



Product Integrity Laboratory

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Certification Test Report
FCC Part 22, Subpart H/ Industry Canada RSS 129
Part 24, Subpart E/ Industry Canada RSS 133

Sendum Wireless
Model GT200

FCC ID # TS5-6050M-GT200

IC ID # 6234A-GT200

Project Code CG-547

(Report CG-547-RA-1-2)

Revision: 2

May 15, 2007

Prepared for: Sendum Wireless

Author: Glen Moore
EMC Manager

Approved by: Nick Kobrosly
Lab Manager

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Report Summary

NTS Canada

Product Integrity Laboratory
5151-47th Street, N.E. Calgary Alberta T3J 3R2

Accreditation Numbers: FCC 101386
IC 46405-3978 File # IC3978-2
Standards Council of Canada Accredited Laboratory No. 440

Applicant: Sendum Wireless
4500 Beedie Street
Burnaby, BC
V5J 5L2
Tel: 604-454-3774

Customer Representative: Henry Seto

EUT Description:

EUT Description	Manufacturer	Model	Revision	Serial Number
GT200	Sendum Wireless	GT200	2.00	3A358545

The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

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Test Summary

Appendix	Test/Requirement Description	Deviations* from:			Status	Applicable Rule Parts
		Base Standard	Test Basis	NTS Procedure		
A	Occupied BW	No	No	No	PASS	Cell Mode – FCC 22.905 PCS Mode – FCC -24.238
B	Peak Power Output	No	No	No	PASS	Cell Mode – FCC 22.913 PCS Mode – FCC -24.232
C	TX Frequency Stability	No	No	No	PASS	Cell Mode – FCC 22.335 PCS Mode – FCC -24.235
D	TX Conducted Spurious Emissions	No	No	No	PASS	Cell Mode – FCC 22.917 PCS Mode – FCC -24.238
E	TX Radiated Spurious Emissions 30 MHz-19GHz RSS 129/133 RX Spurious Emissions	No	No	No	PASS	Cell Mode – FCC 22.917 PCS Mode – FCC -24.238
F	Test Equipment List	No	No	No	PASS	NA

Test Result: The product presented for testing complied with test requirements as shown above.

Prepared By: _____
Glen Moore
EMC Manager

Reviewed By: _____
Alex Mathews
Compliance Specialist

Approved By: _____
Jennifer Hansen
Quality Representative

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Register of revisions

Revision	Date	Description of Revisions
0	May 14, 2007	Draft release for Internal review
1	May 15, 2007	Release to customer/TCB
2	May 16, 2007	Added setup diagrams

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the tests applied by NTS Canada to demonstrate compliance of the GT200 Inc to the following specifications:

FCC Part 22, Subpart H Public Mobile Services
 RSS-129, Issue 2 800MHz Dual-Mode CDMA Cellular Telephones
 FCC Part 24, Subpart E Personal Communications Services
 RSS-133, Issue 2, Rev.1 2GHz Personal Communications Services

2.0 EUT DESCRIPTION

2.1 CONFIGURATION

Description of EUT

	Name	Model	Revision	Serial Number
EUT	Tracking device with 800MHz/1900 MHz CDMA	GT200	2.0	Sample1: 3A358545 (modified for conducted measurements) Sample 2: 3A35851 Sample3: 3A358536
Classification	Mobile			
Operating frequency range	Cell Mode : 836.51 to 848.97 MHz, PCS Mode: 1851.25 to 1908.75 MHz			
Rated Output Power	25 dbm ERP (Cell mode and PCS Mode)			
Modulation	Cell Mode: CDMA PCS Mode: CDMA			
Emission Designator	1M27F9W			
Antenna Type/Gain	Internal integral antenna Cell Mode gain: 1.5 db PCS Mode gain: .5 db			
Manufactured by	Sendum Wireless			
Functional description	The device uses GPS technology to encode its location, which is transmitted via CDMA or PCS wireless elephony to keep track of the container or vehicle it is in.			
Voltage/Power source	3.7 VDC Lithium battery			
Voltage/current into final amplifier stage	<ul style="list-style-type: none"> ➤ The voltage is 3.6V dc nominal and ranges from 3.2Vdc to 4.2Vdc ➤ The dc current is 500mA 			
Tune up procedure	Within the GT200, there is a digitally controlled attenuator and peak power detector for this purpose. Each unit will be calibrated at the factory for accuracy and maximum power limiting. The power detector is calibrated and set to a power limit of 23.5dBm for PCS band and 24.5dBm for Cellular band. During operation of the unit, the CDMA base station detected the transmit power from the device and command it to step up/down by 1dB depending on whether the device power is low or high. But the unit will not exceed the maximum power			

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	limit due to its internal maximum power limiting.
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2.2 MODE OF OPERATION DURING TESTS

The EUT was tested while in a continuous transmit mode. The EUT was tuned to a low, middle, and high channel to perform power, occupied bandwidth, and spurious/harmonic tests. For all test cases pre-scans were completed in all modes to determine worst case levels.

3.0 SUPPORT EQUIPMENT

3.1 CONFIGURATION

NA

3.2 TEST BED/PERIPHERAL CABLES

NA

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APPENDICES

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APPENDIX A: OCCUPIED BANDWIDTH

A.1. Base Standard & Test Basis

Base Standard	Cell Mode - FCC PART 22.905, PCS Mode – FCC Part 24.238
Test Basis	FCC PART 2.1049
Test Method	FCC PART 2.1049/24.238

A.2. Specifications

Using an RBW of 300Hz or 1% of the emission bandwidth, The spectral shape of the output should look similar to the input for all modulations.

Sec. 24.238 Emission limits

(b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

A.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
1.11/-1.22

A.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

A.5. Test Procedure

2.1049 or TIA-603-C-2004

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A.6. Test Results

The EUT is in compliance with the limits as specified above. See plots on following pages and data summary below

Cell Mode

Cell Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
1013	824.7	1.27
384	836.52	1.27
777	848.31	1.27

PCS Mode

PCS Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
1175	1908.75	1.27
600	1880	1.27
25	1951.25	1.27

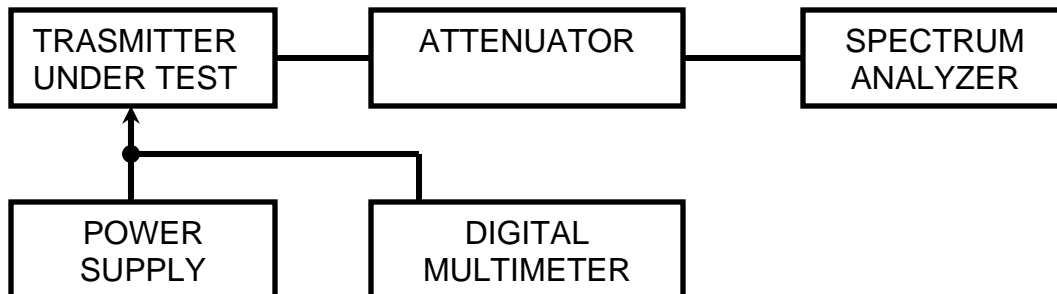
A.7. Operating Mode During Test

The EUT was tested while in a continuous transmit mode. The EUT was tuned to a low, middle, and high channel operating at maximum rated RF output power.

A.8. Sample Calculation

NA

A.9. Test Setup diagram



A.10. Tested By

This testing was conducted in accordance with the ISO 17025:1999 scope of accreditation, table 1; Quality Manual.

Name: Glen Moore
Function: EMC Manager

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Figure 1 Occupied Bandwidth Cell Mode Channel 1013

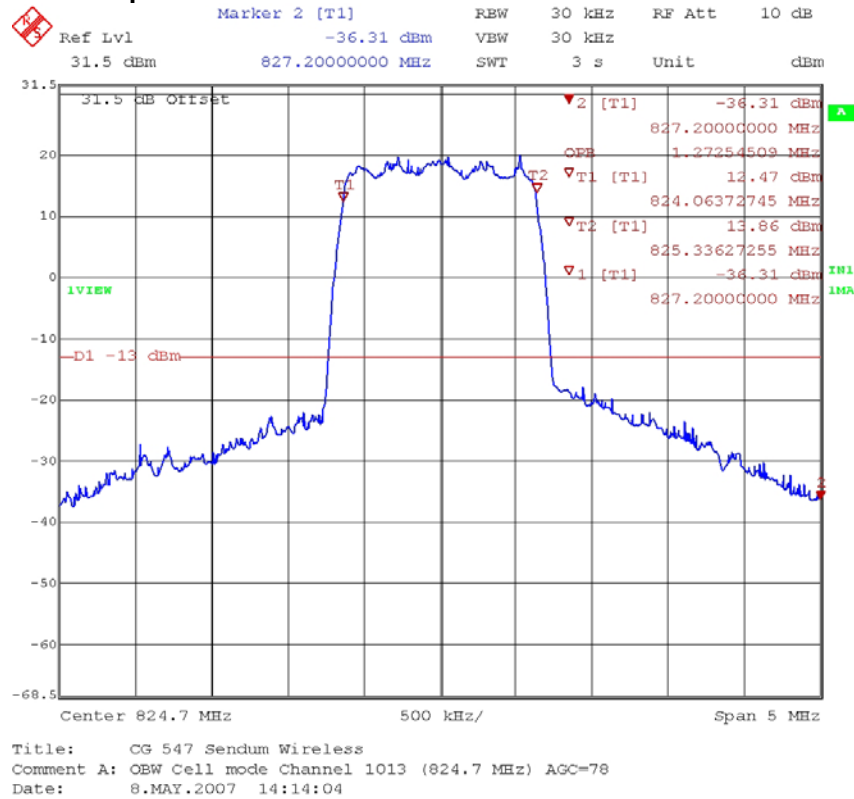
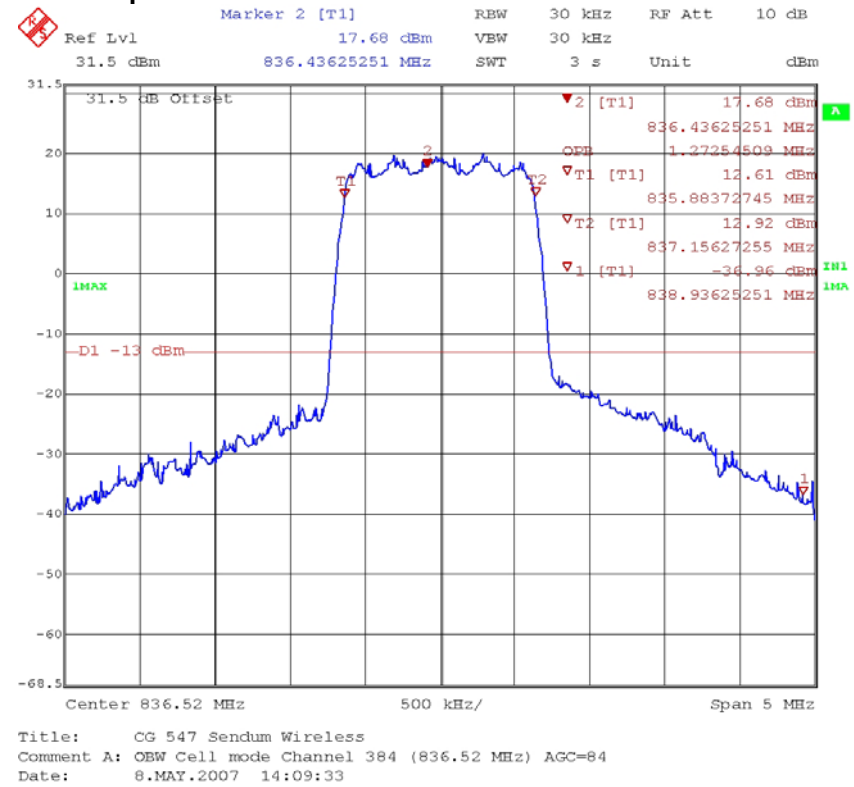
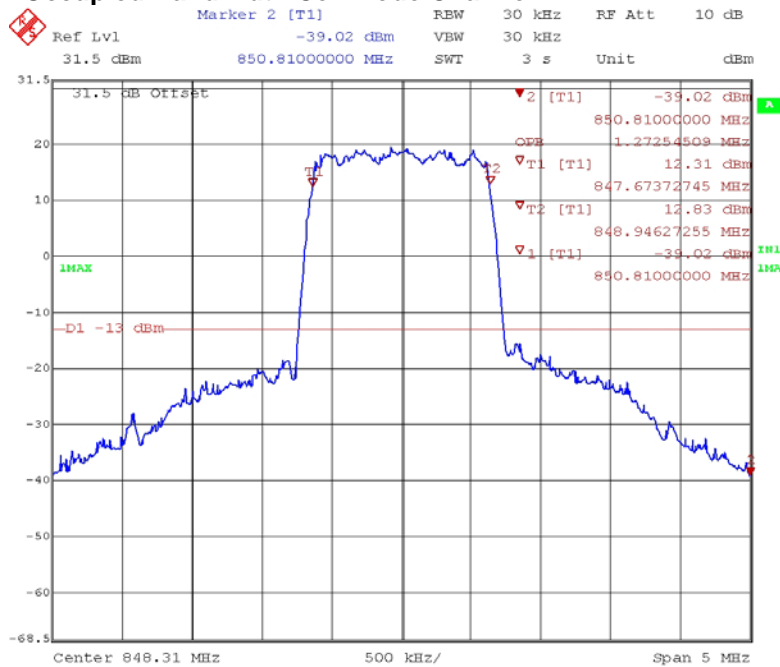


Figure 2 Occupied Bandwidth Cell Mode Channel 384



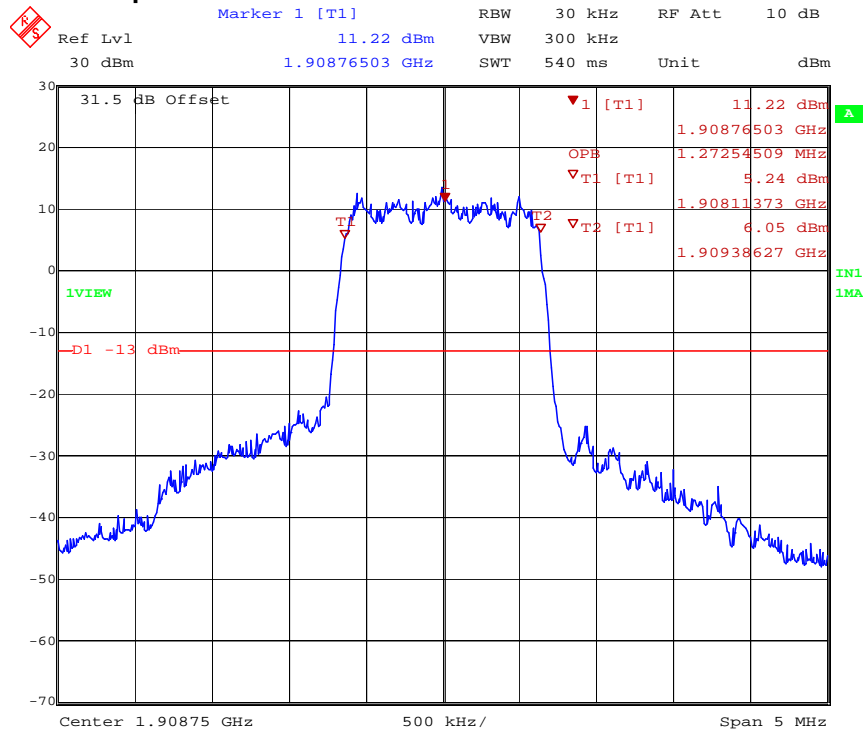
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Figure 3 Occupied Bandwidth Cell Mode Channel 777



Title: CG 547 Sendum Wireless
Comment A: OBW Cell mode Channel 777 (848.31 MHz) AGC=82
Date: 8.MAY.2007 14:05:41

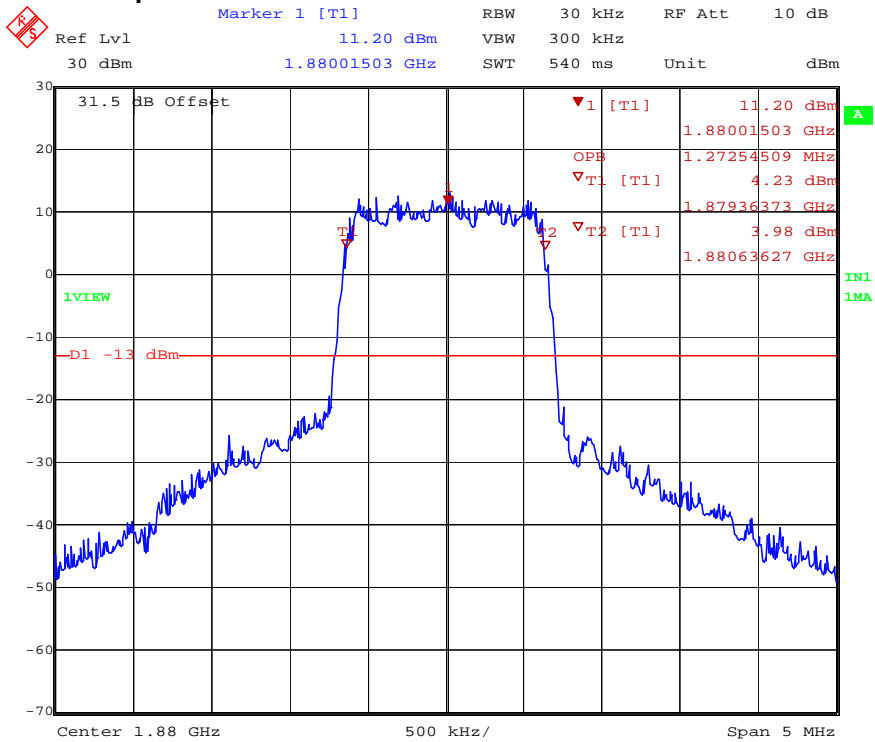
Figure 4 Occupied Bandwidth PCS Mode Channel 1175



Title: CG 547 Sendum Wireless
Comment A: Occupied BW PCS Channel 1175
Date: 10.MAY.2007 17:48:25

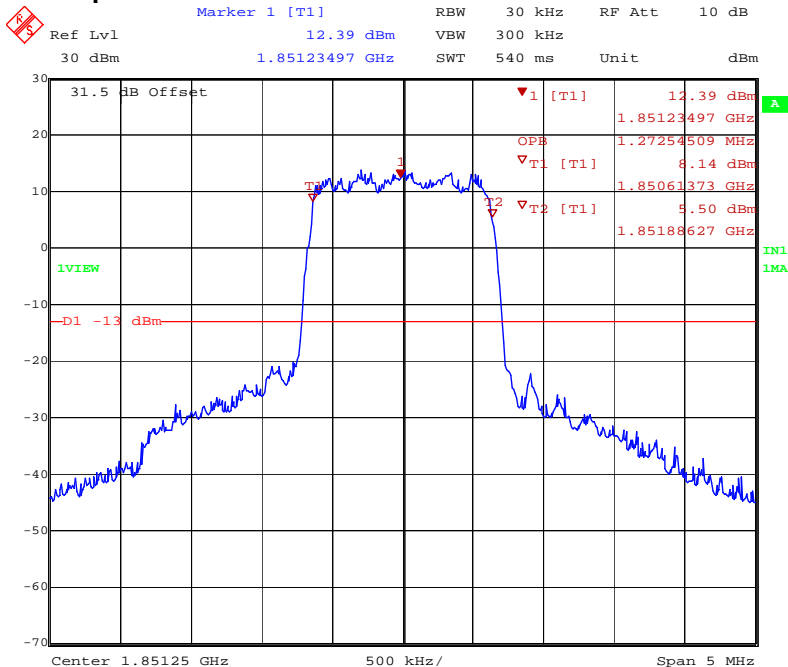
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Figure 5 Occupied Bandwidth PCS Mode Channel 600



Title: CG 547 Sendum Wireless
Comment A: Occupied BW PCS Channel 600
Date: 10.MAY.2007 17:46:57

Figure 6 Occupied Bandwidth PCS Mode Channel 25



Title: CG 547 Sendum Wireless
Comment A: Occupied BW PCS Channel 25
Date: 10.MAY.2007 17:43:44

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APPENDIX B: PEAK POWER OUTPUT

B.1. Base Standard & Test Basis

Base Standard	Cell Mode: FCC Part 22.913 - PCS Mode: FCC Part 24.232
Test Basis	FCC 2.1046
Test Method	TIA/EIA 603

B.2. Specifications

Cell Mode

22.913 Effective radiated power limits.

(2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in §22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts. **The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.**

PCS Mode

24.232 Power and antenna height limits.

(c) Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

B.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
1.11/-1.22

B.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

B.5. Test Method

EIA/TIA 603 using signal substitution

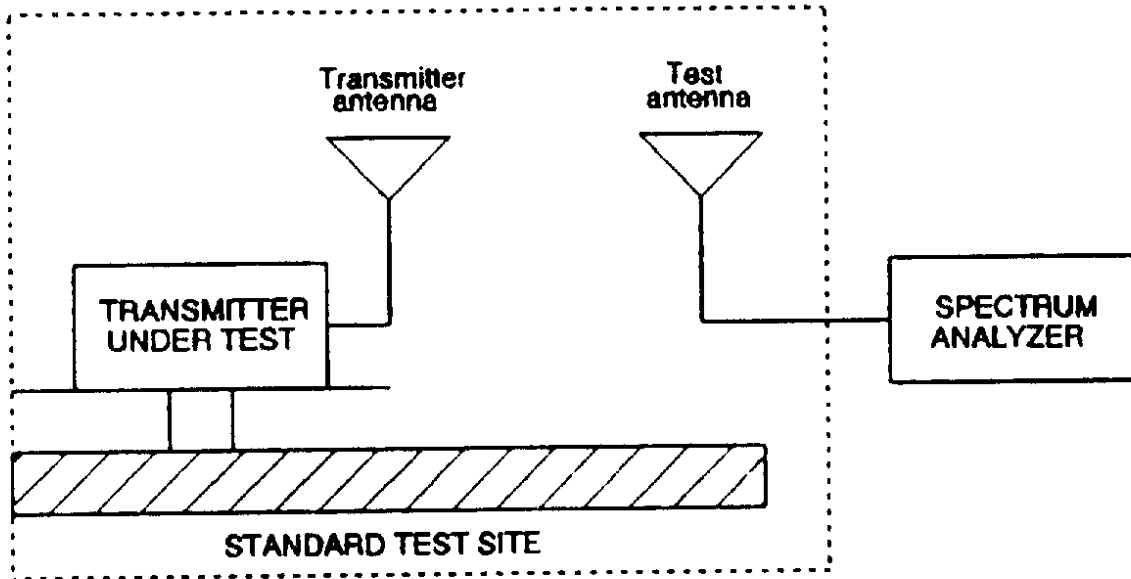
B.6. Test Results

Compliant – The maximum ERP on each channel is indicated in the table below

EUT Transmit Channel (MHz)	ERP /EIRP
824.70	24.2 ERP
836.52	25.7 ERP
848.31	26.2 ERP
1851.25	26.5EIRP
1880.00	26.0EIRP
1908.00	25.5EIRP

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B.9. Radiated Test Setup



Note: Transmitter is replace with signal generator for substitution

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APPENDIX C: FREQUENCY STABILITY

C.1. Base Standard & Test Basis

Base Standard	Cell Mode: FCC 22.335 – PCS Mode: FCC 24.235
Test Basis	FCC Part 2.1055
Test Method	FCC Part 2.1055/EIA/TIA 603

C.2. Specifications

Cell Mode

22.355

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Table C-1. - Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed	Mobile >3	Mobile <=3
	(ppm)	watts (ppm)	watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

PCS Mode

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

C.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
+1.11/-1.22

C.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

C.5. Test Method

The eut was placed in the thermal chamber and tested at 20 celcius and increased in 10 degree increments to 50 celcius and then down to -30 c. After a sufficient time of temperature stabilization the eut was keyed on to transmit unmodulated in CW mode on a center channel in each band and the maximum frequency drift was recorded. This verified the tolerance of the frequency determining components of the EUT.

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C.6. Test Results

Compliant. The maximum measured frequency drift in cell mode was 423 Hz. The maximum measured frequency drift in PCS Mode was 980 Hz.

800 MHz Cell Mode

Temperature	Channel	Assigned Frequency	Measured Frequency	Drift (Hz)
-30	384	836520000	836520072	-72
-20	384	836520000	836520078	-78
-10	384	836520000	836520043	-43
0	384	836520000	836520105	-105
10	384	836520000	836520138	-138
20 nom 3.7vdc	384	836520000	836519823	177
20 115%vdc nom	384	836520000	836519788	212
20 end vdc nom	384	836520000	836519782	218
30	384	836520000	836520310	-310
40	384	836520000	836520402	-402
50	384	836520000	836520423	-423

PCS Mode

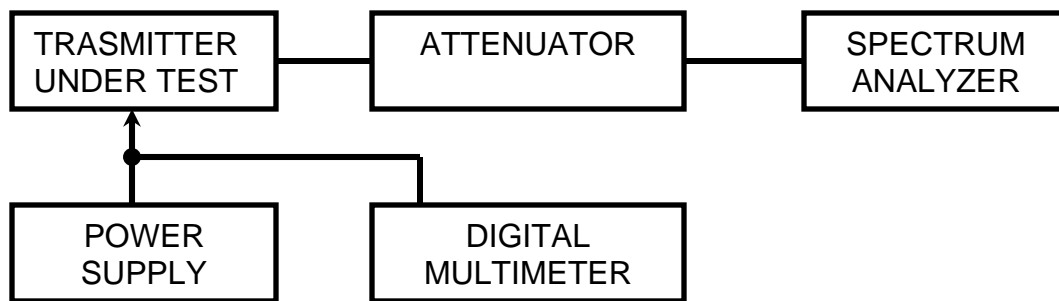
Temperature	Channel	Assigned Frequency	Measured Frequency	Drift (Hz)
-30	600	1880000000	1880000179	-179
-20	600	1880000000	1880000420	-420
-10	600	1880000000	1880000250	-250
0	600	1880000000	1880000220	-220
10	600	1880000000	1880000360	-360
20 nom 3.7vdc	600	1880000000	1880000377	-377
20 115%vdc nom	600	1880000000	1880000390	-390
20 end vdc nom	600	1880000000	1880000385	-385
30	600	1880000000	1880000306	-306
40	600	1880000000	1880000980	-980
50	600	1880000000	1880000811	-811

C.7. Tested By

This testing was conducted in accordance with the ISO 17025:1999 scope of accreditation, table 1; Quality Manual.

Name: Glen Moore
Function: EMC Manager

C.8. Test Setup diagram



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APPENDIX D: TX CONDUCTED SPURIOUS EMISSIONS

D.1. Base Standard & Test Basis

Base Standard	Cell Mode: FCC Part 22.917 - PCS Mode: FCC Part 24.238
Test Basis	FCC 2.1051
Test Method	FCC 2.1051

D.2. Specifications

Cell Mode:

a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

PCS Mode:

24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power

D.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
1.11/-1.22

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D.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

D.5. Test Results

Compliant see plots on following pages and summary tables below

Cell Mode

Channel	Emission Frequency (MHz)	Level (dbm)	Limit (dbm)	Margin (db)
1013	Lower band edge 823.9 MHz – 824 MHz (Integrated)	-14.2	-13	1.2
1013	Lower band edge 823.8 MHz – 823.9 MHz (Integrated)	-19.1	-13	6.1
1013	Lower band edge 823.0 MHz – 823.8 MHz Peak	-18.7	-13	5.7
777	Hi band edge 849 MHz – 849.1 MHz (Integrated)	-14.2	-13	1.2
777	Hi band edge 849.1 MHz – 849.2 MHz (Integrated)	-19.4	-13	6.4
777	Hi band edge 849.2 MHz – 850 MHz peak	-18.5	-13	5.5

All other emissions were more than 20 db below the limit – see plots

PCS Mode

Channel	Emission Frequency (MHz)	Level (dbm)	Limit (dbm)	Margin (db)
1175	Lower band edge – 1849.94 MHz	-27.3	-13	14.3
25	Upper band edge -1910.07 MHz	-30.7	-13	17.7
25	3705.4	-29.78	-13	16.78
600	3761.12	-33.01	-13	20
1175	3820.00	-22.4	-13	9.6

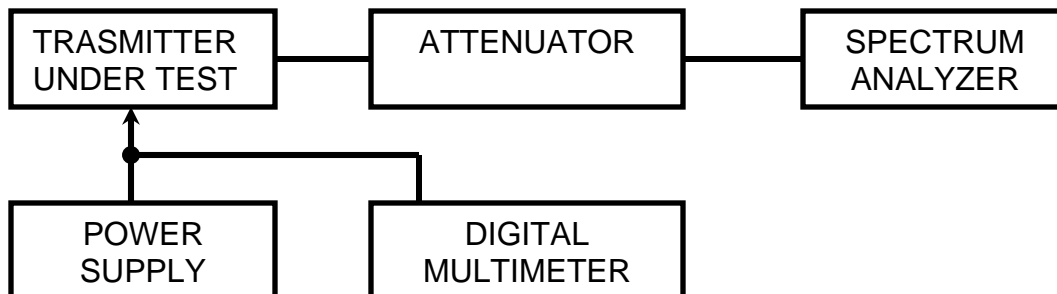
All other emissions were more than 20 db below the limit – see plots

D.6. Tested By

This testing was conducted in accordance with the ISO 17025:1999 scope of accreditation, table 1; Quality Manual.

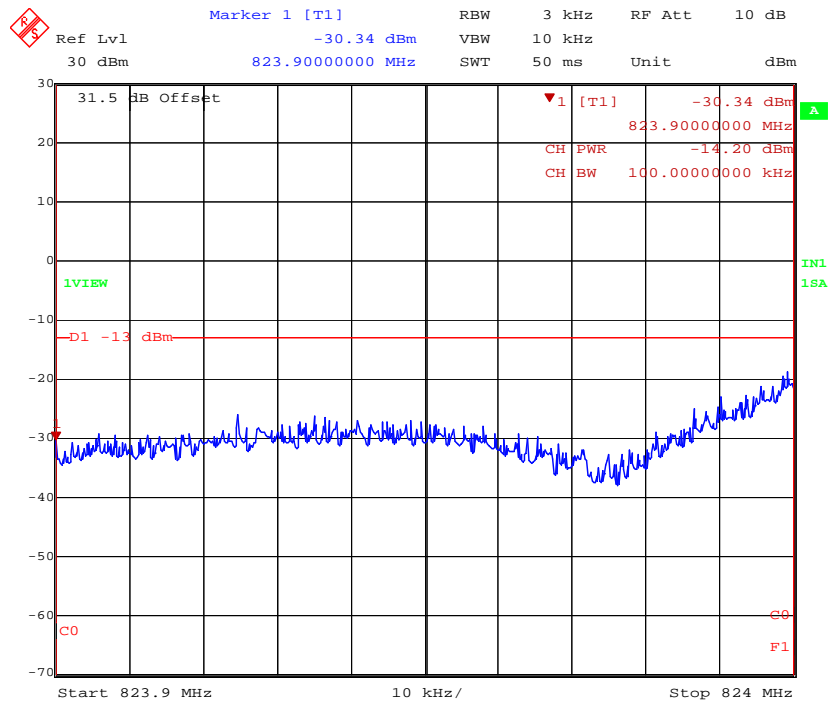
Name: Glen Moore
Function: EMC Manager

D.7. Test Setup Diagram



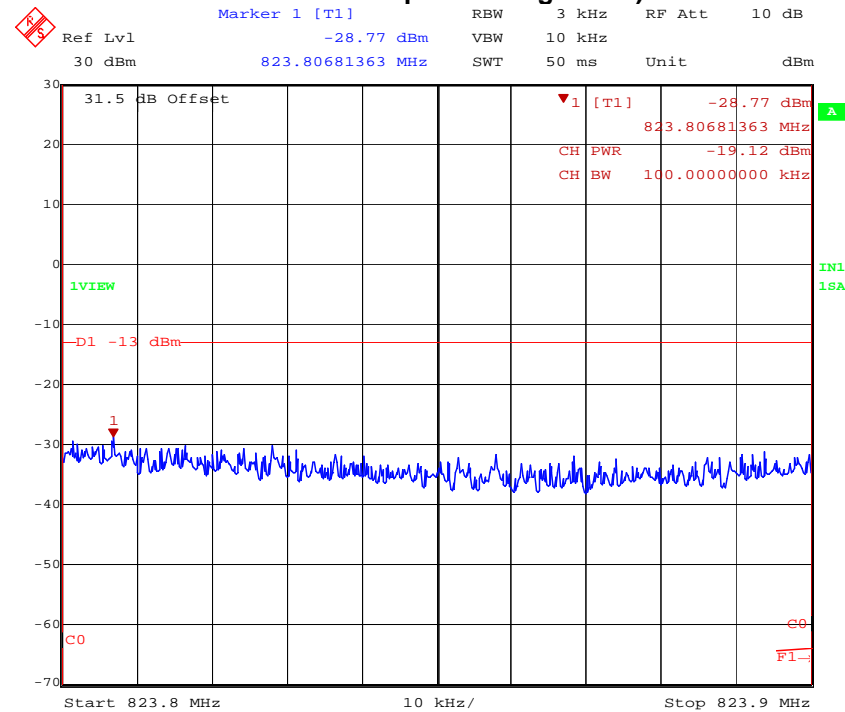
The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

Cell Mode - Conducted Spurious Lower Bandedge Cell Mode (adjacent 100KHz 823.9 MHz-824 MHz power integration)



Title: CG 547 Sendum Wireless
 Comment A: Conducted Spurious Cell Mode Low Bandedge Ch Pwr adj 100 KHz
 Date: 10.MAY.2007 22:33:08

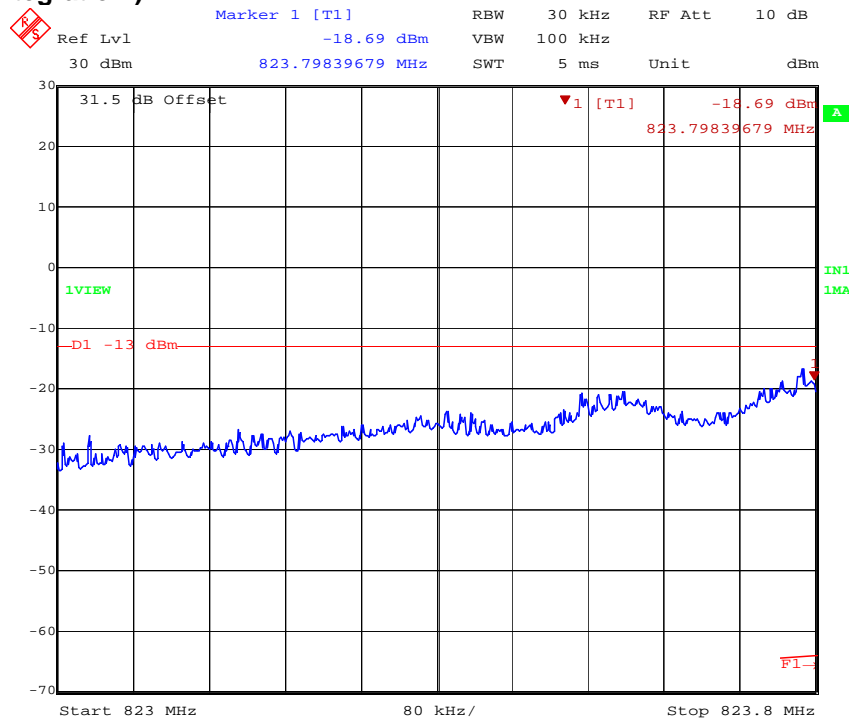
Figure 7 Cell Mode - Conducted Spurious Lower Bandedge Cell Mode (adjacent 100KHz 823.8-823.9 MHz- power integration)



Title: CG 547 Sendum Wireless
 Comment A: Conducted Spurious Cell Mode Low Bandedge Ch Pwr alt 100 KHz
 Date: 10.MAY.2007 22:35:01

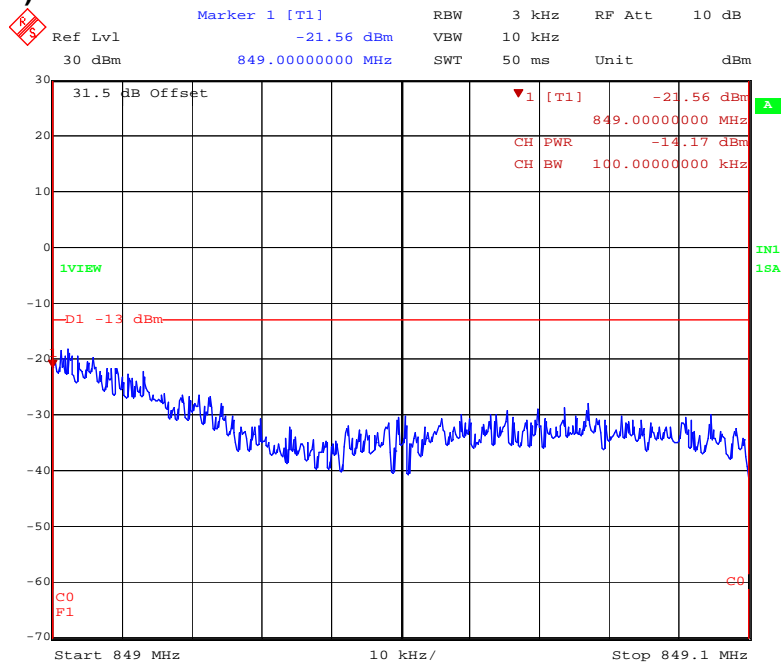
The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

Figure 8 Cell Mode - Conducted Spurious Lower Bandedge Cell Mode (823.0MHz-823.8MHz power integration)



Title: CG 547 Sendum Wireless
Comment A: Conducted Spurious Cell Mode Low Bandedge 823MHz_823.8 MHz
Date: 10.MAY.2007 22:37:26

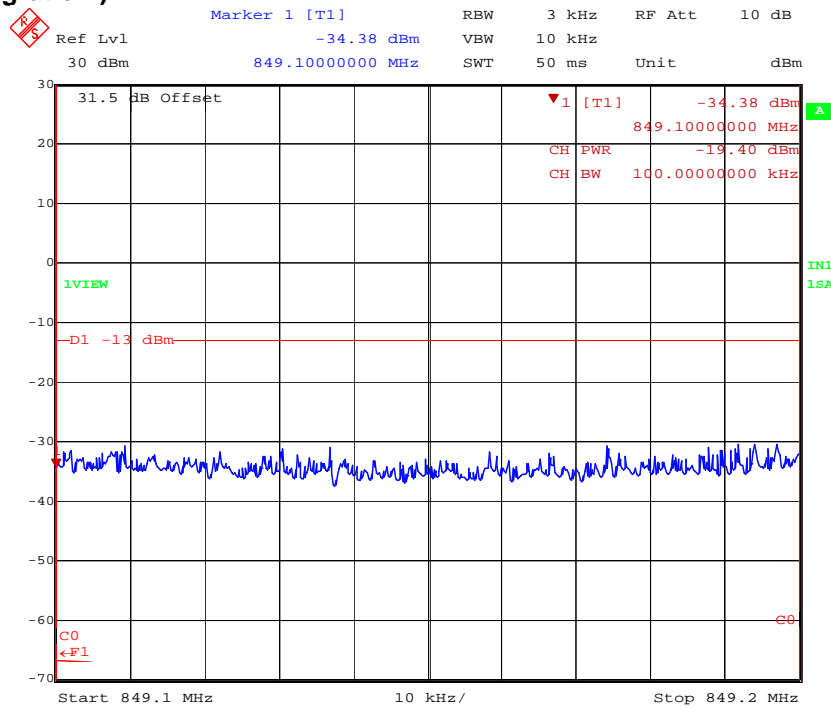
Figure 9 Cell Mode - Conducted Spurious Hi Bandedge Cell Mode (849.0MHz-849.1MHz power integration)



Title: CG 547 Sendum Wireless
Comment A: Conducted Spurious Cell Mode Hi Bandedge adj 100 KHz
Date: 10.MAY.2007 22:46:46

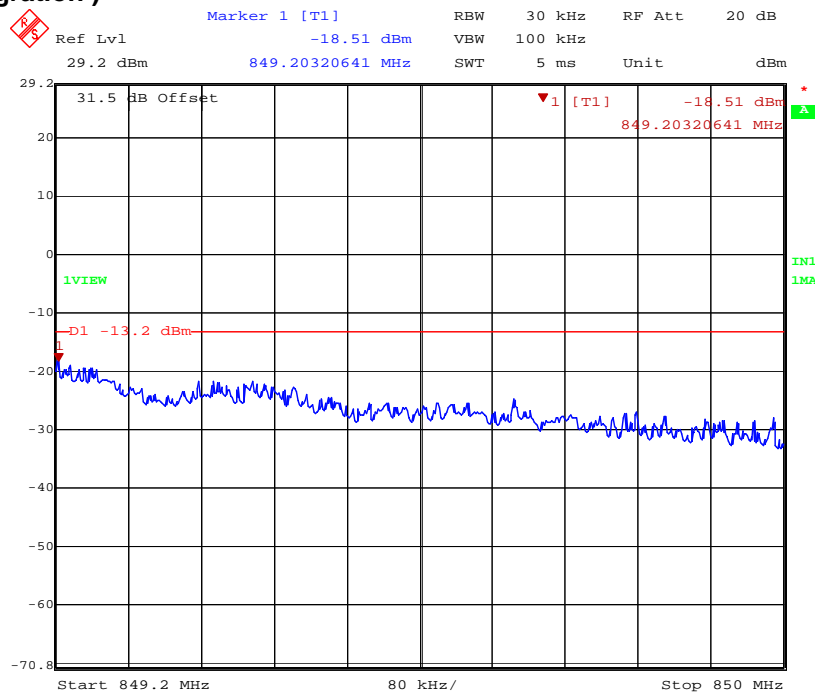
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Figure 10 Cell Mode- Conducted Spurious Hi Bandedge Cell Mode (849.1MHz-849.2MHz power integration)



Title: CG 547 Sendum Wireless
 Comment A: Conducted Spurious Cell Mode Hi Bandedge alt 100 KHz
 Date: 10.MAY.2007 22:48:16

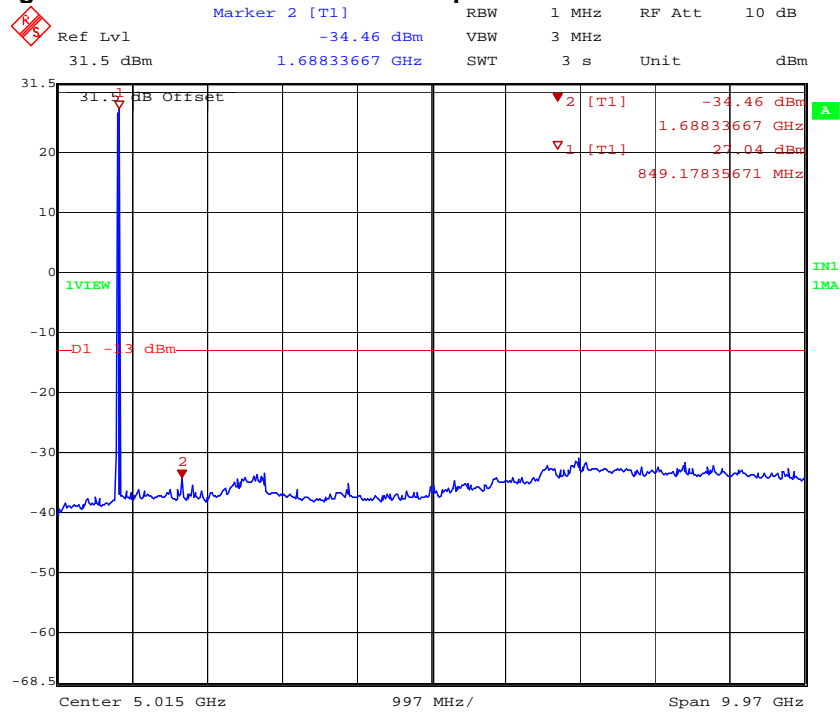
Figure 11 Cell Mode- Conducted Spurious Hi Bandedge Cell Mode (849.2MHz-850 MHz power integration)



Title: CG-567
 Comment A: Conf09
 Date: 14.MAY.2007 11:52:11

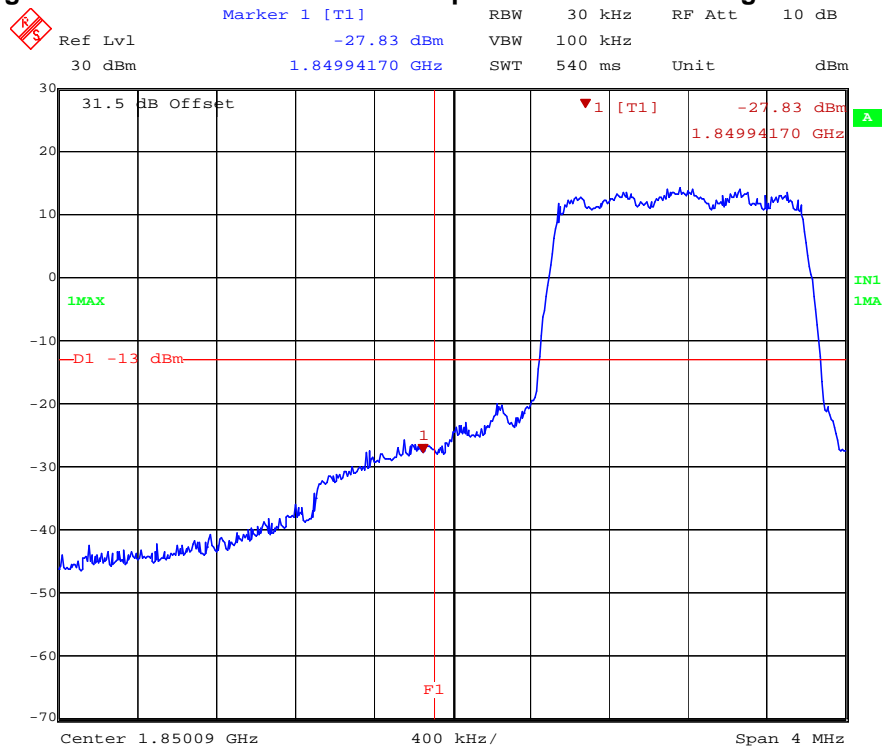
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Figure 14 Cell Mode- Conducted Spurious Channel 777



Title: CG 547 Sendum Wireless
 Comment A: Conducted Spurs Cell mode Channel 777 (848.31 MHz) AGC=82
 Date: 8.MAY.2007 13:57:12

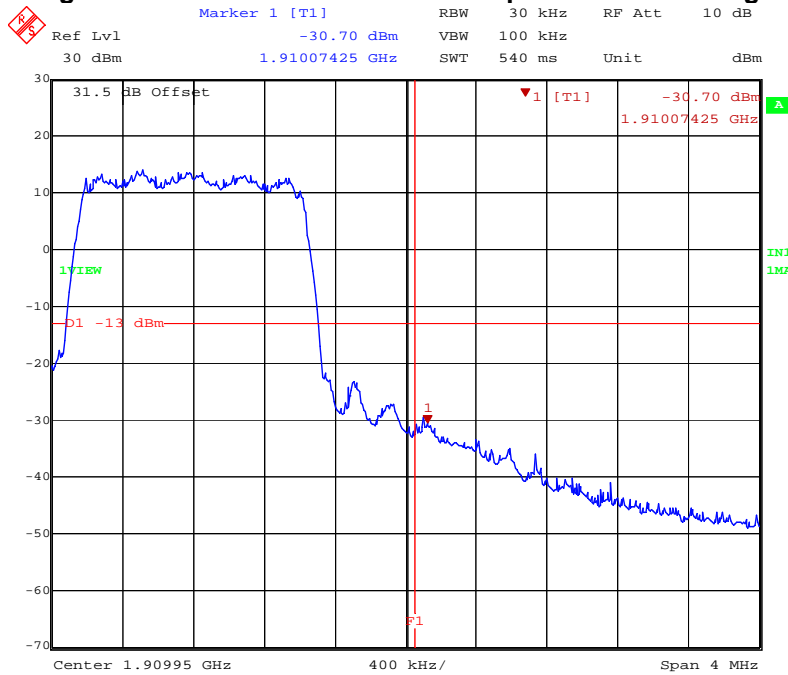
Figure 15 PCS Mode - Conducted Spurious Lower Bandedge



Title: CG 547 Sendum Wireless
 Comment A: PCS Lower band edge
 Date: 10.MAY.2007 18:11:07

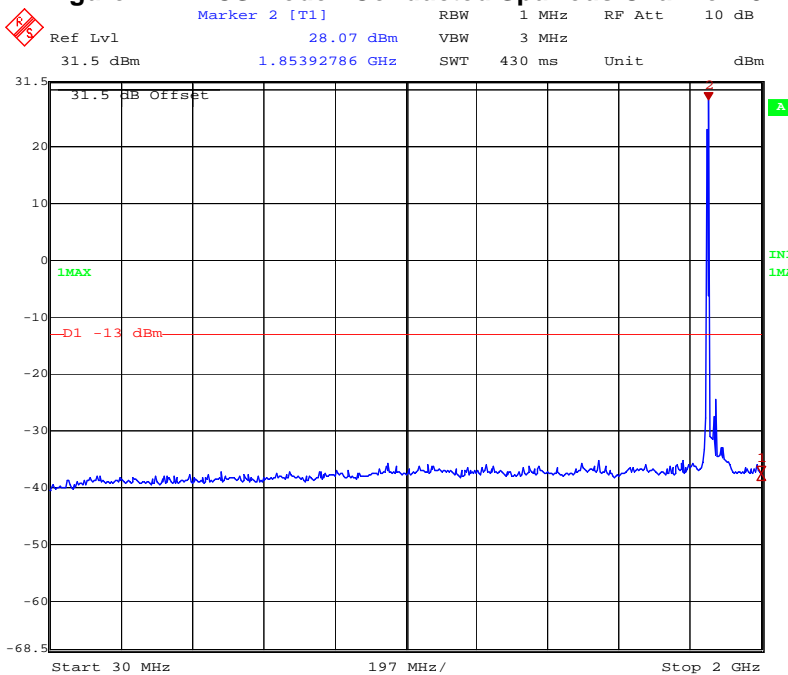
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Figure 16 PCS Mode - Conducted Spurious Hi Bandedge



Title: CG 547 Sendum Wireless
 Comment A: PCS Upper band edge
 Date: 10.MAY.2007 18:07:06

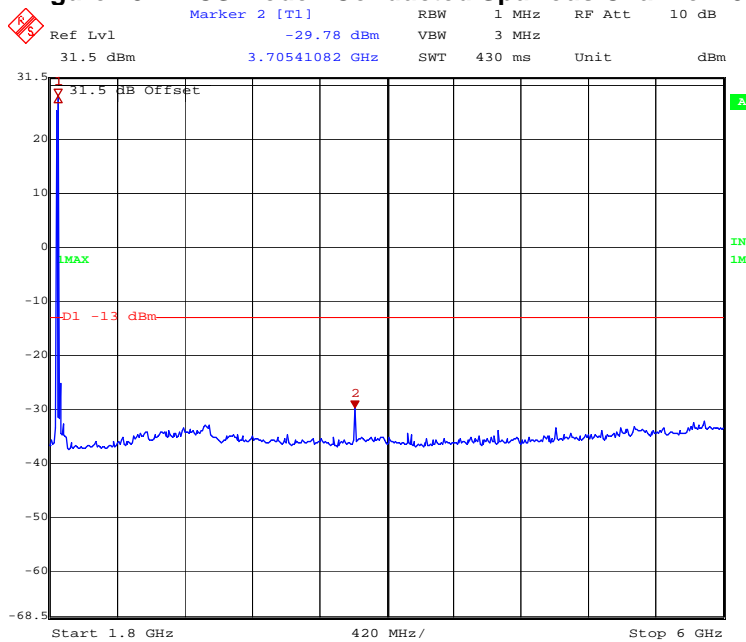
Figure 17 PCS Mode - Conducted Spurious Channel 25



Title: CG 547 Sendum Wireless GT200
 Comment A: Conducted Spurs PCS mode Channel 25 (1851.25 MHz) AGC at 114
 Date: 8.MAY.2007 11:22:33

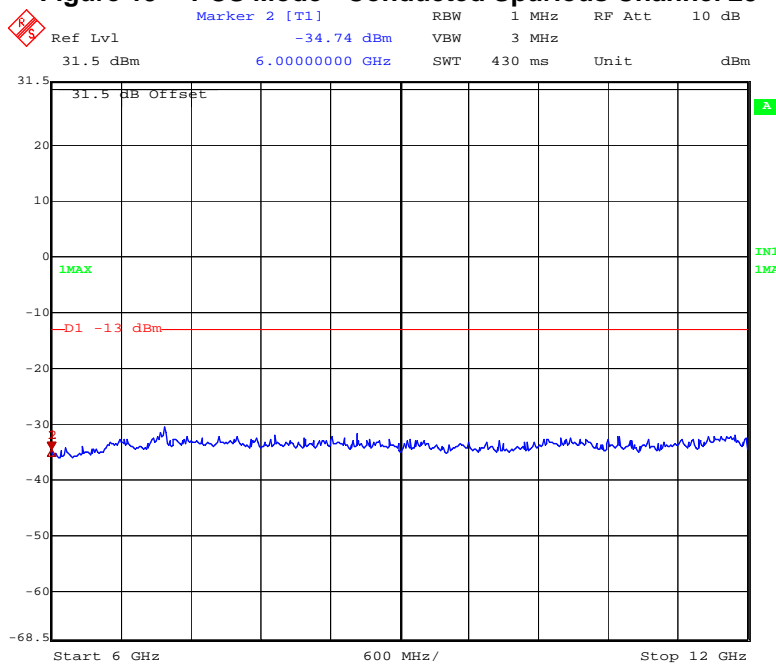
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Figure 18 PCS Mode - Conducted Spurious Channel 25



Title: CG 547 Sendum Wireless GT200
Comment A: Conducted Spurs PCS mode Channel 25 (1851.25 MHz) AGC at 114
Date: 8.MAY.2007 10:37:03

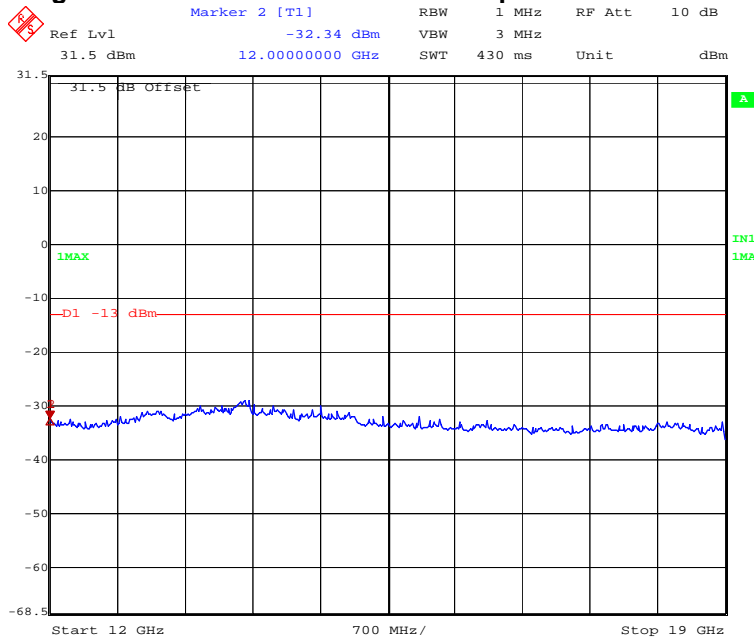
Figure 19 PCS Mode - Conducted Spurious Channel 25



Title: CG 547 Sendum Wireless GT200
Comment A: Conducted Spurs PCS mode Channel 25 (1851.25 MHz) AGC at 114
Date: 8.MAY.2007 10:39:42

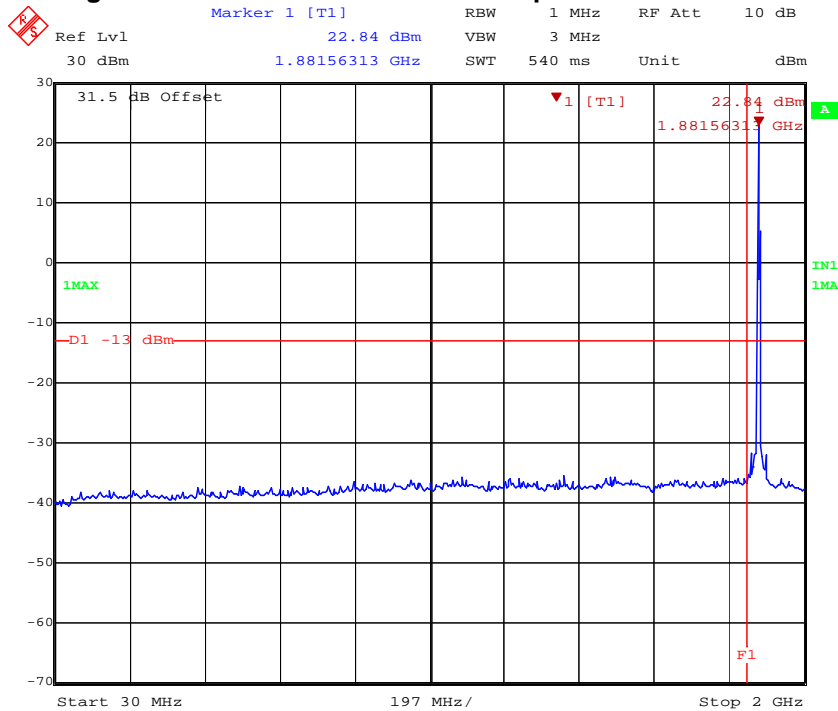
The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

Figure 20 PCS Mode - Conducted Spurious Channel 25



Title: CG 547 Sendum Wireless GT200
Comment A: Conducted Spurs PCS mode Channel 25 (1851.25 MHz) AGC at 114
Date: 8.MAY.2007 10:41:01

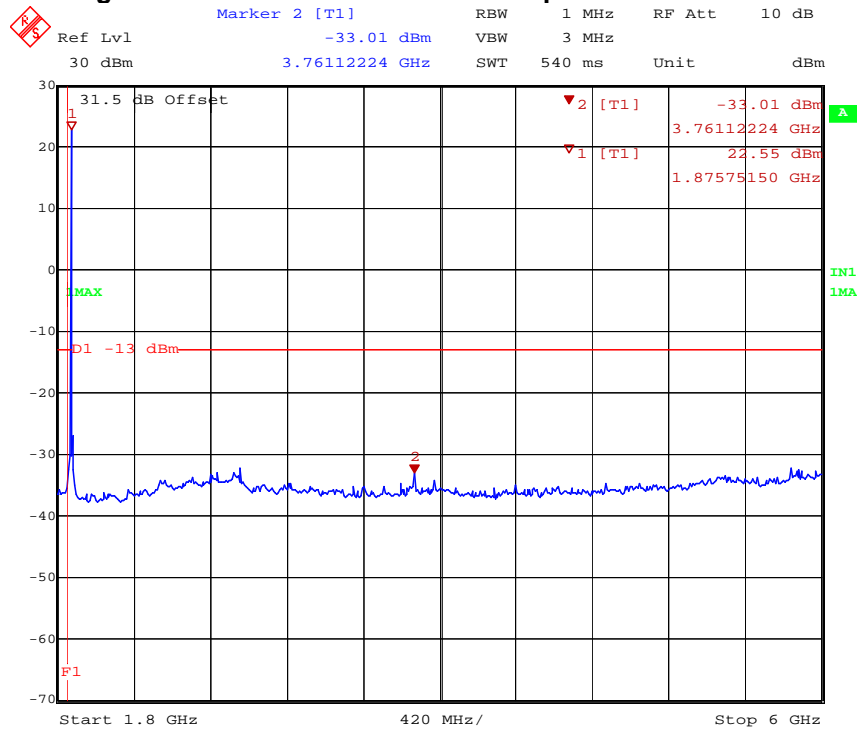
Figure 21 PCS Mode - Conducted Spurious Channel 600



Title: CG 547 Sendum Wireless
Comment A: Conducted Spurious Channel 600
Date: 10.MAY.2007 18:47:18

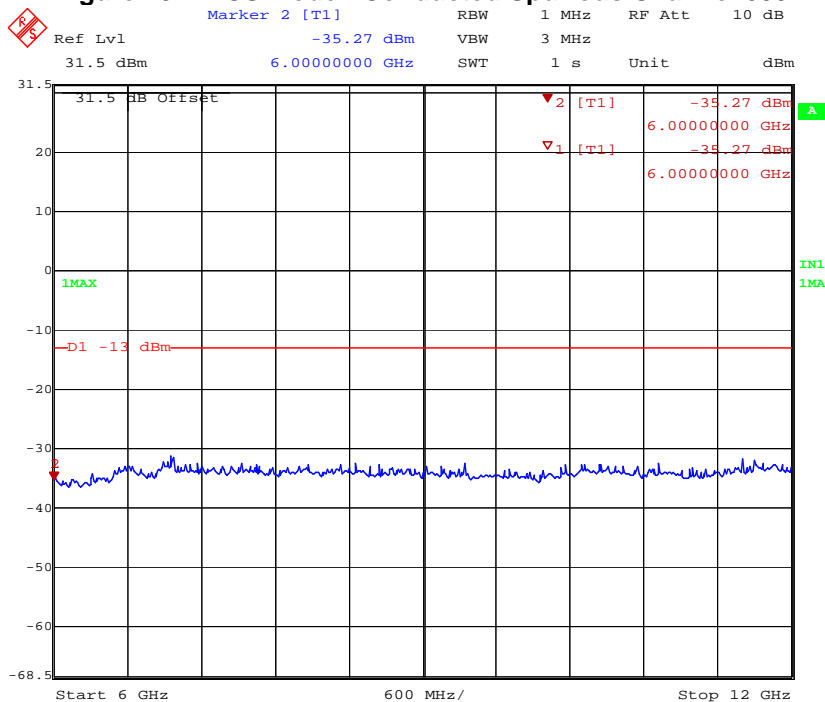
The test results contained in this report refer exclusively to the product(s) presented for testing. The test results do not cover models or products not referred herein. This test report should not be published or duplicated in whole or part without permission from the testing body and the customer.

Figure 22 PCS Mode - Conducted Spurious Channel 600



Title: CG 547 Sendum Wireless
Comment A: Conducted Spurious Channel 600
Date: 10.MAY.2007 18:49:56

Figure 23 PCS Mode - Conducted Spurious Channel 600



Title: CG 547 Sendum Wireless GT200
Comment A: Conducted Spurs PCS mode Channel 600 (1880.00 MHz) AGC=127
Date: 8.MAY.2007 11:29:45

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APPENDIX E: TX/RX RADIATED SPURIOUS EMISSIONS 30 MHZ – 19 GHZ (TX AND RX)

E.1. Base Standard & Test Basis

Base Standard	Cell Mode: FCC Part 22.917 - PCS Mode: FCC Part 24.238, RSS 129/133
Test Basis	FCC 2.1053
Test Method	TIA/EIA 603 – B 2002

Specifications

TX Spurious emissions

Cell Mode:

a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

PCS Mode:

24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power

CELL Mode RX Spurious emission Limits Minimum Standard (Mobile Stations)

(a) No spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz **spurious frequency in the band 30-1000 MHz or 5 nanowatts above 1 GHz.**

(b) No spurious output signals appearing at the antenna terminals and falling within the mobile station receive band (869-894 MHz) shall exceed 22.4 uV across 50 ohms, or

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equivalent output power of -80 dBm/30 kHz.

(c) No spurious output signals appearing at the antenna terminals and falling within the mobile station transmit band (824-849 MHz) shall exceed 224 uV across 50 ohms, or equivalent output power of -60 dBm/30 kHz.

(d) Except for the provisions of (a) and (b), all spurious emissions shall comply with the limits of Table 10.1. The resolution bandwidth of the spectrum analyser shall be 100 kHz for spurious emission measurements below 1.0 GHz and 1.0 MHz for measurements above 1.0 GHz.

800 MHz Dual-Mode CDMA Cellular Telephones RSS-129
23

Spurious Frequency (MHz) at 3 metres	Field Strength (microvolts/m)
30-88	100
88-216	150
216-960	200
960-1610	500
Above 1610	1000

PCS MODE Receiver Spurious Emissions

- a. If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 2. The resolution bandwidth of the spectrum analyser shall be 100 kHz for spurious emissions measurements below 1.0 GHz, and 1.0 MHz for measurements above 1.0 GHz.

Table 2 - Spurious Emission Limits for Receivers

Spurious Frequency (MHz)	Field Strength (microvolts/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

E.2. Measurement Uncertainty


Radiated Emissions	Measurement Uncertainty	Expanded Uncertainty (K=2)
30 MHz – 1 GHz	+2.32/-2.36	+4.65/-4.72
1 – 19 GHz	+3.48/-3.51	+6.96/-7.02

E.3. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

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E.4. Test Results

		Project Number: CG-547 Model: Sendum Wireless GT200 Comments: PCS Mode Ch25 (1851.25MHz), Ch800 (1880MHz), Ch1175 (1908MHz), EUT Upright on table						Tester: Deniz Test ID: RE03-3m-547			
		Standard: FCC Part 24		Measurement Distance: <1GHz 10 meters >1GHz 3 meters							
Antenna Polarization	Frequency (MHz)	Measured Level (dBμV)	Measurement Detector	Correction Factors (dB/m)	Emission Level (dBμV/m)	Signal Generator Level (dBm)	Tx Cable Loss (dB)	Tx Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	EUT Mode
Horizontal	3703.06	53.48	Peak	3.81	57.29	-44.60	2.00	9.30	-37.20	-13.0	Tx AGC:135
Vertical	3702.70	53.61	Peak	3.75	57.36	-44.60	2.00	9.43	-37.17	-13.0	Tx AGC:135
Horizontal	3780.75	60.27	Peak	4.20	64.47	-38.20	2.02	9.42	-30.80	-13.0	Tx AGC:147
Vertical	3780.03	59.73	Peak	4.13	63.86	-38.70	2.02	9.42	-31.30	-13.0	Tx AGC:147
Horizontal	3816.87	70.18	Peak	4.18	74.36	-28.20	2.04	9.41	-20.83	-13.0	Tx AGC:141
Vertical	3817.35	72.62	Peak	4.14	76.76	-25.90	2.04	9.41	-18.63	-13.0	Tx AGC:141

E.5. Observations

The EUT was operating in RX and TX mode during this test. The highest emissions detected are reported above, all other emissions were more than 20 dB below the limit

E.6. Deviations from Normal Operating Mode During Test

None.

E.7. Sample Calculation

Emission Level = Measured Level + Correction Factors.

Margin = Limit – Emission Level.

E.8. Test Data

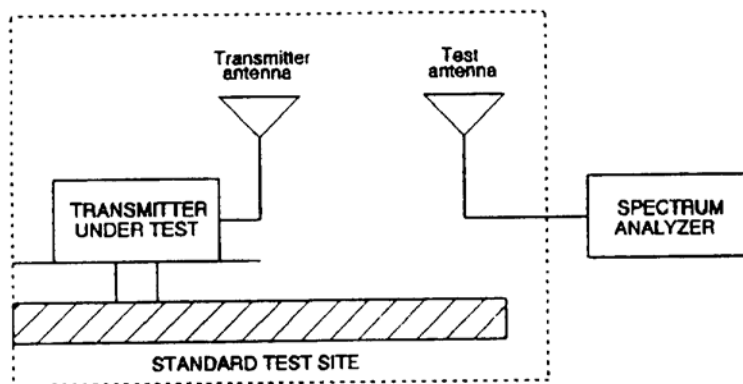
Plots were not provided in order to reduce file size.

E.9. Tested By

This testing was conducted in accordance with the ISO 17025:1999 scope of accreditation, table 1; Quality Manual.

Name:	Glen Moore	Deniz Demerci	Parminder Singh
Function:	EMC Manager	EMC Tester	EMC Tester

E.10. Test Setup Diagram



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APPENDIX F: EMISSION TEST EQUIPMENTS LIST

F.1. Radiated Emissions 30 MHz – 1 GHz Measurement Equipment

Description	Manufacturer	Type/Model	Asset #	Cal Due	Cal Date
10m ANECHOIC CHAMBER					
Bilog Antenna	<input type="checkbox"/> Chase	CBL 6111B	CG0408	24AUG07	24AUG06
	<input checked="" type="checkbox"/> Chase	CBL 6112B	CG0314		
RF Cable	Suhner Sucoflex	Ferrite bead loaded cable	CG0398	13APR07	13APR06
CONTROL ROOM					
Test Receiver	Rohde & Schwarz	ESMI	CG0433/ CG0434	27FEB08	27FEB07
Mast Controller	EMCO	2090	CG0179	N/A	N/A
Multi Device Controller TT1 (Turntable)	EMCO	2090	CG0178	N/A	N/A
RF 10m East site Link				13APR07	13APR06
- Cable 1	Suhner Sucoflex	NA	CG0690		
- Cable 2	Suhner Sucoflex	NA	CG0634		
- Cable 3	Suhner Sucoflex	NA	CG0660		
- Cable 4	Suhner Sucoflex	NA	CG0661		
- Switch Matrix Controller	TDL	SMC-002	CG0175		
- Amplifier	Hewlett Packard	8447F	CG0177		

F.2. Radiated Emissions 1 GHz – 40 GHz Measurement Equipment

Description	Manufacturer	Type/Model	Asset #	Cal Due	Cal Date
10m ANECHOIC CHAMBER					
Horn Antenna (Rx) 1 GHz – 18 GHz	<input checked="" type="checkbox"/> EMCO	3115	CG0103	30AUG07	30AUG06
Standard Gain Horn (Rx) 18 GHz – 26.5 GHz	<input type="checkbox"/> EMCO	3160-09	CG0075	N/A	27NOV01
Standard Gain Horn (Rx) 26.5 GHz – 40 GHz	<input type="checkbox"/> EMCO	3160-10	CG0076	N/A	27NOV01
High pass filter f>1000 MHz	<input checked="" type="checkbox"/> MicroTronics	HPM14576	CG0963	10AUG07	10AUG06
Band Reject Filter 2400MHz<f<2500MHz	<input type="checkbox"/> MicroTronics	BRM50702	CG0933	02MAR09	02MAR06
Band Reject Filter 5725MHz<f<5875 MHz	<input type="checkbox"/> MicroTronics	BRC50705	CG0904	02MAR09	02MAR06
High pass filter f>2800 MHz	<input type="checkbox"/> MicroTronics	HPM50111	CG0964	08JAN09	08JAN06
High pass filter f>6400 MHz	<input type="checkbox"/> MicroTronics	HPM50112	CG0965	09JAN09	09JAN06
LNA 1 GHz<f<18 GHz	<input checked="" type="checkbox"/> Miteq	JSD00121	CG0317	10AUG07	10AUG06
LNA 18GHz<f<26.5GHz	<input type="checkbox"/> Miteq	JSD00119	CG0482	19JAN08	19JAN07

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LNA 26.5GHz<f<40GHz	<input type="checkbox"/> Miteq	JSD00120	CG0483	19JAN08	19JAN07
Cable from Antenna to LNA	Sucoflex 104	2422774A	CG0686	10AUG07	10AUG06
Cable from LNA to SA	Sucoflex 100	115757-4	CG0686	10AUG07	10AUG06
Spectrum Analyzer 9 kHz – 40 GHz	Rohde & Schwarz	FSEK-20	CG0118	15JUN07	09MAY06
LNA DC Power Supply	Xantrex	LXO 30-2	CG0493	NA	NA
HPIB Extender	HP	37204	CG0110	N/A	N/A
CONTROL ROOM					
PC with FSEK Manual ctrl S/W	N/A	N/A	N/A	N/A	N/A
HPIB Extender	HP	37204	CG0181	N/A	N/A
Mast Controller	EMCO	2090	CG0179	N/A	N/A
Multi Device Controller TT1	EMCO	2090	CG0178	N/A	N/A

VERIFICATION EQUIPMENT					
Horn Antenna (Tx)	<input checked="" type="checkbox"/> EMCO	3115	CG0099	N/A	N/A
Standard Gain Horn (Rx) 18 GHz – 26.5 GHz	<input checked="" type="checkbox"/> EMCO	3160-09	CG0075	N/A	27NOV01
Standard Gain Horn (Rx) 26.5 GHz – 40 GHz	<input checked="" type="checkbox"/> EMCO	3160-10	CG0077	N/A	27NOV01
Signal Generator	<input type="checkbox"/> Rohde & Schwarz	SMP-04	CG0435	N/A	N/A
	<input type="checkbox"/> Rohde & Schwarz	SMIQ	CG0117	N/A	N/A
	<input checked="" type="checkbox"/> Wiltron	68369B	CG0043	N/A	N/A
Cable TX antenna to Signal Generator	Sucoflex	115745-4	CG0635	19JAN08	19JAN07

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END OF DOCUMENT

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NTS Product Integrity Laboratory, 5151-47th Street N.E. Tel: 403-568-6605, Fax: 403-568-6970