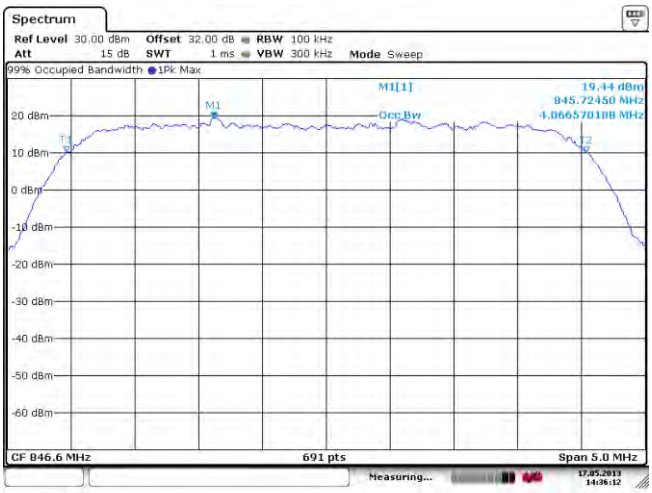
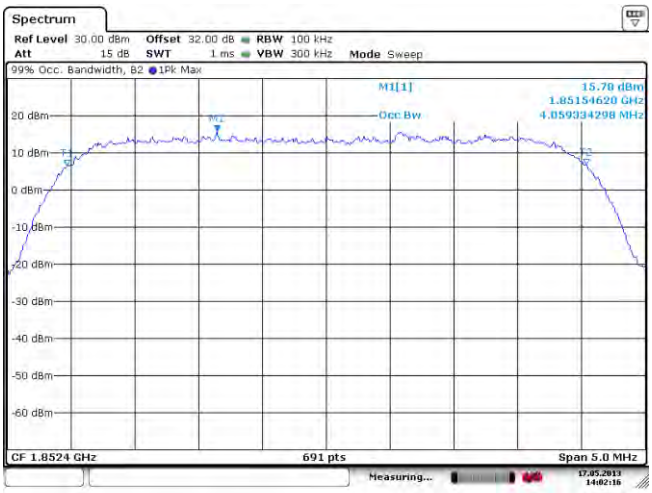


Figure 1-16b: Occupied Bandwidth, Band 2 Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

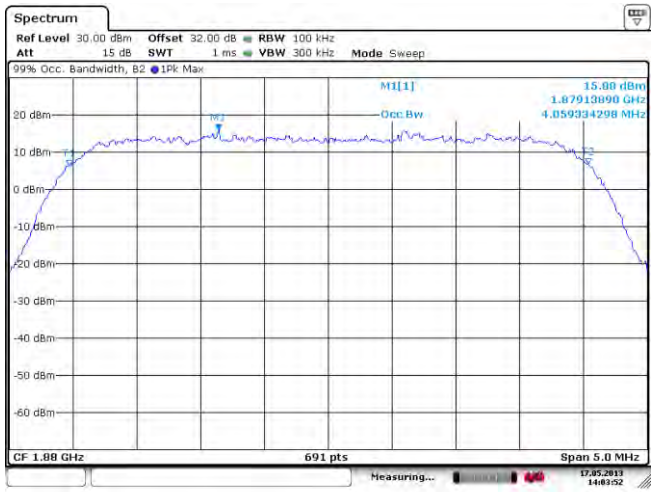


Figure 1-18b: Occupied Bandwidth, Band 2 High Channel

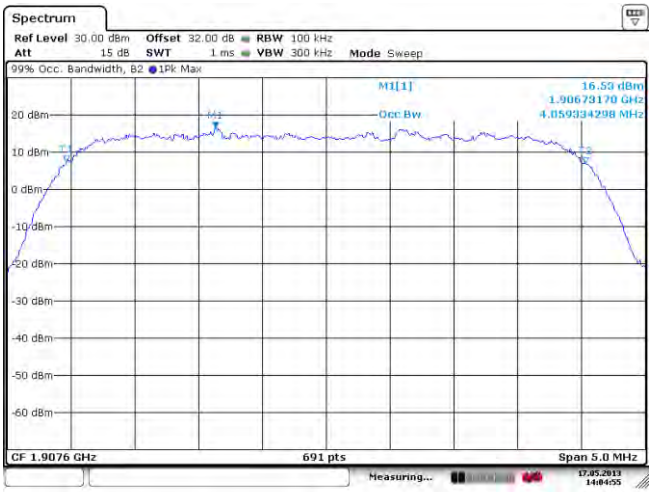


Figure 1-19b: -26 dBc Bandwidth, Band 5 Low Channel

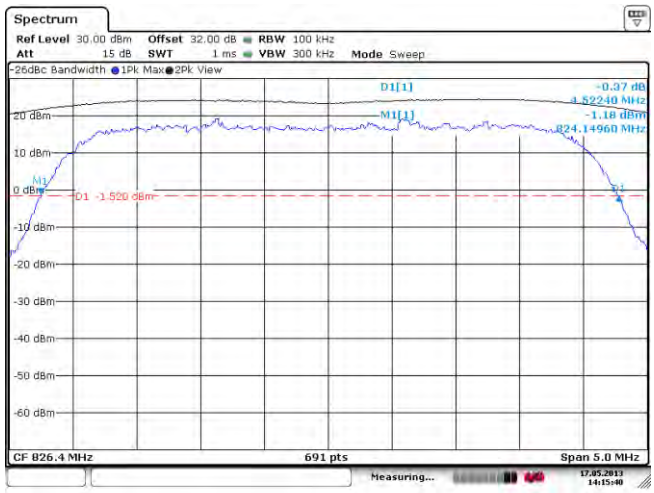
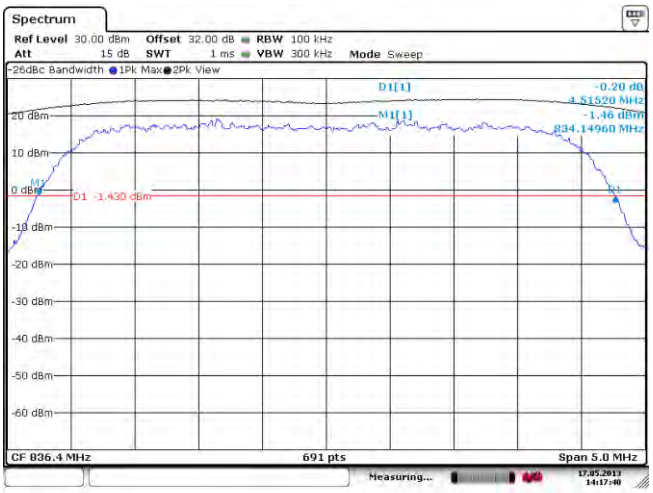


Figure 1-20b: -26 dBc Bandwidth, Band 5 Middle Channel



WCDMA Conducted RF Emission Test Data cont'd

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

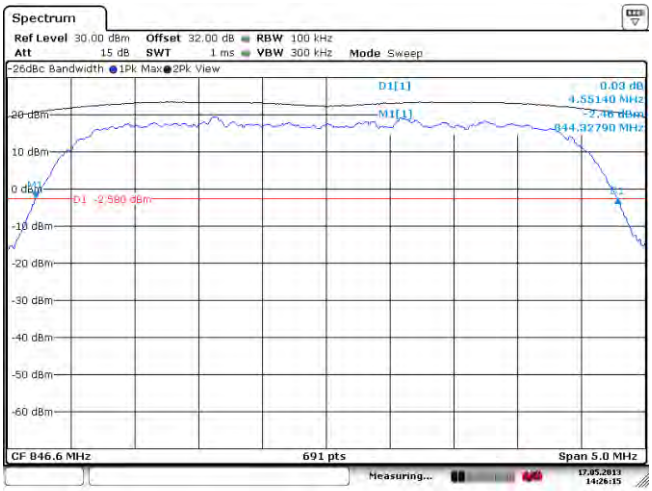


Figure 1-22b: -26 dBc Bandwidth, Band 2 Low Channel

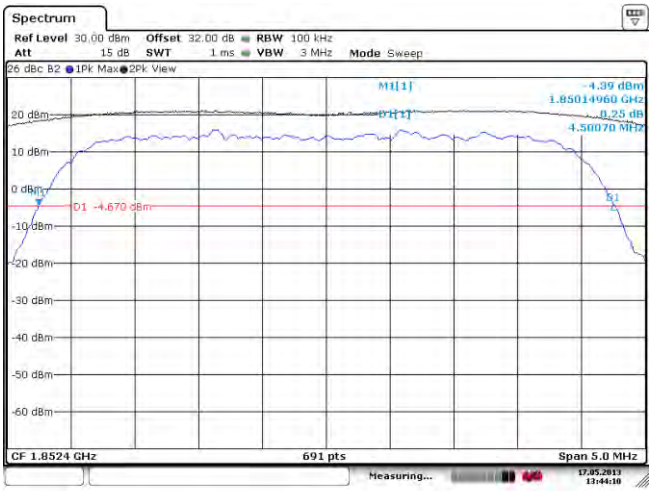


Figure 1-23b: -26 dBc Bandwidth, Band 2 Middle Channel

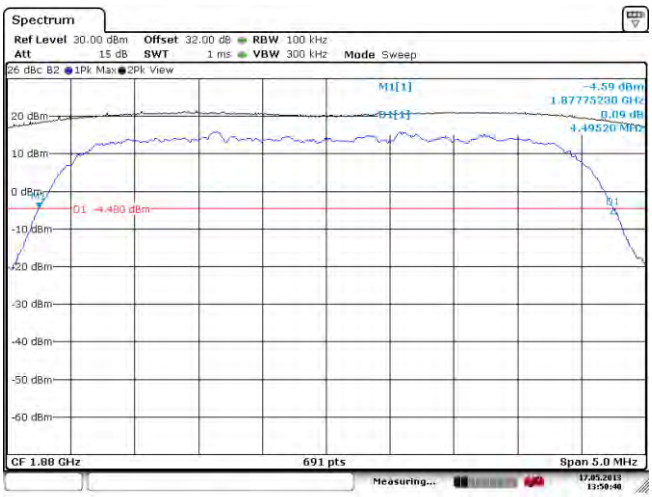
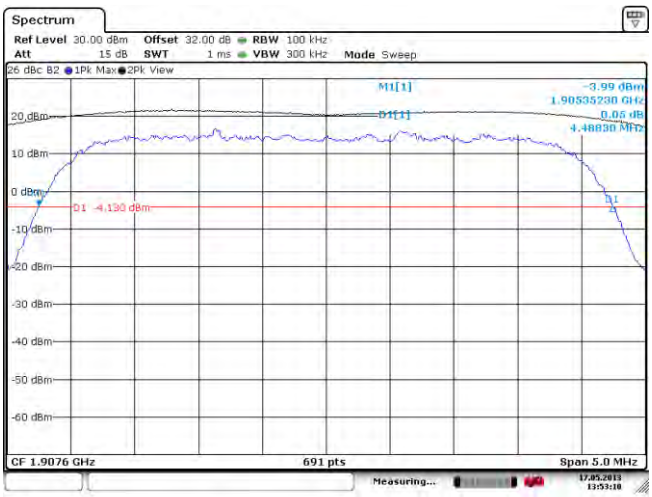


Figure 1-24b: -26 dBc Bandwidth, Band 2 High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-25b: Band 5 Low Channel Mask

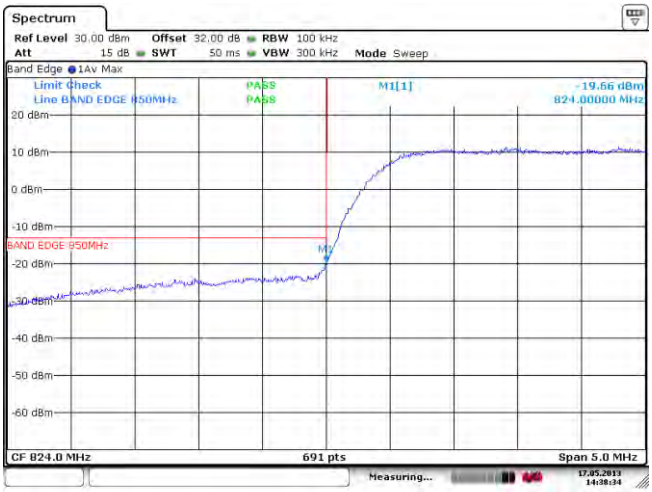


Figure 1-26b: Band 5 High Channel Mask

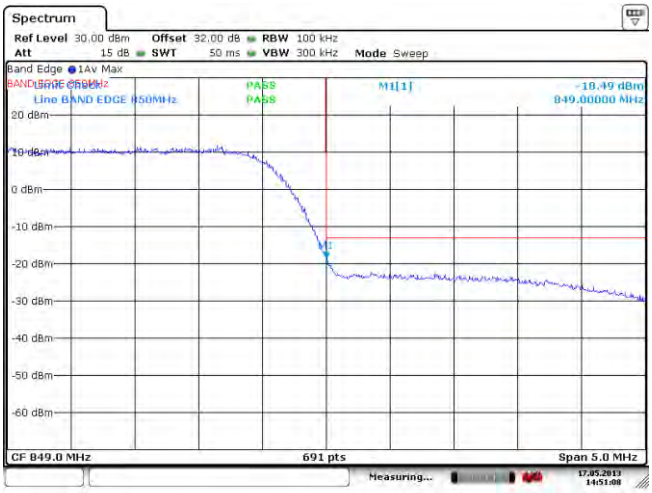


Figure 1-27b: Band 2 Low Channel Mask

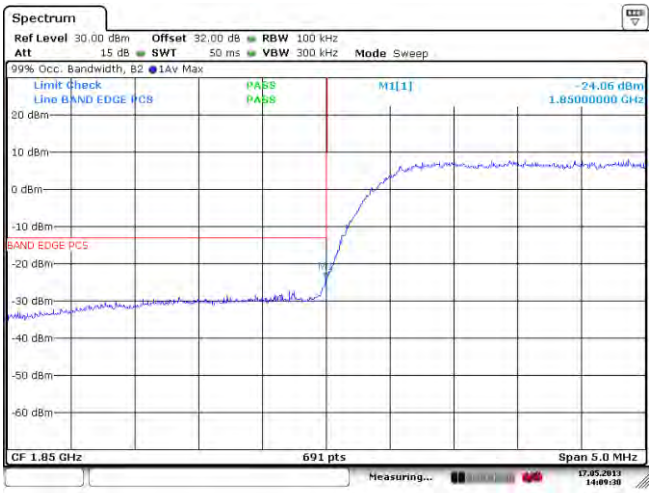
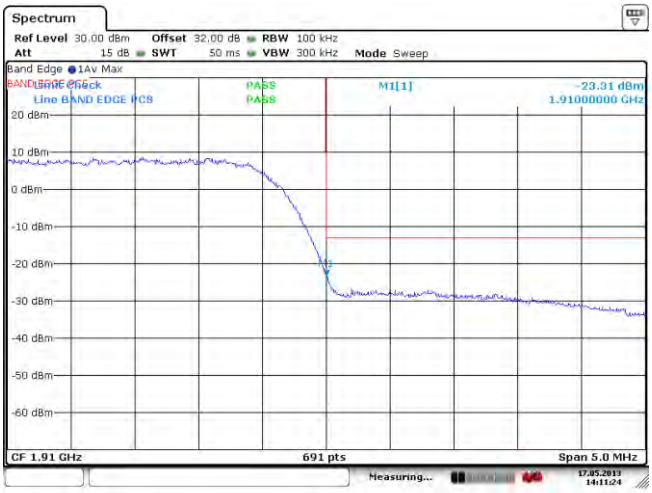


Figure 1-28b: Band 2 High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-29b: Band 2, PAR Low Channel

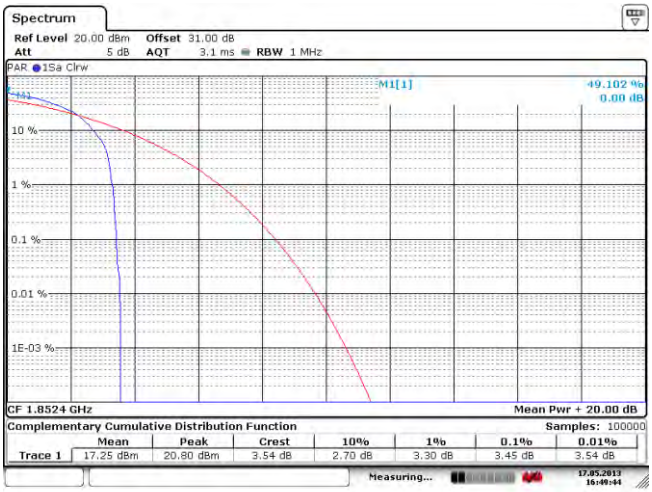


Figure 1-30b: Band 2, PAR Mid Channel

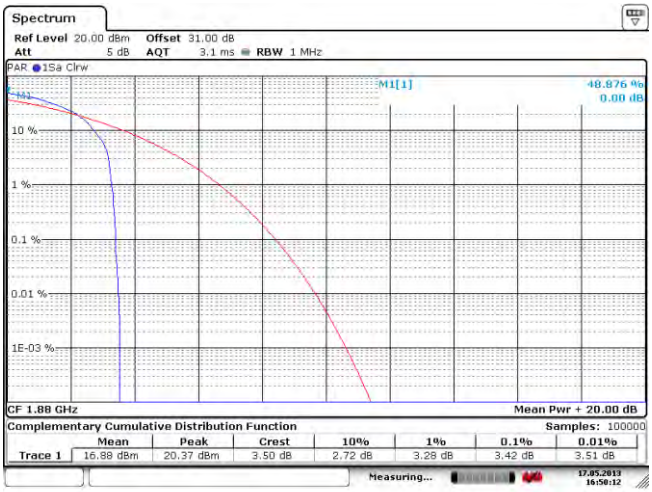
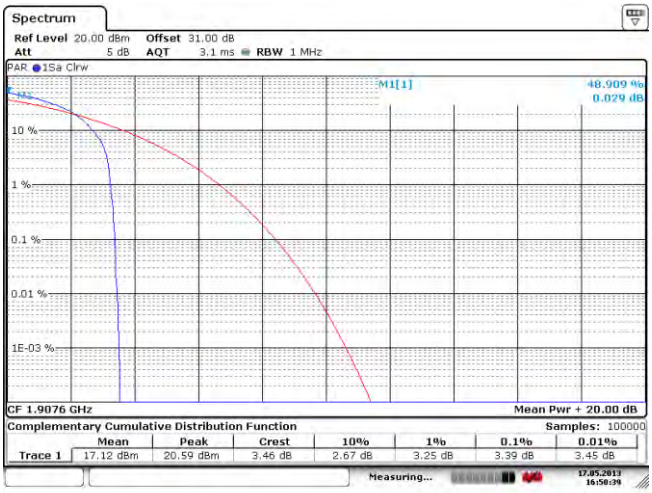


Figure 1-31b: Band 2, PAR High Channel



WCDMA Conducted RF Emission Test Data cont'd

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

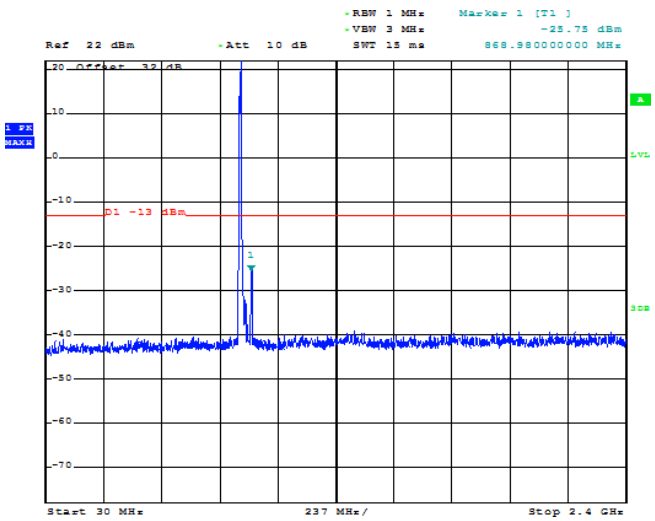


Figure 1-33b: Band 5 HSUPA, Spurious Conducted Emissions, Low channel

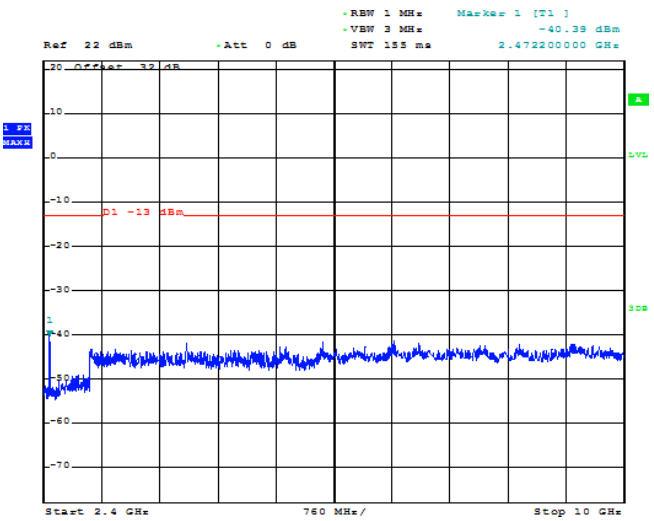


Figure 1-34b: Band 5 HSUPA, Spurious Conducted Emissions, Middle channel

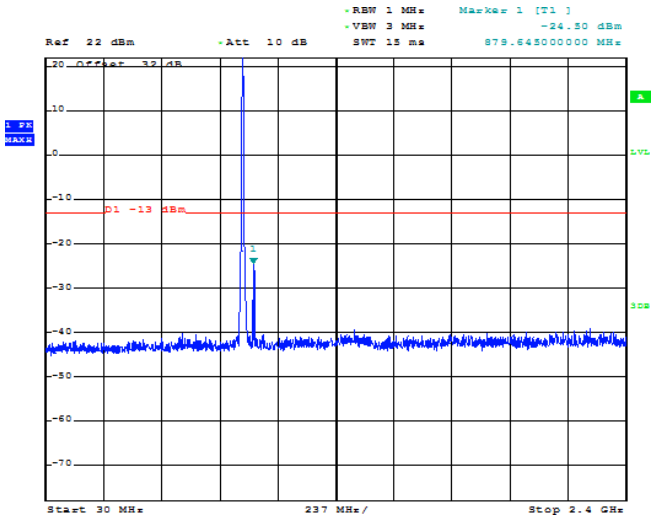
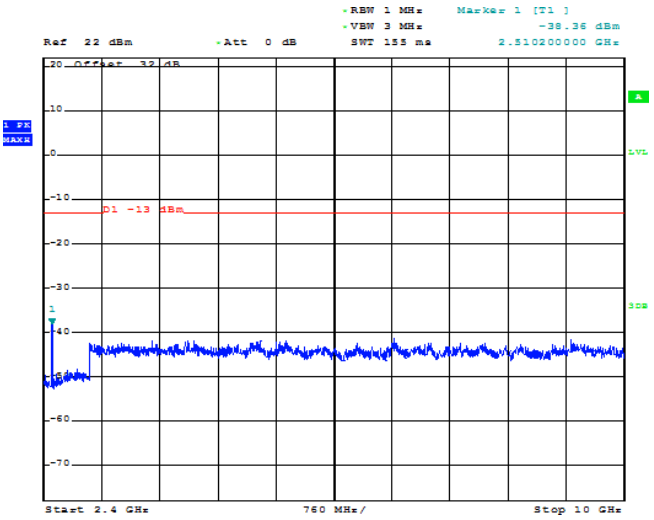


Figure 1-35b: Band 5 HSUPA, Spurious Conducted Emissions, Middle channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-36b: Band 5 HSUPA, Spurious Conducted Emissions, High Channel

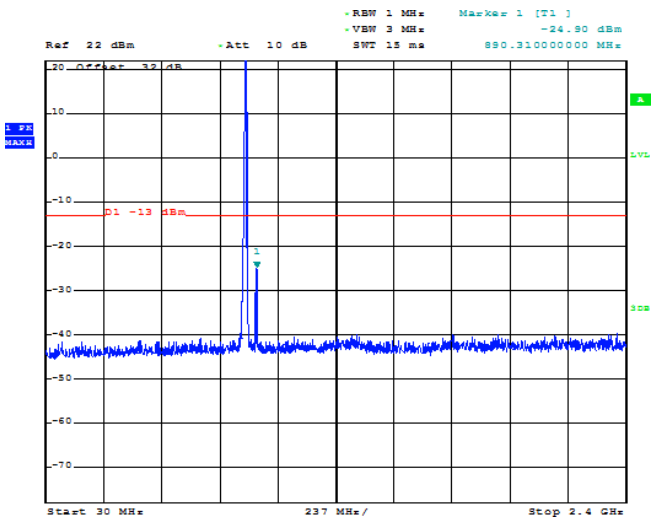


Figure 1-37b: Band 5 HSUPA, Spurious Conducted Emissions, High Channel

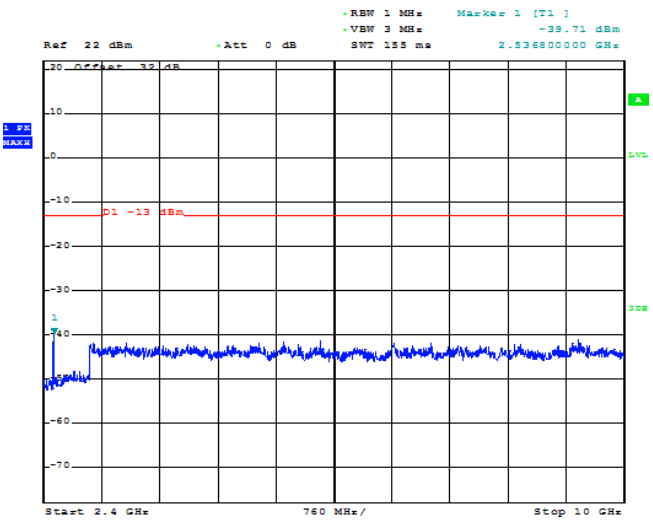


Figure 1-38b: Band 2 HSUPA, Spurious Conducted Emissions, Low Channel

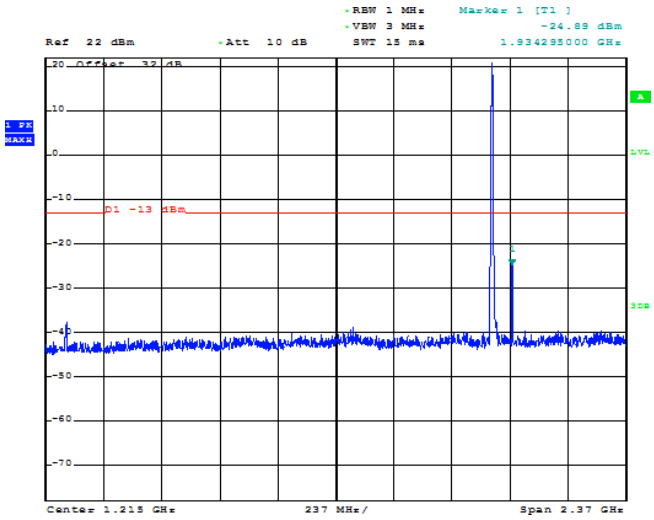
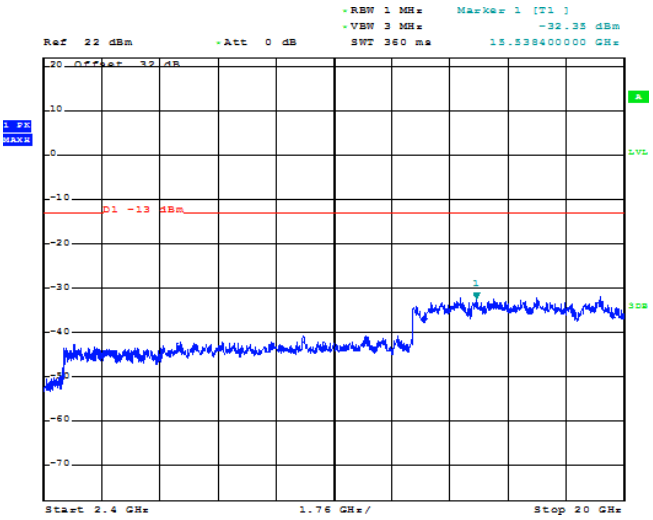


Figure 1-39b: Band 2 HSUPA, Spurious Conducted Emissions, Low Channel



WCDMA Conducted RF Emission Test Data cont'd

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

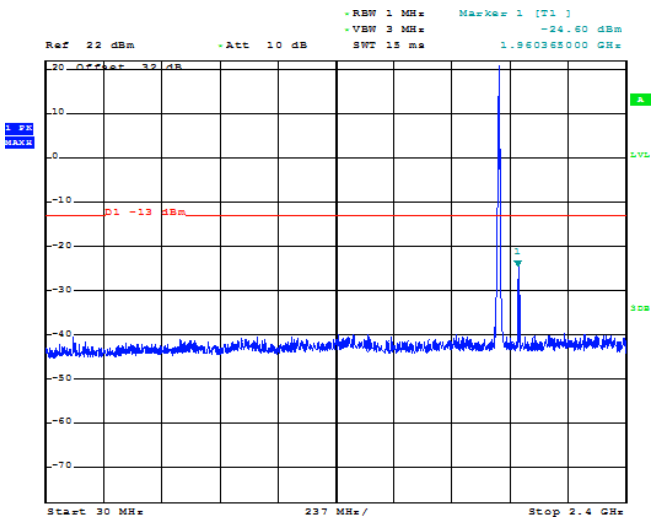


Figure 1-41b: Band 2 HSUPA, Spurious Conducted Emissions, Middle Channel

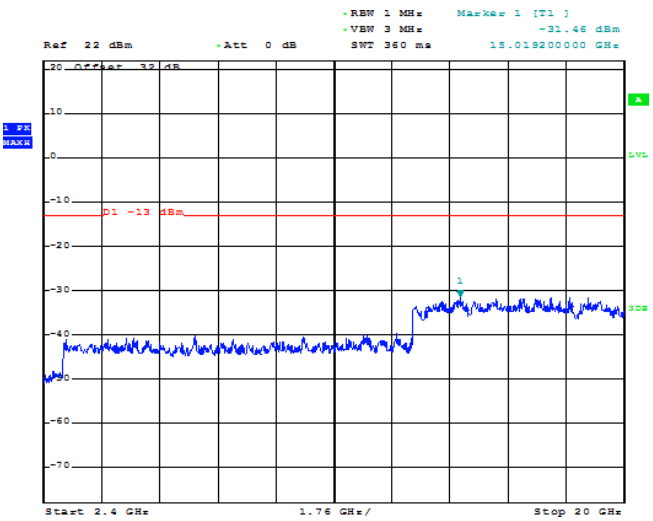


Figure 1-42b: Band 2 HSUPA, Spurious Conducted Emissions, High Channel

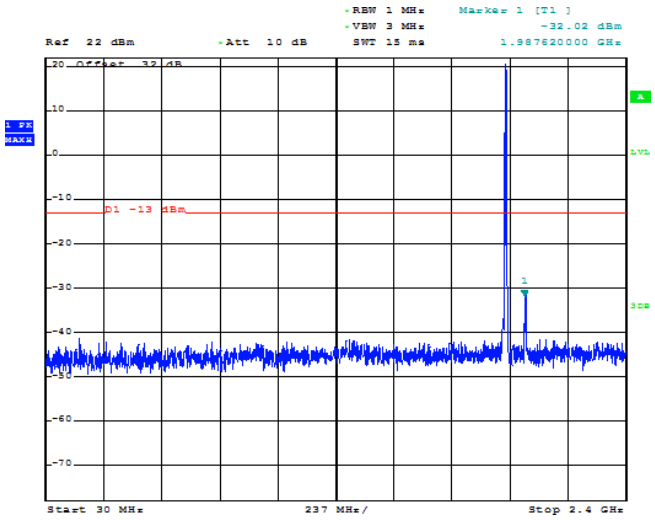
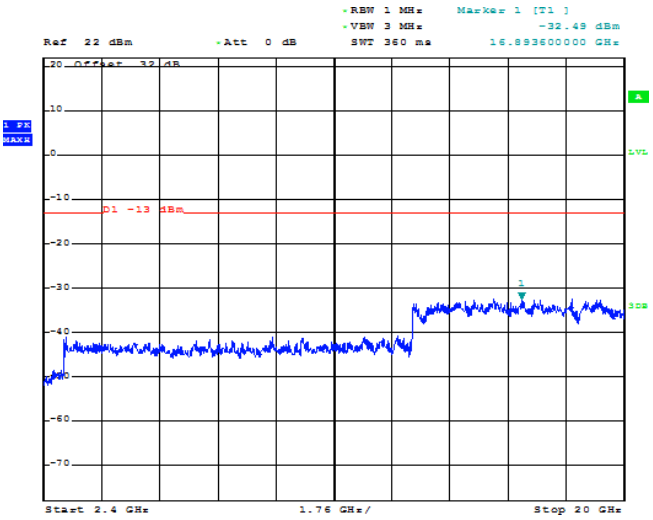


Figure 1-43b: Band 2 HSUPA, Spurious Conducted Emissions, High Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-44b: Occupied Bandwidth, Band 5 HSUPA Low Channel

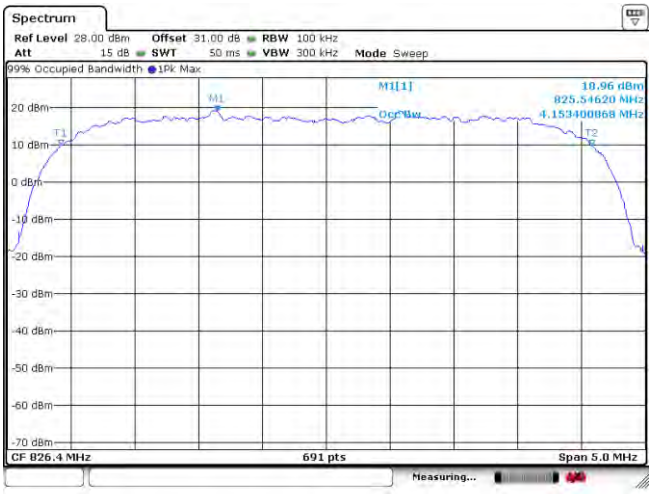


Figure 1-45b: Occupied Bandwidth, Band 5 HSUPA Middle Channel

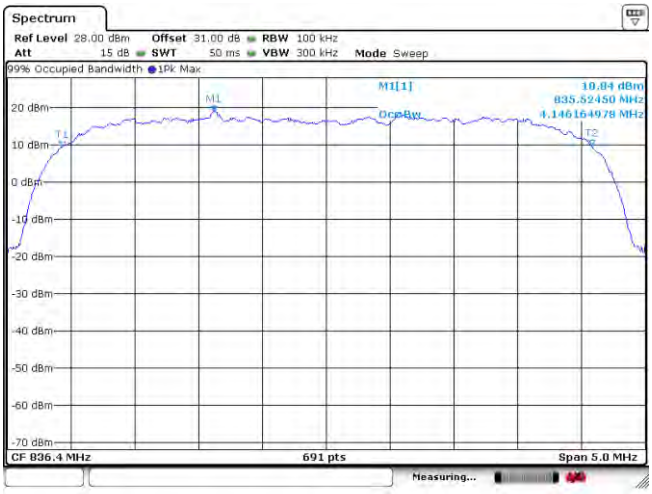


Figure 1-46b: Occupied Bandwidth, Band 5 HSUPA High Channel

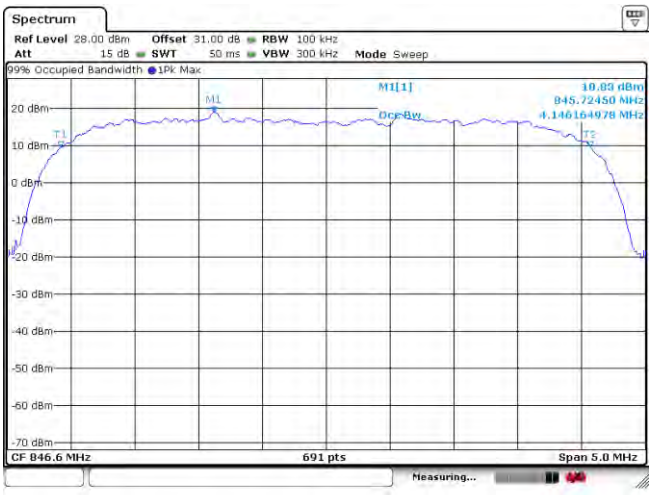
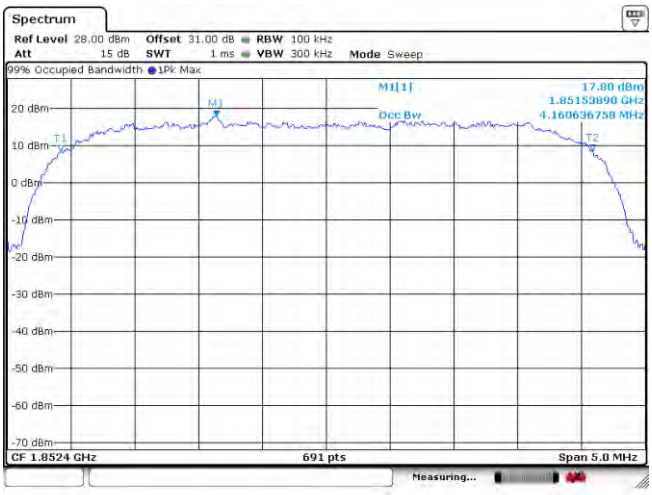


Figure 1-47b: Occupied Bandwidth, Band 2 HSUPA Low Channel



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-48b: Occupied Bandwidth, Band 2 HSUPA Middle Channel

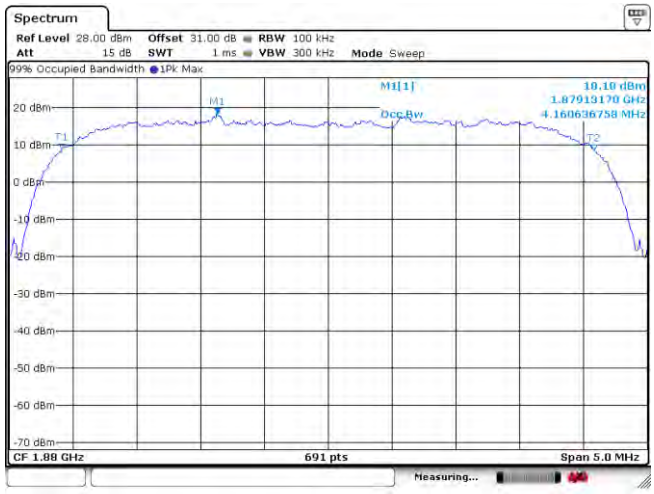


Figure 1-49b: Occupied Bandwidth, Band 2 HSUPA High Channel

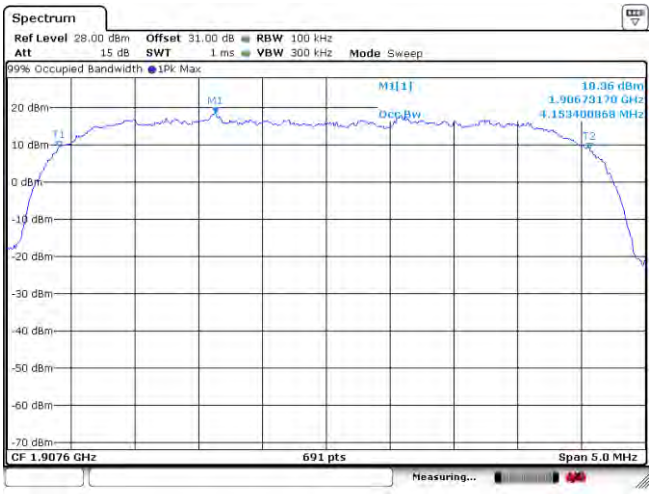


Figure 1-50b: Band 5 , HSUPA Low Channel Mask

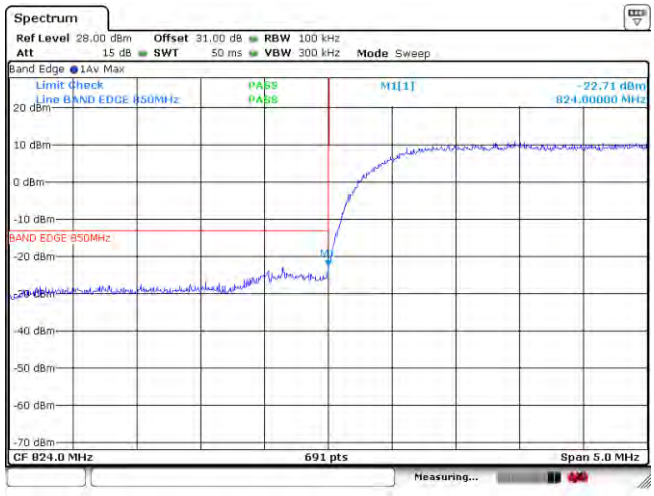
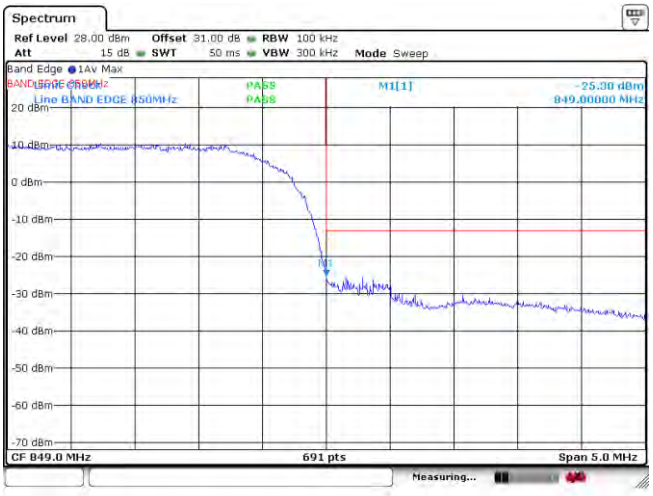


Figure 1-51b: Band 5 , HSUPA High Channel Mask



WCDMA Conducted RF Emission Test Data cont'd

Figure 1-52b: Band 2, HSUPA Low Channel Mask

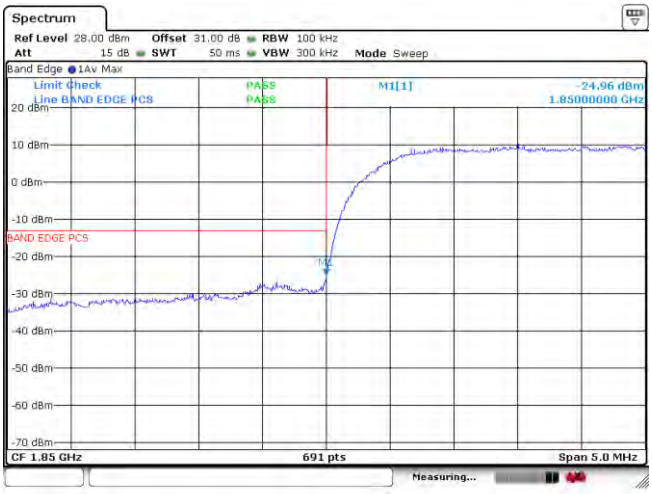
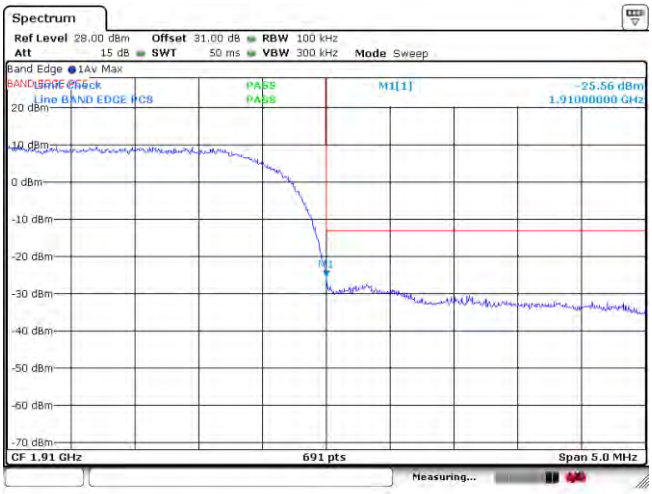
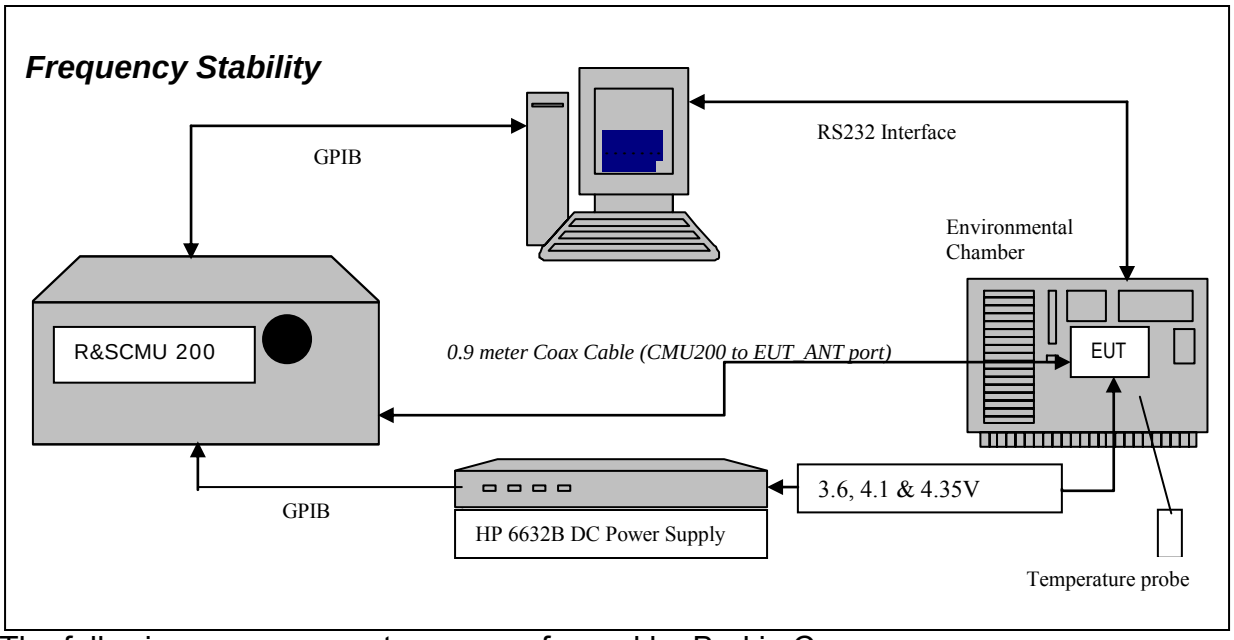


Figure 1-53b: Band 2, HSUPA High Channel Mask



APPENDIX 2B – WCDMA Band 2/5 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, 4.1 volts and to 4.35 volts maximum voltage. The frequency error was measured at a maximum output power and recorded by the automated system test software.

The EUT output power and frequency was measured at 3.6 volts, 4.1 volts and 4.35 volts. The transmit frequency was varied in 3 steps consisting of 1852.4, 1880.0 and 1907.6 MHz for the WCDMA band 2. This frequency was recorded in MHz and deviation from nominal, in Parts Per Million.
After the initial one-hour soak at the beginning of the tests, a period of thirty minutes soak was initialized between each ascending temperature step, before proceeding to the next measurement test cycle.

Procedure:

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

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

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

The maximum frequency error in the WCDMA band 5 measured was **0.0387 PPM**.
The maximum frequency error in the WCDMA band 2 measured was **0.0154 PPM.**

The following measurements were performed on product RFU81UW.

Date of Test: May 17 to June 3, 2013

The environmental conditions were: Temperature: 22.0 - 23.4 °C
Humidity: 20.1 - 26.1 %

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

Traffic Channel Number	WCDMA Band 5 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	3.6	20	20.03	0.0242
4182	836.4	3.6	20	-6.05	-0.0072
4233	846.6	3.6	20	-7.00	-0.0083

Traffic Channel Number	WCDMA Band 5 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.1	20	-7.55	-0.0091
4182	836.4	4.1	20	22.38	0.0268
4233	846.6	4.1	20	-13.99	-0.0165

Traffic Channel Number	WCDMA Band 5 Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	4.35	20	-6.82	-0.0083
4182	836.4	4.35	20	-10.15	-0.0121
4233	846.6	4.35	20	-6.59	-0.0078

WCDMA Band 5 Results: channel 4132 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4132	826.4	3.6	-30	-10.44	-0.0126
4132	826.4	3.6	-20	-3.24	-0.0039
4132	826.4	3.6	-10	12.39	0.0150
4132	826.4	3.6	0	-5.40	-0.0065
4132	826.4	3.6	10	-6.67	-0.0081
4132	826.4	3.6	20	20.03	0.0242
4132	826.4	3.6	30	-13.02	-0.0158
4132	826.4	3.6	40	18.19	0.0220
4132	826.4	3.6	50	17.80	0.0215
4132	826.4	3.6	60	-3.49	-0.0042
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4132	826.4	4.1	-30	18.21	0.0220
4132	826.4	4.1	-20	-4.88	-0.0059
4132	826.4	4.1	-10	-4.16	-0.0050
4132	826.4	4.1	0	-4.29	-0.0052
4132	826.4	4.1	10	17.38	0.0210
4132	826.4	4.1	20	-7.55	-0.0091
4132	826.4	4.1	30	-2.29	-0.0028
4132	826.4	4.1	40	-1.58	-0.0019
4132	826.4	4.1	50	-2.60	-0.0031
4132	826.4	4.1	60	26.39	0.0319
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4132	826.4	4.35	-30	-14.15	-0.0171
4132	826.4	4.35	-20	-6.01	-0.0073
4132	826.4	4.35	-10	-4.05	-0.0049
4132	826.4	4.35	0	-6.05	-0.0073
4132	826.4	4.35	10	19.22	0.0233
4132	826.4	4.35	20	-6.82	-0.0083
4132	826.4	4.35	30	-3.20	-0.0039
4132	826.4	4.35	40	17.04	0.0206
4132	826.4	4.35	50	20.31	0.0246
4132	826.4	4.35	60	-5.66	-0.0068

WCDMA Band 5 Results: channel 4182 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4182	836.4	3.6	-30	12.84	0.0154
4182	836.4	3.6	-20	18.39	0.0220
4182	836.4	3.6	-10	-7.27	-0.0087
4182	836.4	3.6	0	20.90	0.0250
4182	836.4	3.6	10	15.52	0.0186
4182	836.4	3.6	20	-6.05	-0.0072
4182	836.4	3.6	30	19.85	0.0237
4182	836.4	3.6	40	1.47	0.0018
4182	836.4	3.6	50	-0.26	-0.0003
4182	836.4	3.6	60	**32.37**	**0.0387**
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4182	836.4	4.1	-30	10.93	0.0131
4182	836.4	4.1	-20	-6.79	-0.0081
4182	836.4	4.1	-10	-8.06	-0.0096
4182	836.4	4.1	0	17.62	0.0211
4182	836.4	4.1	10	-6.23	-0.0074
4182	836.4	4.1	20	22.38	0.0268
4182	836.4	4.1	30	14.23	0.0170
4182	836.4	4.1	40	19.46	0.0233
4182	836.4	4.1	50	19.27	0.0230
4182	836.4	4.1	60	-7.77	-0.0093
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4182	836.4	4.35	-30	12.50	0.0149
4182	836.4	4.35	-20	14.07	0.0168
4182	836.4	4.35	-10	13.52	0.0162
4182	836.4	4.35	0	16.23	0.0194
4182	836.4	4.35	10	-7.92	-0.0095
4182	836.4	4.35	20	-10.15	-0.0121
4182	836.4	4.35	30	19.95	0.0239
4182	836.4	4.35	40	-3.48	-0.0042
4182	836.4	4.35	50	-5.51	-0.0066
4182	836.4	4.35	60	31.83	0.0381

WCDMA Band 5 Results: channel 4233 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
4233	846.6	3.6	-30	14.85	0.0175
4233	846.6	3.6	-20	-5.30	-0.0063
4233	846.6	3.6	-10	-12.68	-0.0150
4233	846.6	3.6	0	17.22	0.0203
4233	846.6	3.6	10	-6.57	-0.0078
4233	846.6	3.6	20	-7.00	-0.0083
4233	846.6	3.6	30	13.16	0.0155
4233	846.6	3.6	40	17.30	0.0204
4233	846.6	3.6	50	21.71	0.0256
4233	846.6	3.6	60	-7.33	-0.0087
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4233	846.6	4.1	-30	16.56	0.0196
4233	846.6	4.1	-20	16.68	0.0197
4233	846.6	4.1	-10	20.45	0.0242
4233	846.6	4.1	0	20.46	0.0242
4233	846.6	4.1	10	16.83	0.0199
4233	846.6	4.1	20	-13.99	-0.0165
4233	846.6	4.1	30	-6.34	-0.0075
4233	846.6	4.1	40	-1.93	-0.0023
4233	846.6	4.1	50	-1.25	-0.0015
4233	846.6	4.1	60	-9.56	-0.0113
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
4233	846.6	4.35	-30	-6.73	-0.0079
4233	846.6	4.35	-20	-6.80	-0.0080
4233	846.6	4.35	-10	16.50	0.0195
4233	846.6	4.35	0	18.29	0.0216
4233	846.6	4.35	10	18.23	0.0215
4233	846.6	4.35	20	-6.59	-0.0078
4233	846.6	4.35	30	16.35	0.0193
4233	846.6	4.35	40	-7.35	-0.0087
4233	846.6	4.35	50	-4.31	-0.0051
4233	846.6	4.35	60	-3.30	-0.0039

WCDMA Band 2 results: channels 9262, 9400, & 9538 @ 20°C maximum transmitted power

Traffic Channel Number	WCDMA1900 Frequency (MHz	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	3.6	20	17.53	0.0095
9400	1880.00	3.6	20	-7.61	-0.0040
9538	1907.60	3.6	20	-11.91	-0.0062

Traffic Channel Number	WCDMA1900 Frequency (MHz	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.1	20	-8.49	-0.0046
9400	1880.00	4.1	20	14.25	0.0076
9538	1907.60	4.1	20	-13.63	-0.0071

Traffic Channel Number	WCDMA1900 Frequency (MHz	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	4.35	20	-9.12	-0.0049
9400	1880.00	4.35	20	-10.37	-0.0055
9538	1907.60	4.35	20	-13.71	-0.0072

WCDMA Band 2 Results: channel 9262 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9262	1852.40	3.6	-30	-10.90	-0.0059
9262	1852.40	3.6	-20	-3.42	-0.0018
9262	1852.40	3.6	-10	15.82	0.0085
9262	1852.40	3.6	0	-6.96	-0.0038
9262	1852.40	3.6	10	-8.10	-0.0044
9262	1852.40	3.6	20	17.53	0.0095
9262	1852.40	3.6	30	-16.41	-0.0089
9262	1852.40	3.6	40	12.14	0.0066
9262	1852.40	3.6	50	10.90	0.0059
9262	1852.40	3.6	60	-6.37	-0.0034
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9262	1852.40	4.1	-30	17.68	0.0095
9262	1852.40	4.1	-20	-7.49	-0.0040
9262	1852.40	4.1	-10	-11.24	-0.0061
9262	1852.40	4.1	0	-7.55	-0.0041
9262	1852.40	4.1	10	15.91	0.0086
9262	1852.40	4.1	20	-8.49	-0.0046
9262	1852.40	4.1	30	-5.32	-0.0029
9262	1852.40	4.1	40	-9.65	-0.0052
9262	1852.40	4.1	50	-9.69	-0.0052
9262	1852.40	4.1	60	27.35	0.0148
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9262	1852.40	4.35	-30	-13.77	-0.0074
9262	1852.40	4.35	-20	-6.89	-0.0037
9262	1852.40	4.35	-10	-12.75	-0.0069
9262	1852.40	4.35	0	-9.10	-0.0049
9262	1852.40	4.35	10	18.90	0.0102
9262	1852.40	4.35	20	-9.12	-0.0049
9262	1852.40	4.35	30	-3.90	-0.0021
9262	1852.40	4.35	40	18.50	0.0100
9262	1852.40	4.35	50	17.39	0.0094
9262	1852.40	4.35	60	-10.90	-0.0059

WCDMA Band 2 Results: channel 9400 @ maximum transmitted power

Traffic Channel Number	Frequency (MHz)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
9400	1880.00	3.6	-30	13.58	0.0072
9400	1880.00	3.6	-20	15.19	0.0081
9400	1880.00	3.6	-10	-11.42	-0.0061
9400	1880.00	3.6	0	19.37	0.0103
9400	1880.00	3.6	10	12.62	0.0067
9400	1880.00	3.6	20	-7.61	-0.0040
9400	1880.00	3.6	30	15.04	0.0080
9400	1880.00	3.6	40	-5.39	-0.0029
9400	1880.00	3.6	50	-4.63	-0.0025
9400	1880.00	3.6	60	**29.00**	**0.0154**
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9400	1880.00	4.1	-30	11.55	0.0061
9400	1880.00	4.1	-20	-8.48	-0.0045
9400	1880.00	4.1	-10	-8.64	-0.0046
9400	1880.00	4.1	0	13.61	0.0072
9400	1880.00	4.1	10	-8.85	-0.0047
9400	1880.00	4.1	20	14.25	0.0076
9400	1880.00	4.1	30	16.54	0.0088
9400	1880.00	4.1	40	17.70	0.0094
9400	1880.00	4.1	50	16.01	0.0085
9400	1880.00	4.1	60	-11.05	-0.0059
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9400	1880.00	4.35	-30	10.02	0.0053
9400	1880.00	4.35	-20	11.79	0.0063
9400	1880.00	4.35	-10	10.12	0.0054
9400	1880.00	4.35	0	10.41	0.0055
9400	1880.00	4.35	10	-8.92	-0.0047
9400	1880.00	4.35	20	-10.37	-0.0055
9400	1880.00	4.35	30	12.39	0.0066
9400	1880.00	4.35	40	-5.77	-0.0031
9400	1880.00	4.35	50	-10.16	-0.0054
9400	1880.00	4.35	60	28.06	0.0149

WCDMA Band 2 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	15.21	0.0080
9538	1907.60	3.6	-20	-6.58	-0.0034
9538	1907.60	3.6	-10	-10.71	-0.0056
9538	1907.60	3.6	0	16.73	0.0088
9538	1907.60	3.6	10	-8.90	-0.0047
9538	1907.60	3.6	20	-11.91	-0.0062
9538	1907.60	3.6	30	15.02	0.0079
9538	1907.60	3.6	40	16.17	0.0085
9538	1907.60	3.6	50	15.40	0.0081
9538	1907.60	3.6	60	-8.58	-0.0045
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9538	1907.60	4.1	-30	12.51	0.0066
9538	1907.60	4.1	-20	11.69	0.0061
9538	1907.60	4.1	-10	15.44	0.0081
9538	1907.60	4.1	0	15.41	0.0081
9538	1907.60	4.1	10	14.17	0.0074
9538	1907.60	4.1	20	-13.63	-0.0071
9538	1907.60	4.1	30	-8.35	-0.0044
9538	1907.60	4.1	40	-2.73	-0.0014
9538	1907.60	4.1	50	-6.25	-0.0033
9538	1907.60	4.1	60	-12.33	-0.0065
Traffic Channel Number	**Frequency (MHz)**	**Voltage (Volts)**	**Temperature (Celsius)**	**Frequency Error (Hz)**	**PPM**
9538	1907.60	4.35	-30	-11.43	-0.0060
9538	1907.60	4.35	-20	-8.59	-0.0045
9538	1907.60	4.35	-10	11.34	0.0059
9538	1907.60	4.35	0	12.62	0.0066
9538	1907.60	4.35	10	17.72	0.0093
9538	1907.60	4.35	20	-13.71	-0.0072
9538	1907.60	4.35	30	12.65	0.0066
9538	1907.60	4.35	40	-9.09	-0.0048
9538	1907.60	4.35	50	-12.53	-0.0066
9538	1907.60	4.35	60	-9.80	-0.0051