Standards Council of Canada
Accredited Laboratory
Scope of Accreditation 75

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 75

TM

Test Report:	5W57078 Issue 2
Applicant:	Spotwave Wireless Inc. 1 Hines Road Otawa ON K2K3C7
Apparatus:	Spotcell 250Xe/250He CU
FCC ID:	P3YSPOTCELL0014
In Accordance With:	FCC Part 22, Boosters, Public Mobile Services FCC Part 24, Personal Communication Services Class II Permissive Change
Tested By:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Authorized By:	Sim Jagpal, General Manager
Date:	February 16, 2006
Total Number of Pages:	39

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 22 & Part 24. Conducted measurements were performed in accordance with ANSI TIA-603-B-2002. Radiated tests were conducted is accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	Spotcell 250Xe/250He CU
Specification:	FCC Part 22 Public Mobile Services FCC Part 24, Personal Communication Services
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release

Author: Roman Kuleba, EMC/Wireless Specialist

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

TABLE OF CONTENTS

Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows: Indoor Wireless Coverage Unit
Spotcell 250 Xe/250 He CU

1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
1	Donor Unit Spotcell 250Xe/250He	PWB 201-00027-10-01
2	Coverage Unit Spotcell 250Xe/250He	PWB 210-00030-00-01
3	75 Ω Coaxial Cable Promark Electronics 35/05	SPO-970-00031-01
4	USB RX/Interface	210-00024-00-03
5	AC Adapter Cincon Electronics Co. Ltd. 100-240 VAC/1.5 A/50-60 Hz to 24VDC/3A	Model: TR70A2401A03 S/N: 70240-0065602

The first samples were received on: December 12, 2005

1.3 Theory of Operation

The SpotCell 250 Xe/250 He is a dual band (Cellular Band and PCS band) or split band (PCS band and PCS band) adaptive repeater, which operates in the 800MHz Cellular band and in the 1900MHz PCS bands, for indoor RF signal enhancement.
The indoor Coverage Unit (CU) consists of wide-band antenna and DC power connection.
The Donor Unit (DU) consists of two adaptive sub-modules, one for the Cellular band and another one for the PCS band. All the sub-modules are assembled in one PCB board.. The adaptive processor in the DU uses an IF frequency to perform gain control and filtering functions in both the downlink and uplink directions for the Cellular and PCS bands.

1.4 Technical Specifications of the EUT

Manufacturer: Spotwave Wireless Inc.

Operating Frequency:

PCS Band (down-link):	1930 – 1990 MHz
Cellular Band A (down-link):	869 – 880 MHz
	890 – 891.5 MHz
Cellular Band B (down-link):	880 – 890 MHz
	891.5 – 894 MHz

Emission Designator: F7W, G7W, D7W

Rated Power:

PCS:	+2.0 dBm
Cellular Band:	+2.0 dBm
Composite Power:	+5.0 dBm

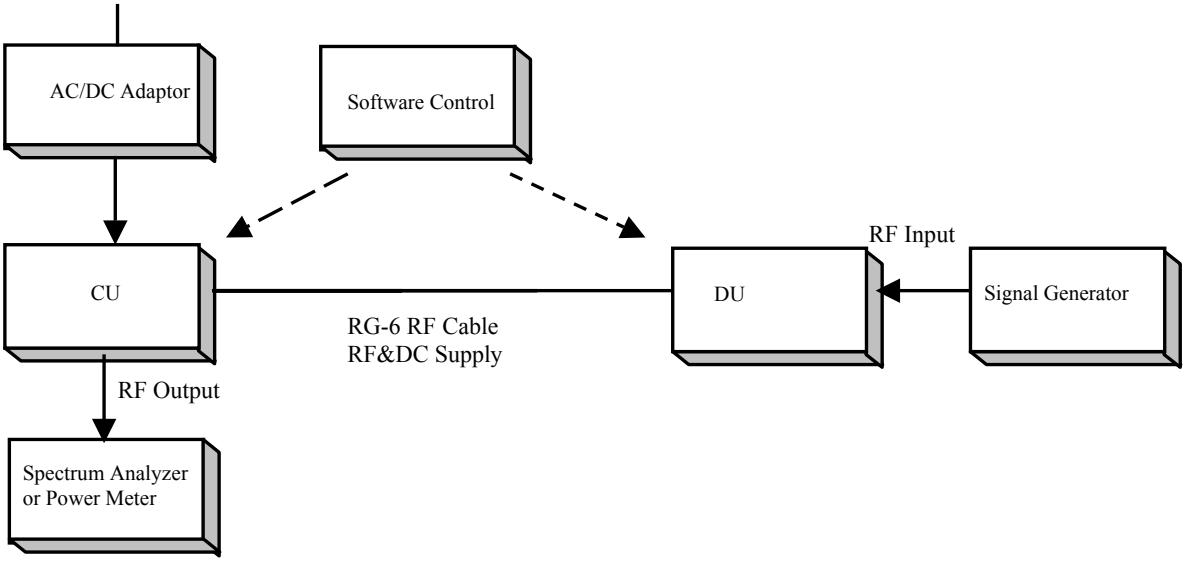
Measured Power:

Cellular Band – Block A:	1.78 dBm
Cellular Band – Block B:	1.96 dBm
PCS Band:	1.84 dBm

Modulation: TDMA, GSM, CDMA, WCDMA

Power Source: AC Adapter Cincon Electronics Co. Ltd.
100-240 VAC/1.5 A/50-60 Hz to 24VDC/3A

1.5 Block Diagram of the EUT



Section 2 : Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 2 Subpart J, Equipment Authorization Procedures
FCC Part 22, Public Mobile Services
FCC Part 24, Personal Communication Services
FCC 2-11-04/EAB/RF Amplifier, Booster, and Repeater Reminder Sheet

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 ^{o}C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

2.4 Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	ASSET	LAST CAL.	NEXT CAL.
Spectrum Analyzer	Rohde & Schwarz	FSP	FA001920	Mar 22/05	Mar 22/06
Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 18/05	May 18/06
Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 18/05	May 18/06
0.1 – 1300 MHz Amplifier	Hewlett Packard	8447D	FA001909	Jan. 13/05	Jan. 13/06
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	COU	COU
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	COU	COU
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	COU	COU
5.0 – 18.0 GHz Amplifier	NARDA	DWT-186N23U40	FA001409	COU	COU
18.0 – 26.0 GHz Amplifier	Narda	BBS-1826N612	FA001550	COU	COU
Biconical Antenna	EMCO	3109	FA000904	Aug. 26/05	Aug. 26/06
Horn Antenna	EMCO	3115	FA000649	Dec. 22/04	Dec. 22/05
Log Periodic Antenna	EMCO	LPA-25	FA000477	Aug. 29/05	Aug. 29/06
18.0 – 40.0GHz Horn Antenna	EMCO	3116	FA001847	April 25/05	April 25/06
Climate Chamber	Thermotron	SM-16C	15649-S	COU	COU

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

3.5 Additional Observations

There were no additional observations made during this assessment.

Section 4 : Results Summary

This section contains the following:

FCC Part 22 & Part 24: Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N	No : not applicable / not relevant.
Y	Yes : Mandatory i.e. the apparatus shall conform to these tests.
N/T	Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

4.1 FCC Part 22 & 24: Test Results

Section	Clause FCC Part 22	Clause FCC Part 24	Test Method	Test Description	Required	Result
1	22.913	24.232	2.1046	RF Power Output	Y	Complies
2	2-11-04/EAB/RF		2.1049	Occupied Bandwidth	Y	Complies
3	22.917	24.238	2.1051	Spurious Emissions at Antenna Terminals	Y	Complies
4	22.917	24.238	2.1053	Field Strength of Spurious Emissions	Y	Complies
5	2-11-04/EAB/RF			Out of band rejection	Y	Complies
6	22.355	24.135	2.1055	Frequency Stability	N [1]	Complies

Notes:

[1] The EUT does not contain any frequency-converting circuitry.

Appendix A : Test Results

Section 1: Clause 22.913 Output Power

(a) Maximum ERP. In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

Test Conditions:

Sample Number:	2	**Temperature:**	23 °C
Date:	January 10, 2006	**Humidity:**	36 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass (see attached tables).

Note:

The Maximum RF output power is below the manufacturer's maximum power rating. The composite RF output power is de-rated according to the number of channels and is equal to the Pmax-10logN.

Pmax=Maximum Composite RF Output Power
N=Number of Channels

The EUT was operated in manual mode to achieve the maximum output power levels.

Output Power

Cellular Band - Block A

	TDMA	GSM	CDMA	WCDMA	
Frequency	P_{OUT} Measured	P_{OUT} Measured	P_{OUT} Measured	P_{OUT} Measured	$P_{OUT\ MAX}$ Rated
(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
Primary:					
870.00	1.59	0.84	0.44	N/A	2.00
875.00	1.67	1.08	1.12	1.47	2.00
879.00	1.78	1.06	1.00	N/A	2.00
Secondary:					
890.75	-6.79	-7.63	-7.30	N/A	2.00

Cellular Band - Block B

	TDMA	GSM	CDMA	WCDMA	
Frequency	P_{OUT} Measured	P_{OUT} Measured	P_{OUT} Measured	P_{OUT} Measured	$P_{OUT\ MAX}$ Rated
(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
Primary:					
881.00	1.12	0.11	-0.41	N/A	2.00
885.00	0.95	0.38	0.93	0.37	2.00
889.00	-1.09	-1.77	-1.42	N/A	2.00
Secondary:					
892.75	1.96	1.06	1.13	N/A	2.00

PCS Band

	TDMA	GSM	CDMA	WCDMA	
Frequency	P_{OUT} Measured	P_{OUT} Measured	P_{OUT} Measured	P_{OUT} Measured	$P_{OUT\ MAX}$ Rated
(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
1937.50	1.45	1.63	1.39	1.64	2.00
1960.00	1.54	0.94	1.17	0.54	2.00
1982.50	1.84	0.92	1.04	0.74	2.00

Section 2: Clause 2-11-04/EAB/RF Occupied Bandwidth

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.

Test Conditions:

Sample Number:	2	**Temperature:**	23 °C
Date:	December 16, 2005	**Humidity:**	36 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

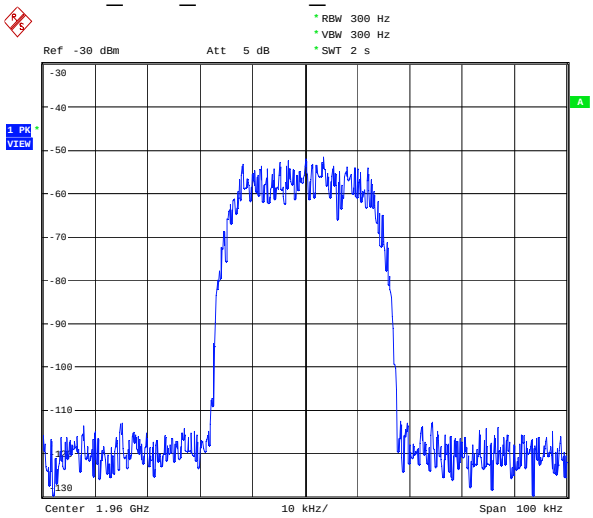
See Attached Plots.

Additional Observations:

The occupied bandwidth was measured by comparison of input from the signal generator to the output signal from the amplifier. This was done in order to determine if there was any degradation to the output signal due to the amplification and conversion through the repeater.

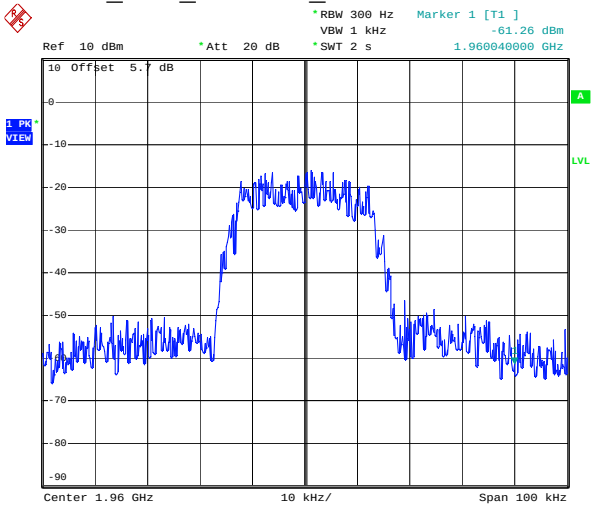
Occupied Bandwidth
PCS Band 1960 MHz
Modulation: TDMA

OccBW_PCS_1960MC_TDMA-In.WMF



Date: 16.DEC.2005 18:29:40

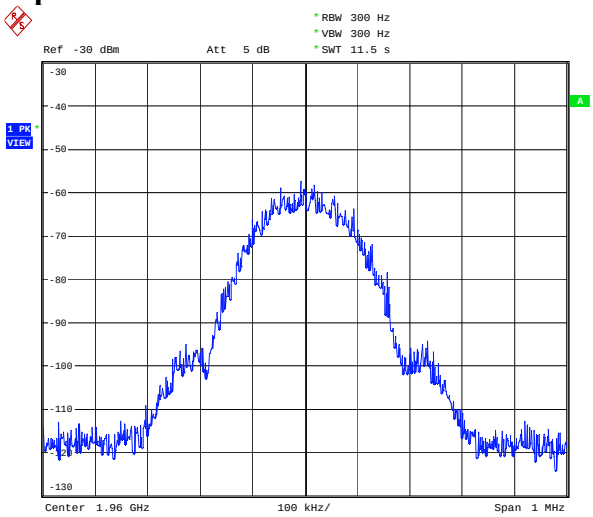
OccBW_PCS_1960MC_TDMA-Out.WMF



Date: 16.DEC.2005 23:24:54

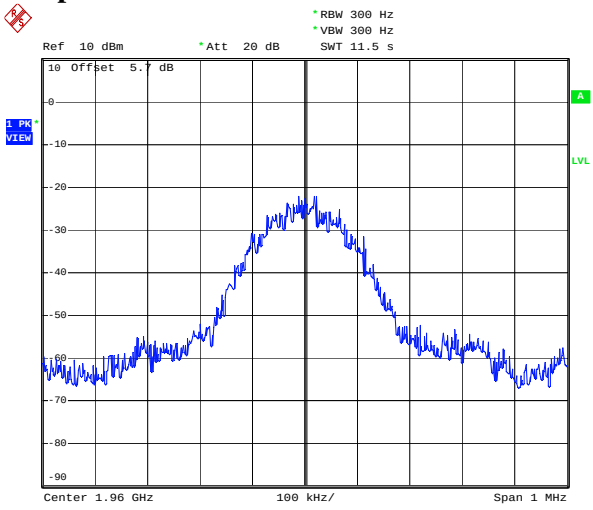
Occupied Bandwidth
PCS Band 1960 MHz
Modulation: GSM

Input



Date: 16.DEC.2005 18:27:02

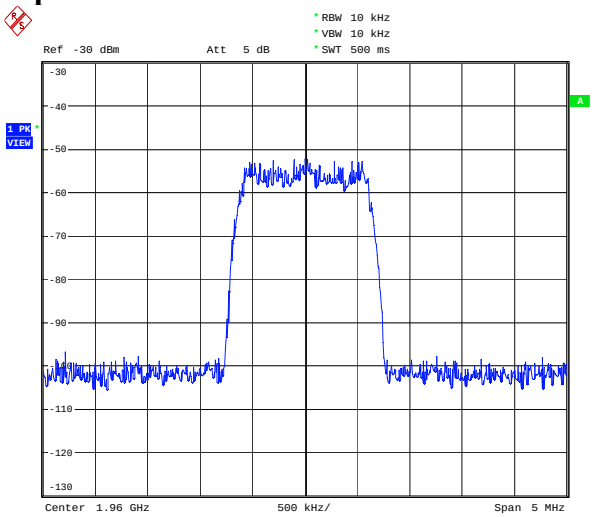
Output



Date: 16.DEC.2005 23:33:07

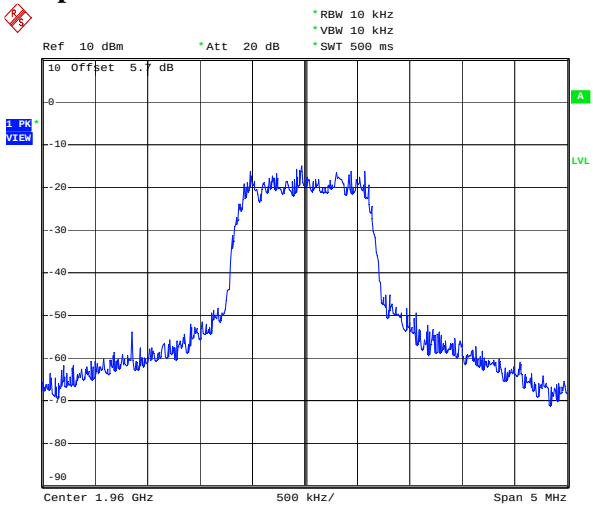
Occupied Bandwidth
PCS Band 1960 MHz
Modulation: CDMA

Input



Date: 16.DEC.2005 18:22:56

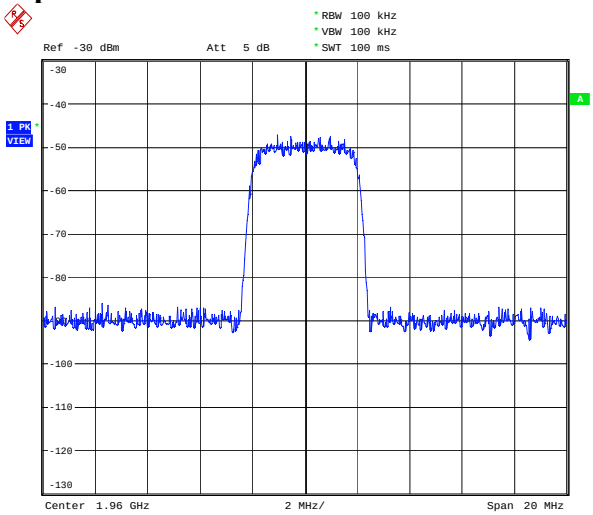
Output



Date: 16.DEC.2005 23:39:38

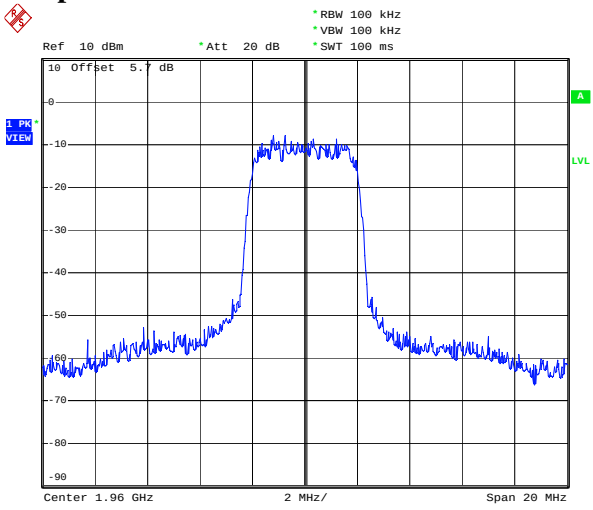
Occupied Bandwidth
PCS Band 1960 MHz
Modulation: WCDMA

Input



Date: 16.DEC.2005 18:19:23

Output



Date: 16.DEC.2005 23:46:46

Section 3: Clause 22.917 Conducted Spurious Emissions at Antenna Terminal

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.

Test Conditions:

Sample Number:	2	**Temperature:**	23 °C
Date:	December 15, 2005	**Humidity:**	36 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

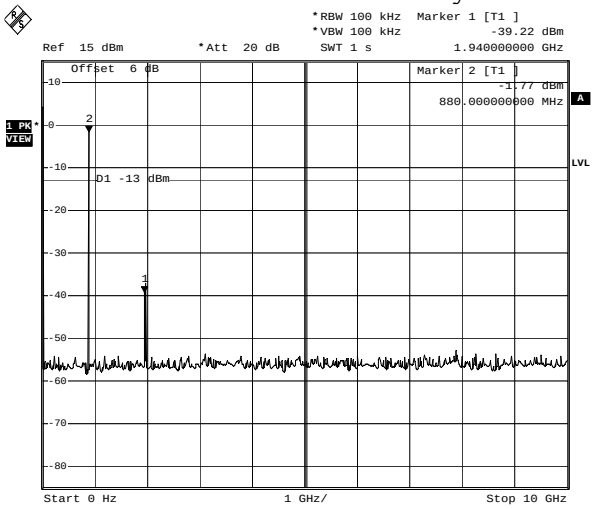
See Attached Plots.

Additional Observations:

The spectrum was searched from 0 Hz to the 10th harmonic.

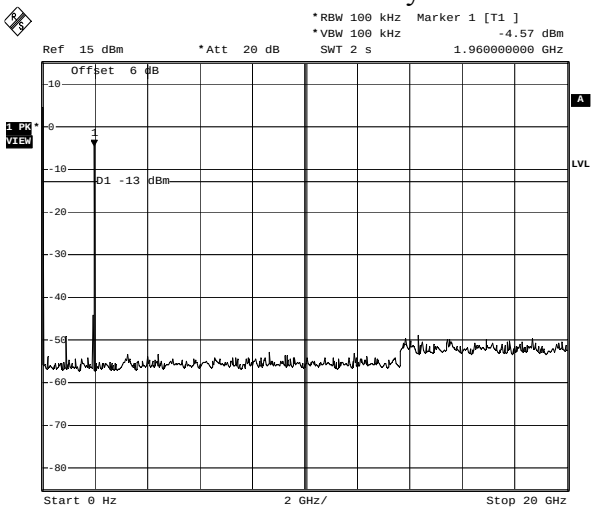
Conducted Spurious Emissions (Downlink):

Transmission in Cellular Band Only:



Date: 15.DEC.2005 21:16:53

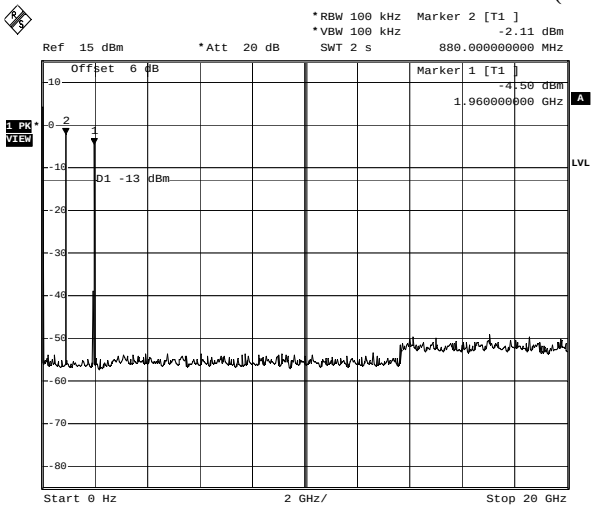
Transmission in PCS Band Only:



Date: 15.DEC.2005 20:47:07

Conducted Spurious Emissions (Downlink):

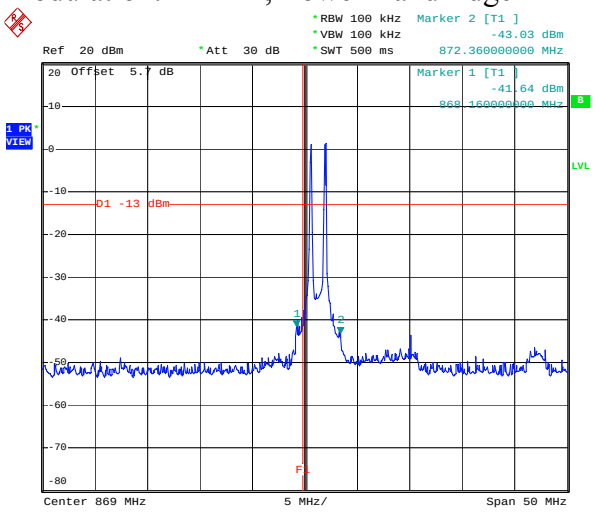
Simultaneous Transmission in both Bands (Cellular and PCS):



Date: 15.DEC.2005 21:14:19

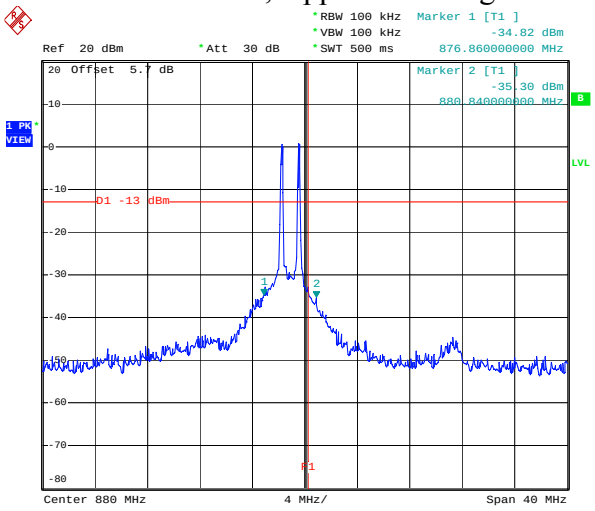
Conducted Spurious Emissions
3rd Order IM-products
Cellular Band – Block A (Downlink)

Modulation: TDMA, Lower Band Edge



Date: 21.DEC.2005 01:39:33

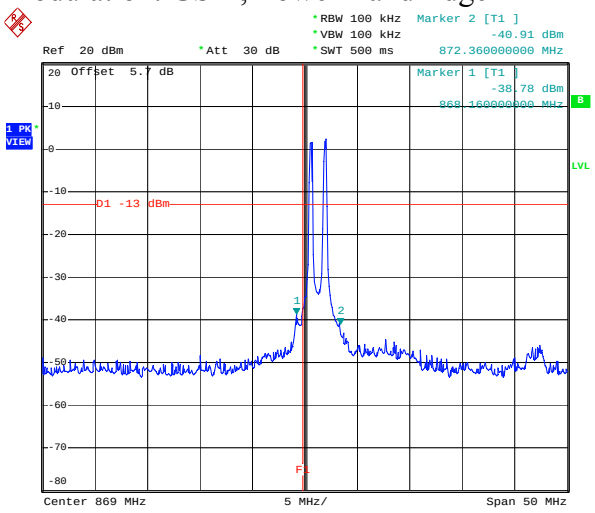
Modulation: TDMA, Upper Band Edge



Date: 21.DEC.2005 23:15:58

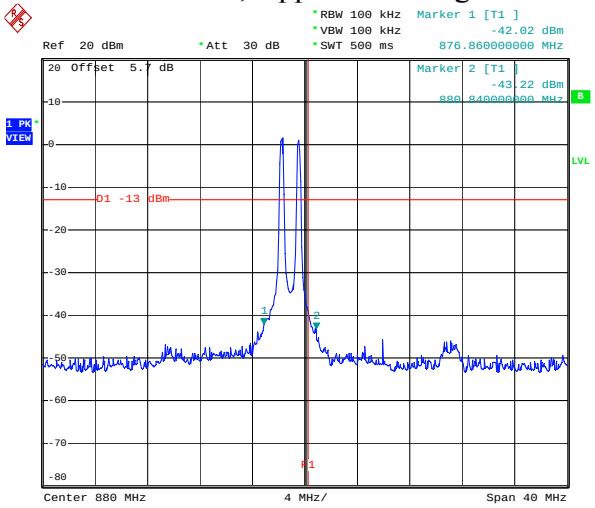
Conducted Spurious Emissions
3rd Order IM-products
Cellular Band – Block A (Downlink)

Modulation: GSM, Lower Band Edge



Date: 21.DEC.2005 01:47:17

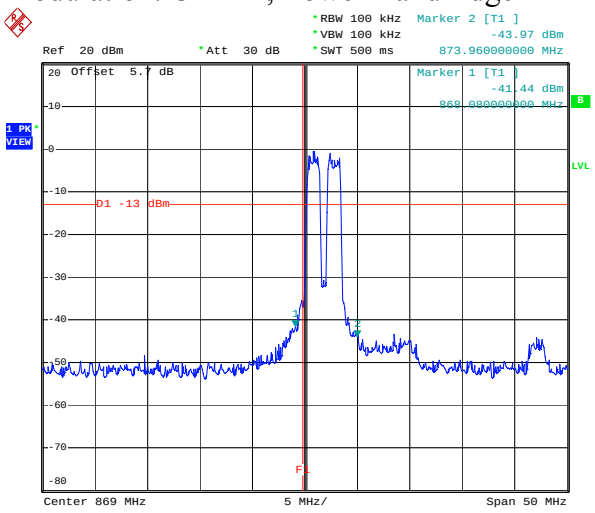
Modulation: GSM, Upper Band Edge



Date: 21.DEC.2005 23:31:37

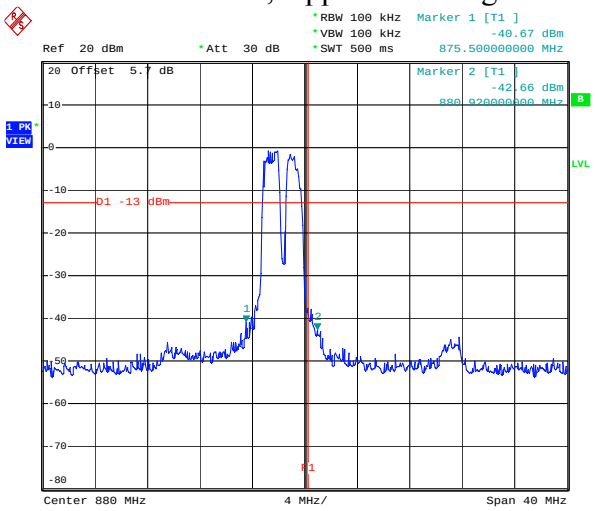
Conducted Spurious Emissions
3rd Order IM-products
Cellular Band – Block A (Downlink)

Modulation: CDMA, Lower Band Edge



Date: 21.DEC.2005 02:03:19

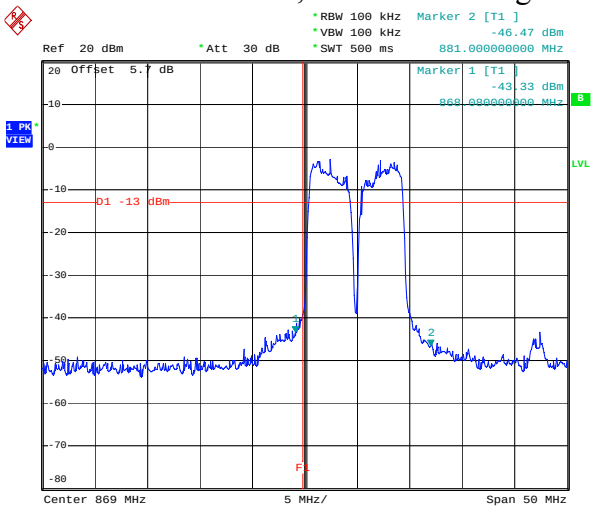
Modulation: CDMA, Upper Band Edge



Date: 21.DEC.2005 19:54:31

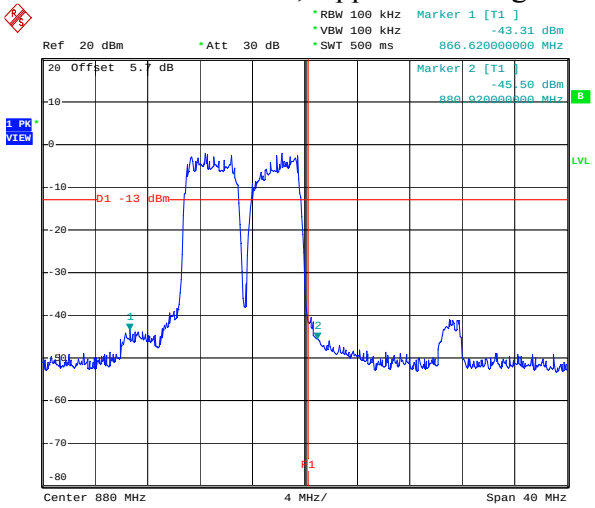
Conducted Spurious Emissions
3rd Order IM-products
Cellular Band – Block A (Downlink)

Modulation: WCDMA, Lower Band Edge



Date: 21.DEC.2005 02:08:54

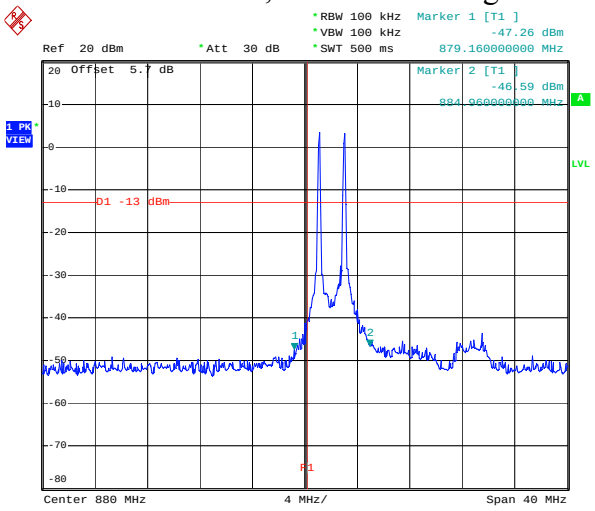
Modulation: WCDMA, Upper Band Edge



Date: 21.DEC.2005 23:00:00

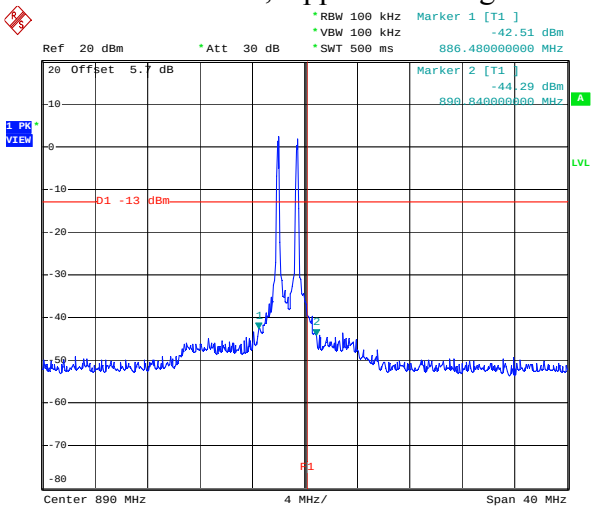
Conducted Spurious Emissions
3rd Order IM-products
Cellular Band – Block B (Downlink)

Modulation: TDMA, Lower Band Edge



Date: 19.DEC.2005 04:27:43

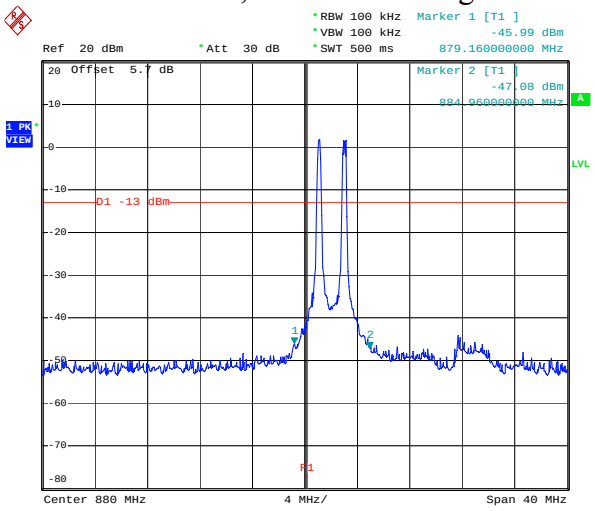
Modulation: TDMA, Upper Band Edge



Date: 20.DEC.2005 01:49:31

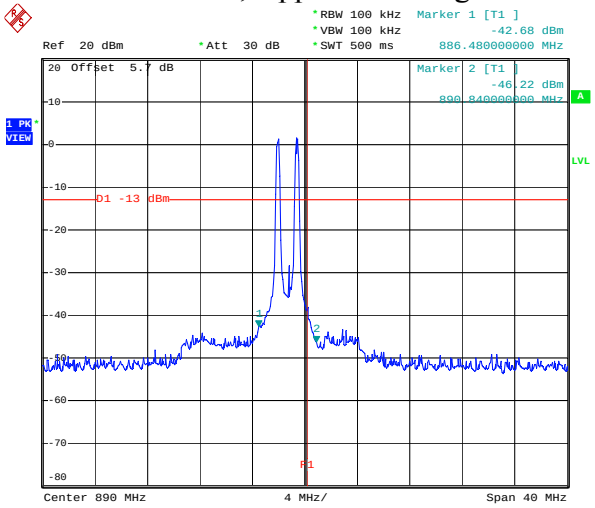
Conducted Spurious Emissions
3rd Order IM-products
Cellular Band – Block B (Downlink)

Modulation: GSM, Lower Band Edge



Date: 19.DEC.2005 04:31:28

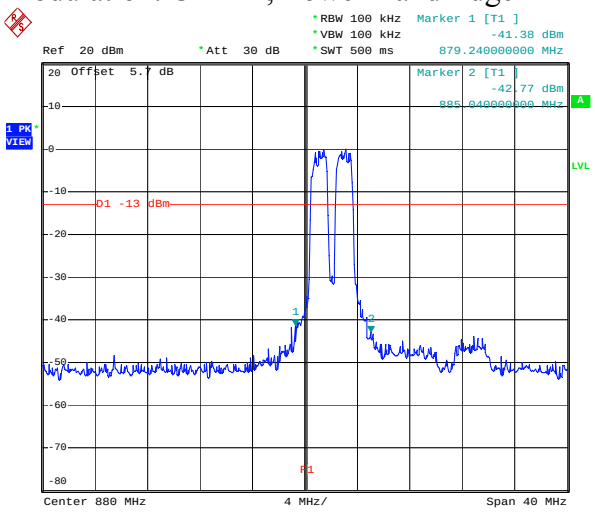
Modulation: GSM, Upper Band Edge



Date: 20.DEC.2005 01:58:33

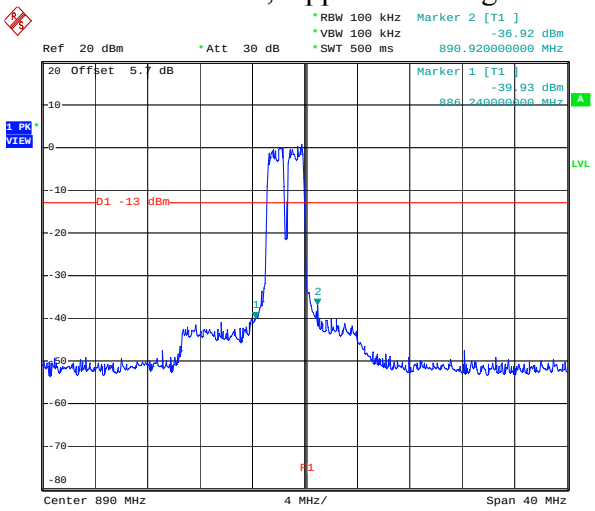
Conducted Spurious Emissions
3rd Order IM-products
Cellular Band – Block B (Downlink)

Modulation: CDMA, Lower Band Edge



Date: 19.DEC.2005 04:36:50

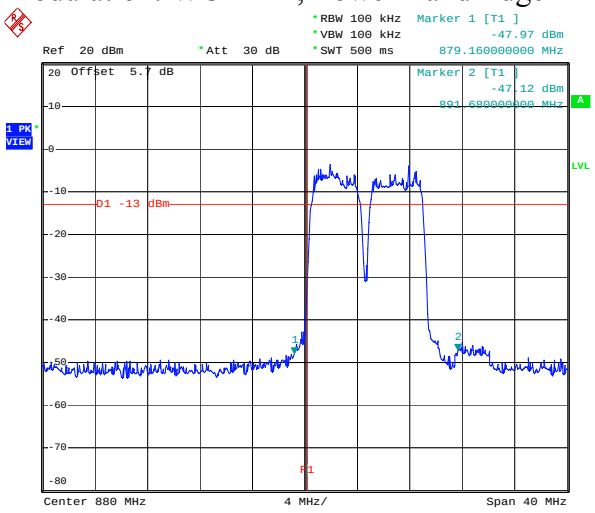
Modulation: CDMA, Upper Band Edge



Date: 20.DEC.2005 02:20:34

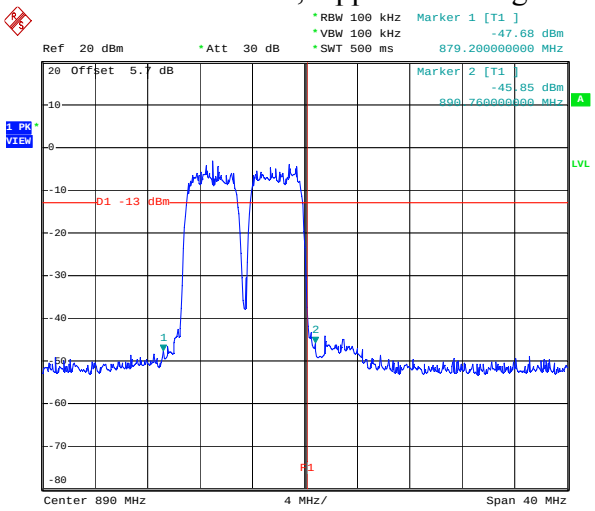
Conducted Spurious Emissions
3rd Order IM-products
Cellular Band – Block B (Downlink)

Modulation: WCDMA, Lower Band Edge



Date: 19.DEC.2005 04:44:24

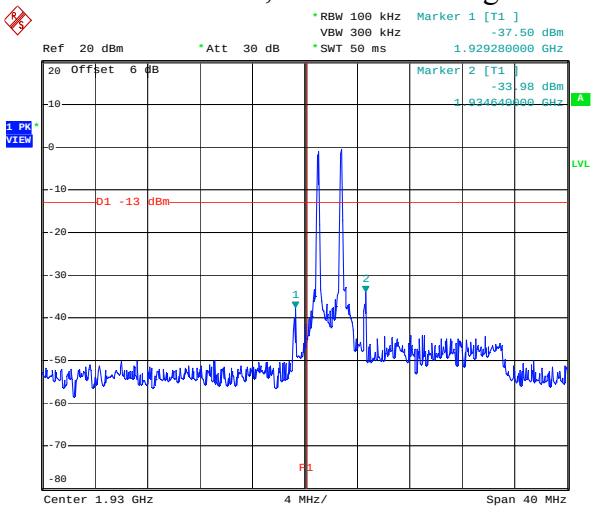
Modulation: WCDMA, Upper Band Edge



Date: 20.DEC.2005 02:27:39

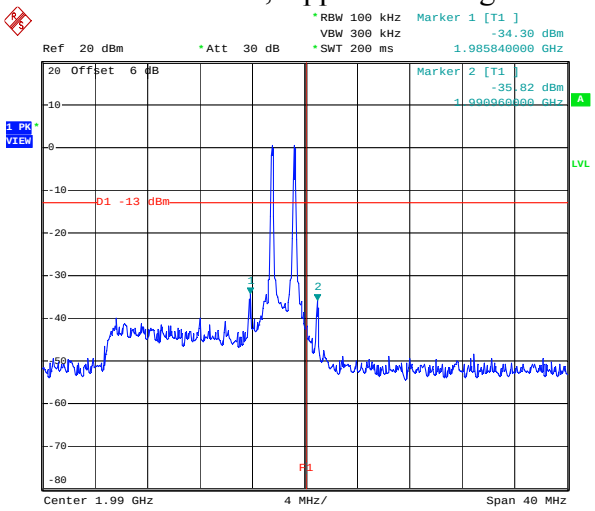
Conducted Spurious Emissions
3rd Order IM-products
PCS Band (Downlink)

Modulation: TDMA, Lower Band Edge



Date: 19.DEC.2005 00:09:06

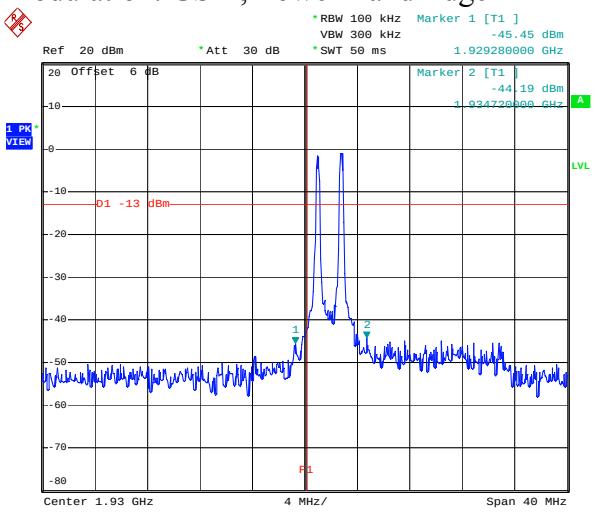
Modulation: TDMA, Upper Band Edge



Date: 19.DEC.2005 01:51:13

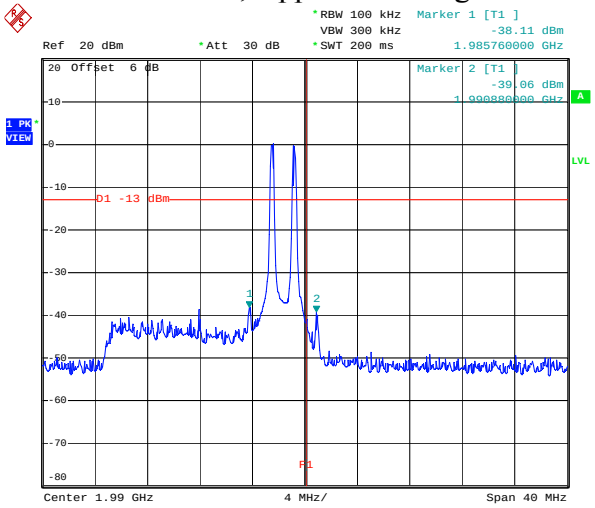
Conducted Spurious Emissions
3rd Order IM-products
PCS Band (Downlink)

Modulation: GSM, Lower Band Edge



Date: 19.DEC.2005 00:13:48

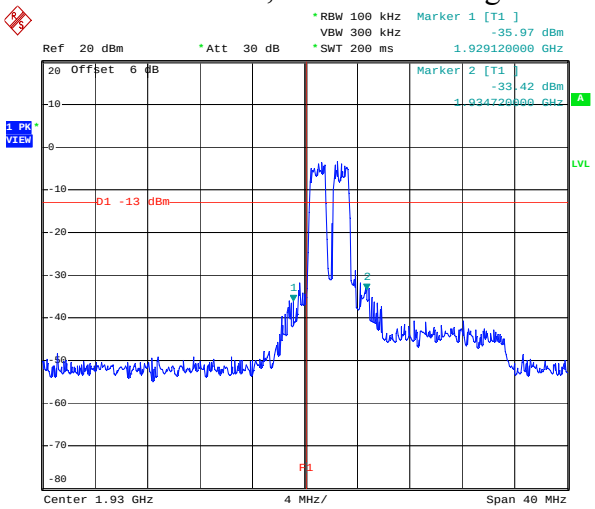
Modulation: GSM, Upper Band Edge



Date: 19.DEC.2005 01:47:03

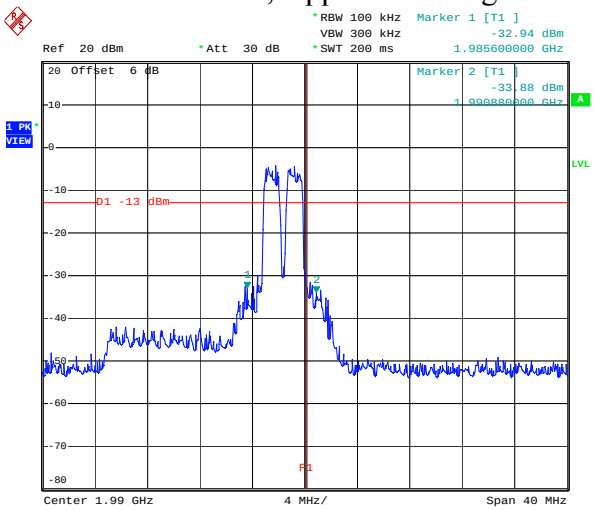
Conducted Spurious Emissions
3rd Order IM-products
PCS Band (Downlink)

Modulation: CDMA, Lower Band Edge



Date: 19.DEC.2005 00:20:50

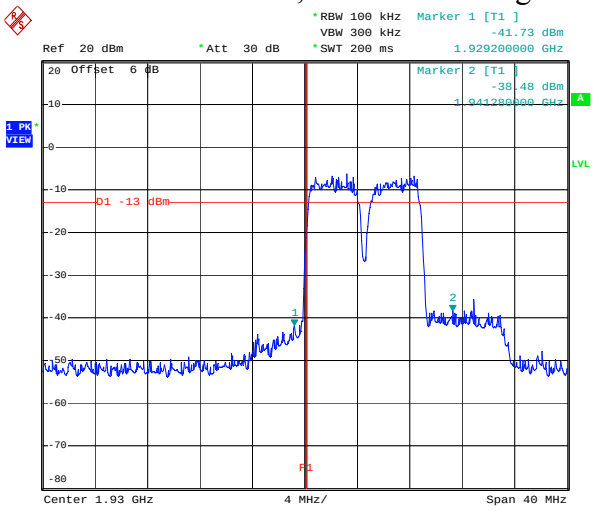
Modulation: CDMA, Upper Band Edge



Date: 19.DEC.2005 01:38:44

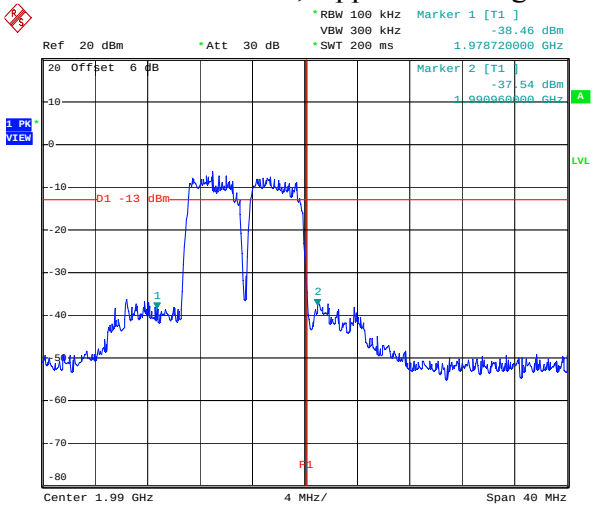
Conducted Spurious Emissions
3rd Order IM-products
PCS Band (Downlink)

Modulation: WCDMA, Lower Band Edge



Date: 19.DEC.2005 00:34:54

Modulation: WCDMA, Upper Band Edge



Date: 19.DEC.2005 01:17:47

Section 4: Clause 22.917, 24.238 & 2.1053 Field Strength of Spurious Emissions

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.

Test Conditions:

Sample Number:	2	**Temperature:**	23 °C
Date:	December 15, 2005	**Humidity:**	36 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

Complies. See Attached Table for Results.

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

The EUT was measured on three orthogonal axis.

All measurements were performed using a Peak Detector with 100kHz RBW below 1GHz and a 1MHz RBW above 1GHz at a distance of 3 meters.

Radiated Spurious Emissions:

Tested as per Table Top								
Test Distance (meters): 3						Range: 1		
Freq. (MHz)	Ant.	Pol. V/H	RCVD Signal (dBµV)	Sig Sub. Factor (dB)	Signal Substitution Power (dBm)	Limit (dBm)	Margin (dB)	Detector
152.6122	BC1	V	37.4	-80.4	-43.0	-13.0	30.0	Peak
153.1033	BC1	V	38.2	-80.4	-42.2	-13.0	29.2	Peak
211.0000	BC1	V	59.6	-78.6	-19.0	-13.0	6.0	Peak
152.6122	BC1	H	23.6	-84.7	-61.1	-13.0	48.1	Peak
153.1033	BC1	H	41.3	-84.8	-43.5	-13.0	30.5	Peak
211.0000	BC1	H	65.7	-83.2	-17.5	-13.0	4.5	Peak
2100.0000	Horn	V	71.6	-123.2	-51.6	-13.0	38.6	Peak
4022.0000	Horn	V	77.2	-112.7	-35.5	-13.0	22.5	Peak
4200.0000	Horn	V	68.9	-113.1	-44.2	-13.0	31.2	Peak
6300.0000	Horn	V	64.7	-108.3	-43.6	-13.0	30.6	Peak
2100.0000	Horn	H	74.4	-124.4	-50.0	-13.0	37.0	Peak
4022.0000	Horn	H	86.7	-113.9	-27.2	-13.0	14.2	Peak
4200.0000	Horn	H	74.9	-114.3	-39.4	-13.0	26.4	Peak
6300.0000	Horn	H	68.4	-108.4	-40.0	-13.0	27.0	Peak

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole
Note 2: Detector Legend: Q-Peak = 120 kHz RBW, Average = 1.0 MHz RBW
Below 1GHz, Peak detector with 100 kHz RBW, 100KHz VBW
Above 1GHz, Peak detector with 1.0MHz RBW, 1.0MHz VBW

Section 5: Clause 2-11-04/EAB/RF Out-of-band Rejection

Plots showing the filter frequency response.

Test Conditions:

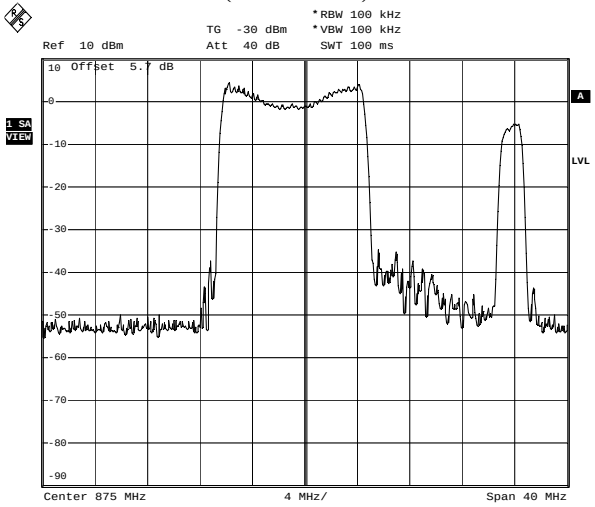
Sample Number:	2	**Temperature:**	23 °C
Date:	December 15, 2005	**Humidity:**	36 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

See Attached Plots.

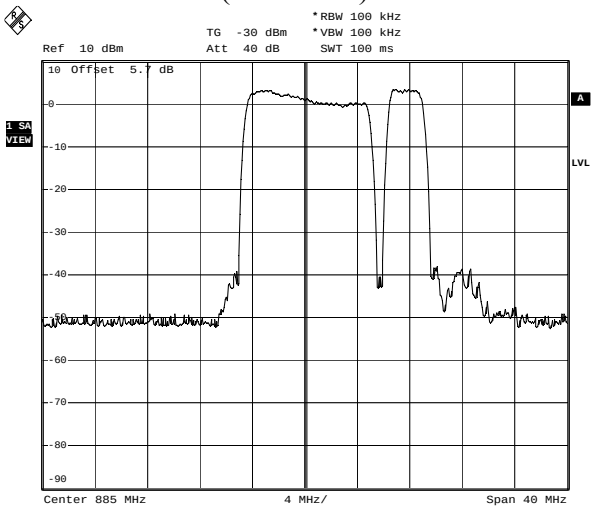
Out-of-band Rejection

Cellular Band A (Downlink):



Date: 15.DEC.2005 19:35:24

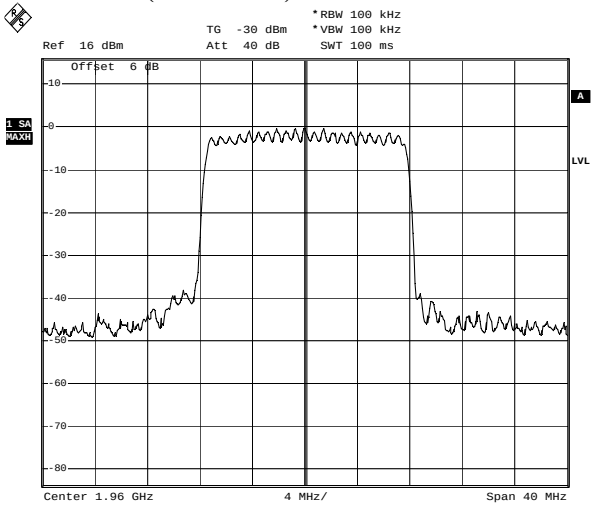
Cellular Band B (Downlink):



Date: 15.DEC.2005 19:20:58

Out-of-band Rejection

PCS Band (Downlink):



Date: 15.DEC.2005 20:34:38

Section 6: Clause: §22.355, §24.235 & §2.1055 Frequency Stability

§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 (ppm)	Mobile >3 Watts (ppm)	Mobile <=3 Watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
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

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

§2.1055 (a)(1) Measurements required:
The frequency stability shall be measured with variation of ambient temperature as follows:
From -30° to +50° centigrade for all equipment except that specified in paragraphs (a)(2) and (3) of this section.

Test Conditions:

Sample Number:	2	**Temperature:**	23 °C
Date:	December 13, 2005	**Humidity:**	36 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

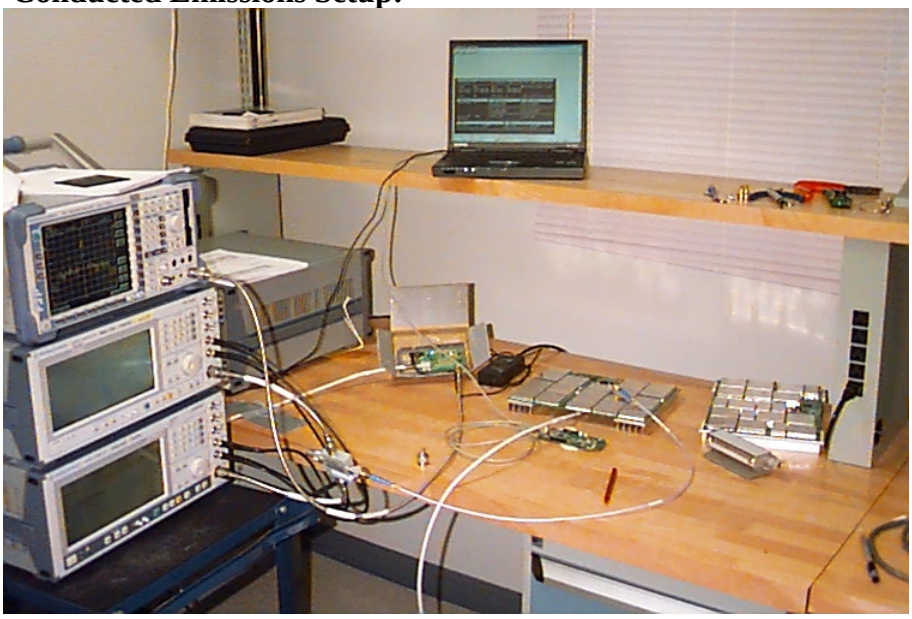
Test Results: N/A.

Additional Observations:

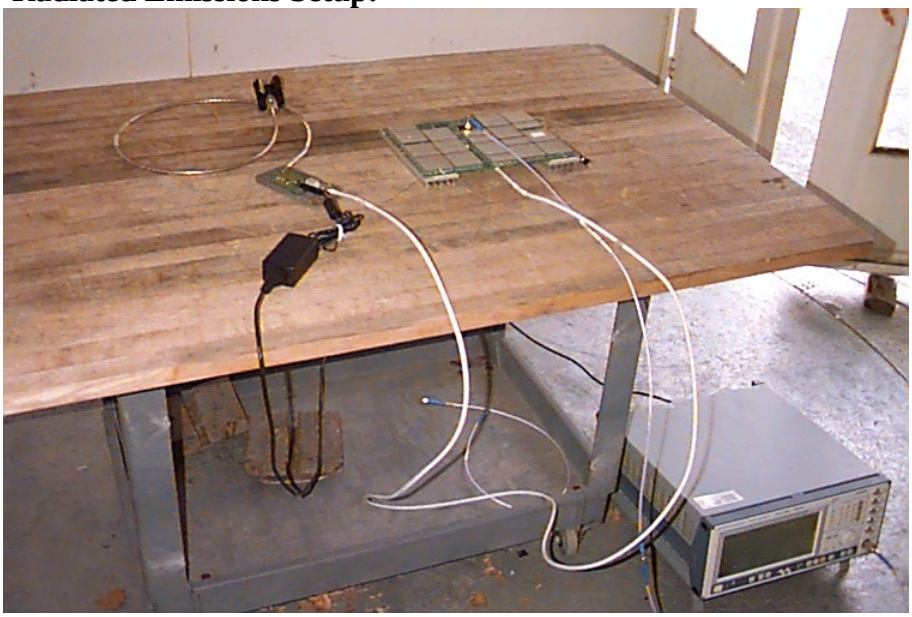
The EUT does not contain any frequency-converting circuitry.

Appendix B : Setup Photographs

Conducted Emissions Setup:

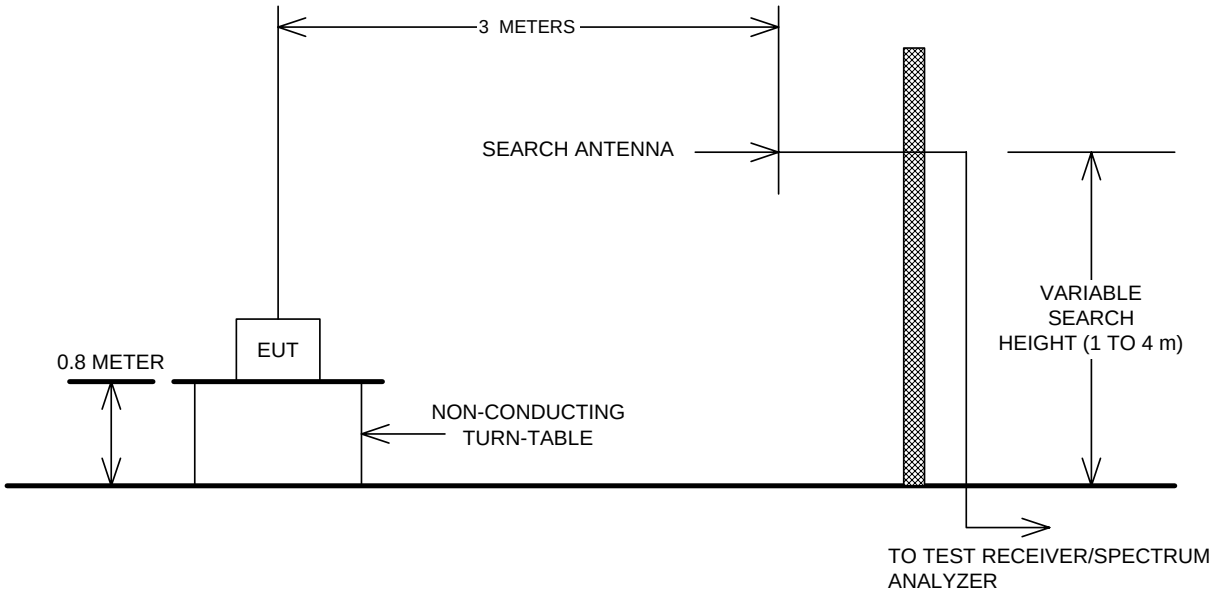


Radiated Emissions Setup:



Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions, Output power, Occupied Bandwidth and Out of Band Rejection