

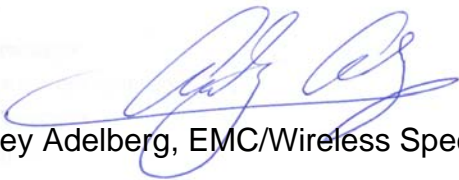
Nemko Test Report: 128225-3TRFWL

Applicant: Axell Wireless Israel
12Bazel Street
POB 10241
Petah-Tikva 49002
Israel

Apparatus: Axell-819

FCC ID: NEOCSRCELLPCS2480

In Accordance With: FCC Part 22, Boosters
Public Mobile Services

Authorized By: 
Andrey Adelberg, EMC/Wireless Specialist

Date: July 7, 2009

Total Number of Pages: 33

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Section 1 : Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 22. Conducted measurements were performed in accordance with ANSI TIA-603-B-2002. Radiated tests were conducted in accordance with ANSI C63.4-2003.

The assessment summary is as follows:

Apparatus Assessed:	Axell-819
Specification:	FCC Part 22
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release
Test Location:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Registration Number:	176392 (3 m Semi-Anechoic Chamber)
Tests Performed By:	David Duchesne, Senior EMC Specialist
Test Dates:	June 12–24, 2009

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. All results contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 2 : Equipment Under Test

2.1 Identification of Equipment Under Test (EUT)

The following information identifies the EUT under test:

Type of Equipment:	Dual-Band Cellular/PCS Selective Repeater
Brand Name:	Axell
Model Name or Number:	MW-CRS-CELL-PCS-2480-M1X
Serial Number:	0905D1008
Nemko Sample Number:	Item # 1
FCC ID:	NEOCSRCELLPCS2480
Date of Receipt:	May 22, 2009

2.2 Accessories

The following information identifies accessories used to exercise the EUT during testing:

Description:	Laptop
Brand Name:	IBM
Model Name or Number:	FA001894
Serial Number:	
Connection Port:	LAN
Cable Length and Type:	RJ45 CAT 5 Cable 3 meter

2.3 EUT Description

Axell 819 is a dual-band Cellular/PCS band selective repeater in a single compact unit. The repeater is specifically designed for simultaneous dual-band operation of Cellular and PCS bands.

The dual band repeater can be installed in a wide variety of applications particularly when adjacent band selectivity and/or very high spectral purity are required. The Repeater provides a solution for situations in which flexible, high quality and high resolution filtering methods are necessary due to low coverage (i.e. dense urban environments or tunnels).

Axell 819 has switchable and tunable IF-SAW. These enable highly accurate out-ofband-rejection and provide simple, fast procedures for adjusting the pass band according to customer requirements.

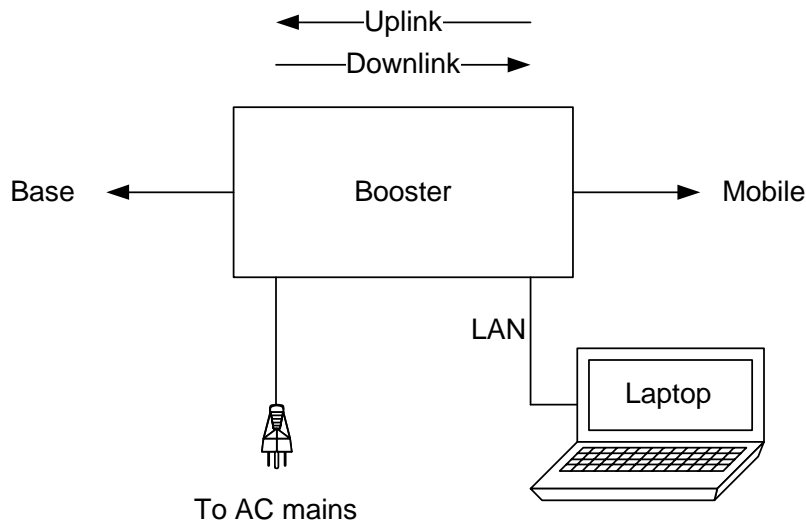
Axell 819 consists of two internal mini-repeaters (PCS/Cellular) that incorporate Axell's Smart Automatic Level Control (Smart-ALC) power control algorithm that automatically optimizes the gain setting by learning the actual range of RSSI levels over a userspecified period of time. The SmartALC algorithm prevents oscillations, reduces the amount of isolation required by the system and optimizes the system to minimize noise rise at the donor cell site.

Intuitive Web access monitoring and management GUI is accessible via a local Ethernet connection (using a cross-cable). An option for remote wireless communication connection (via a separately purchased internal modem) is also available.

2.4 Technical Specifications of the EUT

Operating Band:	Uplink: 824–849 MHz Downlink: 869–894 MHz
Operating Frequency:	Uplink: 824.5–848.5 MHz Downlink: 869.5–893.5 MHz
Modulation:	GSM, CDMA, WCDMA
Emission Designator:	GXW, F9W
Power Supply Requirements:	120 VAC, 60 Hz

2.5 EUT Setup diagram



2.6 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

Section 3 : Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

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

3.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15–30 °C
Humidity range	:	20–75 %
Pressure range	:	86–106 kPa
Power supply range	:	±5 % of rated voltages

3.4 Measurement Uncertainty

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95 % and can be found in Nemko Canada document MU-003.

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
3 m EMI Test Chamber	TDK	SAC-3	FA002047	May 06/10
Bilog	Sunol	JB3	FA002108	Jan. 27/10
Horn Antenna #2	EMCO	3115	FA000825	Jan. 21/10
1 – 18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct. 02/09
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Dec. 16/09
50 Coax cable	HUBER + SUHNER	None	FA002022	July 07/09
50 Coax cable	HUBER + SUHNER	None	FA002074	July 07/09
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	Sept. 03/09
Power Meter	Agilent	N1911A	FA001946	Jan. 21/10
Power Sensor	Agilent	N1922A	FA001947	Jan. 21/10
Power Meter	HP	E4418B	FA001678	June 11/10
Power Sensor	HP	8482A	FA001944	Aug. 22/09
Signal Generator	Rohde & Schwarz	SMIQ03E	FA001269	Aug 18/09
Signal Generator	Rohde & Schwarz	SMIQ06B	FA001878	Sept. 12/09
Combiner	Mini-circuits	ZA3PD-2	FA001155	COU

COU – Calibrate on Use

NCR – No Calibration Required

Section 4 : Results Summary

This section contains the following:

FCC Part 22 : 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 Report Summary)

4.1 FCC Part 22 : Test Results

Clause	Test Method	Test Description	Required	Result
22.355	2.1055	Frequency stability	N	
22.383	—	In-building radiation systems		
22.913	2.1046	Output power	Y	PASS
22.917	2.1051	Conducted spurious emissions	Y	PASS
22.917	2.1053	Radiated spurious emissions	Y	PASS
2-11-04/EAB/RF	2.1049	Occupied bandwidth	Y	PASS
2-11-04/EAB/RF	—	Out of band rejection	Y	PASS

Appendix A : Test Results

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 Results: Pass

Special Notes:

- The average output power measurements were performed using a power meter and thermocouple power sensor.
- The transmitter was set to maximum output power 1dB compression point.
- The Uplink and Downlink were verified with a GSM, CDMA and WCDMA modulation signal on a low, middle and high channel.

Test Data:

Maximum Downlink RF output power: 500 W (57 dBm) ERP

Maximum Uplink RF output power: 7 W (38.5 dBm) ERP

Uplink Output Power (dBm)				
Modulation				
GSM	824.5 MHz	835.5 MHz	848.5 MHz	845.5 MHz
	20.3 dBm	21.1 dBm	20.8 dBm	20.8 dBm
CDMA	825.5 MHz	836.5 MHz	847.5 MHz	
	20.9 dBm	21.1 dBm	20.8 dBm	
WCDMA	826.5 MHz	837.5 MHz		
	21.1 dBm	21 dBm		
Maximum output = 28 dBm <i>(Antenna connected to Uplink should not have a gain of greater than 5 dBi. Amplifier gain should be reduced accordingly to accommodate antennas with higher gains.)</i>				

Downlink Output Power (dBm)				
Modulation				
GSM	869.5 MHz	880.5 MHz	893.5 MHz	890.5 MHz
	19.7 dBm	21.1 dBm	20.7 dBm	20.6
CDMA	870.5 MHz	881.5 MHz	892.5 MHz	
	20.1 dBm	20.8 dBm	20.5 dBm	
WDMA	871.5 MHz	882.5 MHz		
	19.9 dBm	20.9 dBm		
Maximum output = 28 dBm <i>(Antenna connected to downlink should not have a gain of greater than 5 dBi. Amplifier gain should be reduced accordingly to accommodate antennas with higher gains.)</i>				



Clause 22.917 Conducted 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 Results: Pass

Special Notes:

- The Uplink lower and upper band edges were verified with a two-tone intermodulation GSM, CDMA and WCDMA modulation signal.
- The downlink lower and upper band edges were verified with a two-tone intermodulation GSM, CDMA and WCDMA modulation signal.
- The Uplink and Downlink were verified with a GSM, CDMA and WCDMA modulation signal on a low, middle and high channel with a single tone.

Test Data:

See spectral plots of this section.

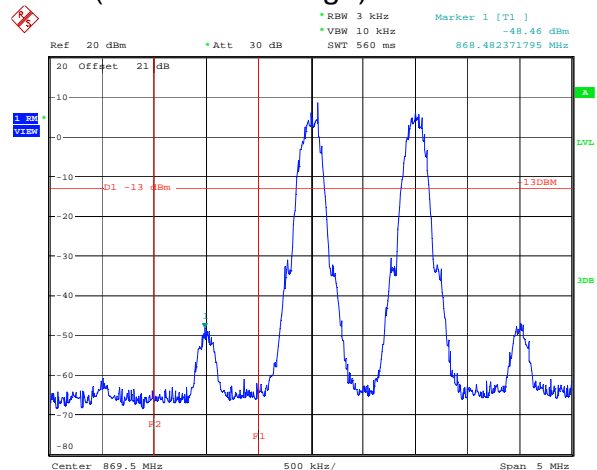


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Clause 22.917 Conducted Spurious Emissions, continued

Downlink 3rd Order Intermodulation

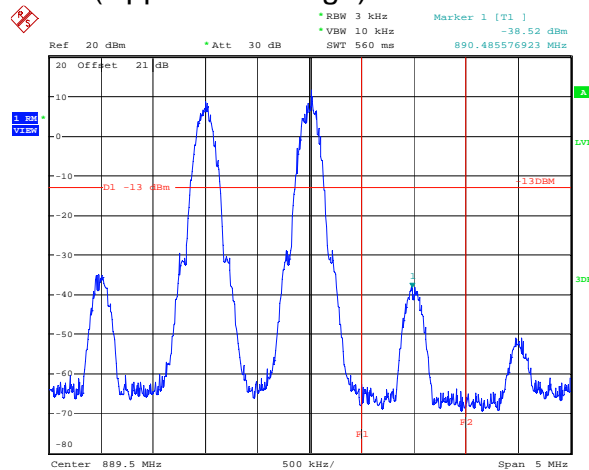
GSM (Lower Band Edge)



Date: 11.JUN.2009 14:30:46

869.5 MHz + 870.5 MHz

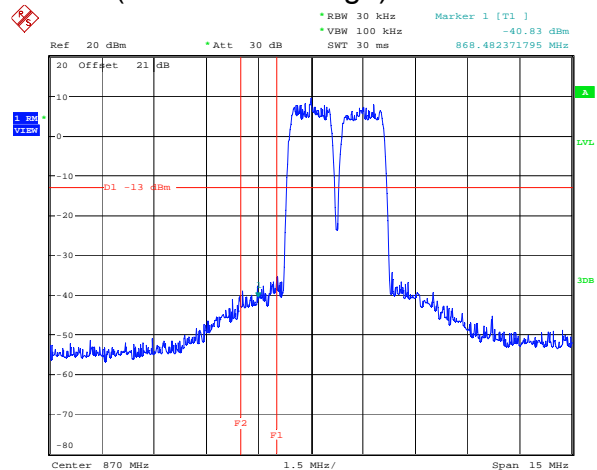
GSM (Upper Band Edge)



Date: 11.JUN.2009 14:40:04

888.5 MHz + 889.5 MHz

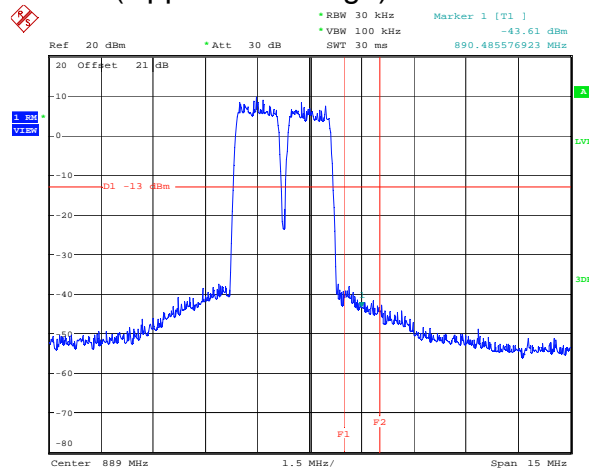
CDMA (Lower Band Edge)



Date: 11.JUN.2009 14:32:38

870 MHz + 871.5 MHz

CDMA (Upper Band Edge)



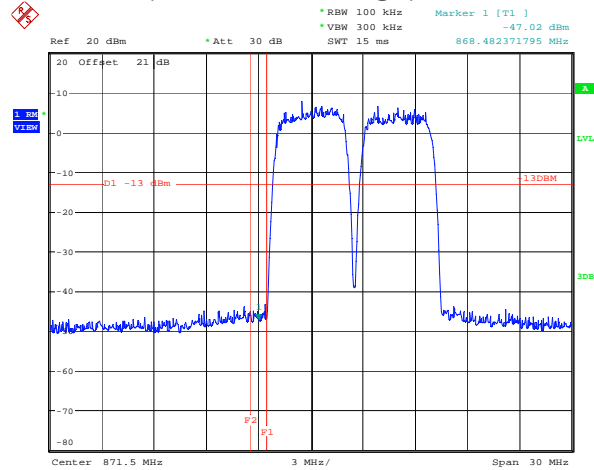
Date: 11.JUN.2009 14:41:53

887.5 MHz + 889 MHz

Clause 22.917 Conducted Spurious Emissions, continued

Downlink 3rd Order Intermodulation

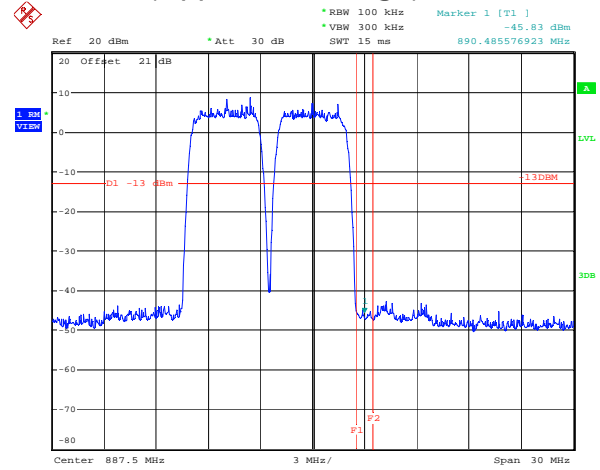
WCDMA (Lower Band Edge)



Date: 11.JUN.2009 14:35:26

871.5 MHz + 876.5 MHz

WCDMA (Upper Band Edge)



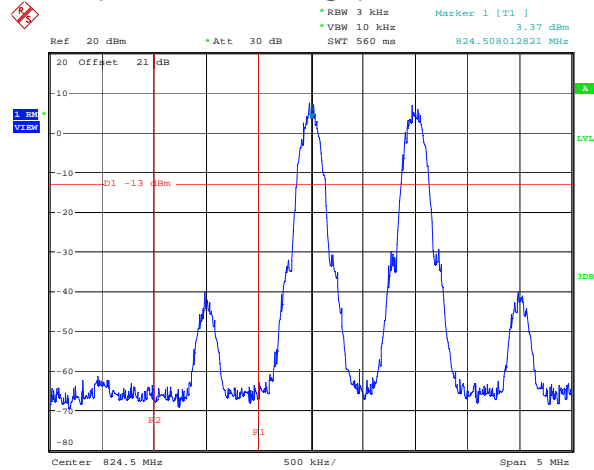
Date: 11.JUN.2009 14:43:29

882 MHz + 887.5 MHz

Clause 22.917 Conducted Spurious Emissions, continued

Uplink 3rd Order Intermodulation

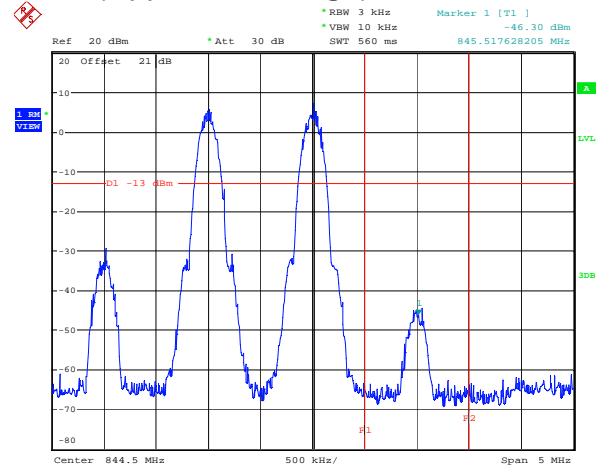
GSM (Lower Band Edge)



Date: 11.JUN.2009 13:12:56

824.5 MHz + 825.5 MHz

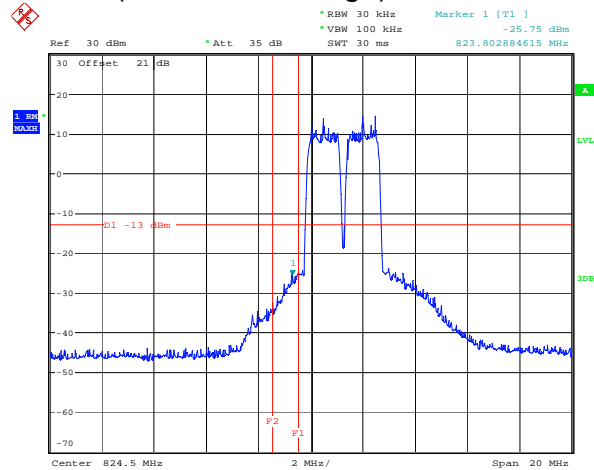
GSM (Upper Band Edge)



Date: 11.JUN.2009 14:10:09

843.5 MHz + 844.5 MHz

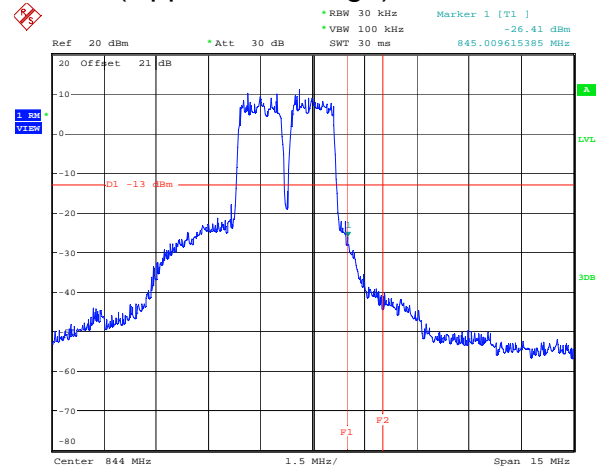
CDMA (Lower Band Edge)



Date: 11.JUN.2009 13:28:00

825 MHz + 826.5 MHz

CDMA (Upper Band Edge)



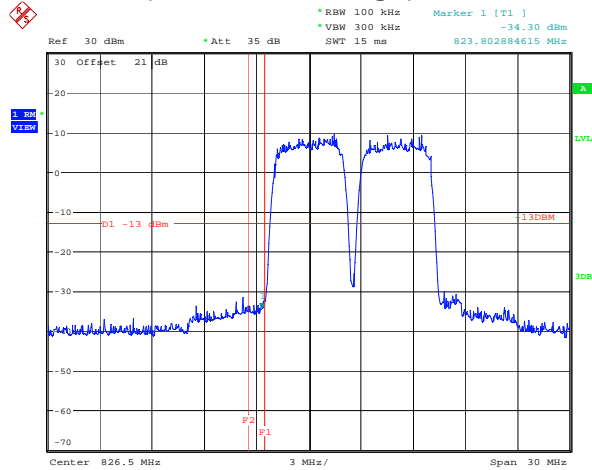
Date: 11.JUN.2009 14:12:58

842.5 MHz + 844 MHz

Clause 22.917 Conducted Spurious Emissions, continued

Uplink 3rd Order Intermodulation

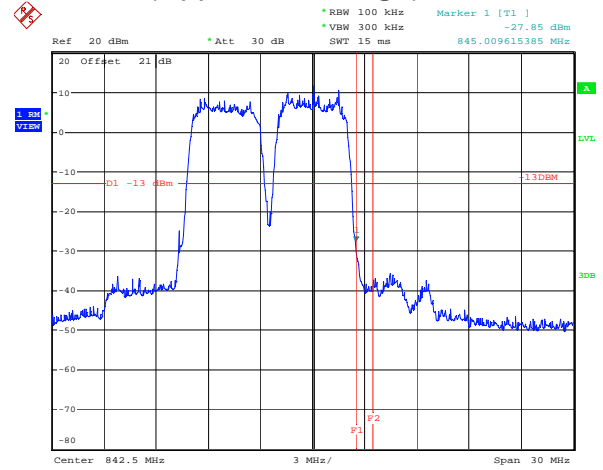
WCDMA (Lower Band Edge)



Date: 11.JUN.2009 13:33:30

826.5 MHz + 831.5 MHz

WCDMA (Upper Band Edge)

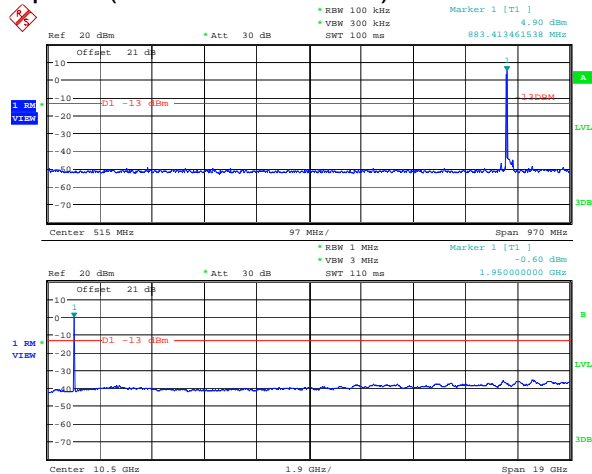


Date: 11.JUN.2009 14:15:40

837.5 MHz + 842.5 MHz

Uplink 3rd Order Intermodulation (Two-Tone Intermodulation Spectral plots)

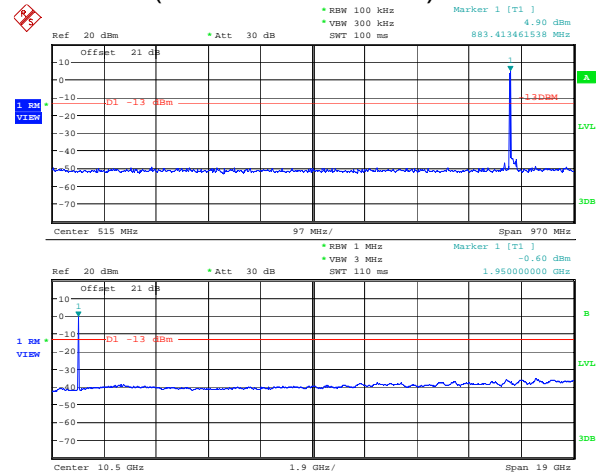
Uplink (Un-modulated CW)



Date: 12.JUN.2009 06:31:21

836.5 MHz + 1880MHz

Downlink (Un-modulated CW)



Date: 12.JUN.2009 06:31:21

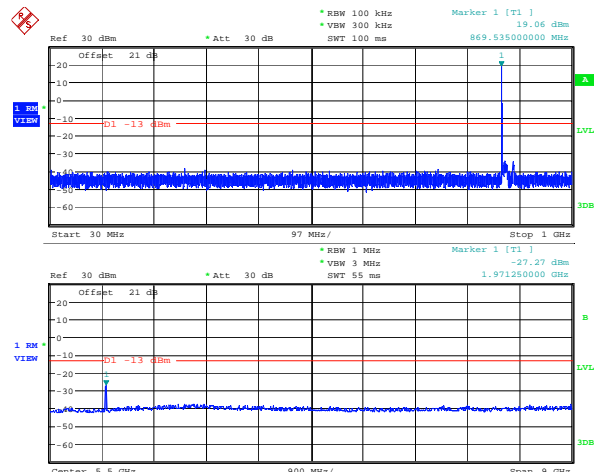
881.5 MHz + 1960MHz



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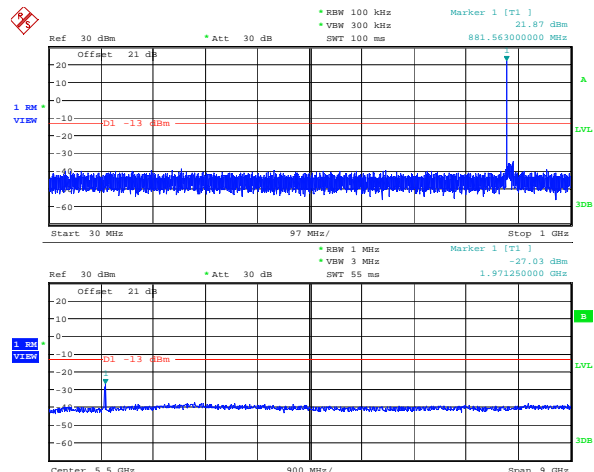
Clause 22.917 Conducted Spurious Emissions, continued

Downlink Conducted Emissions (Single tone) GSM Modulation:



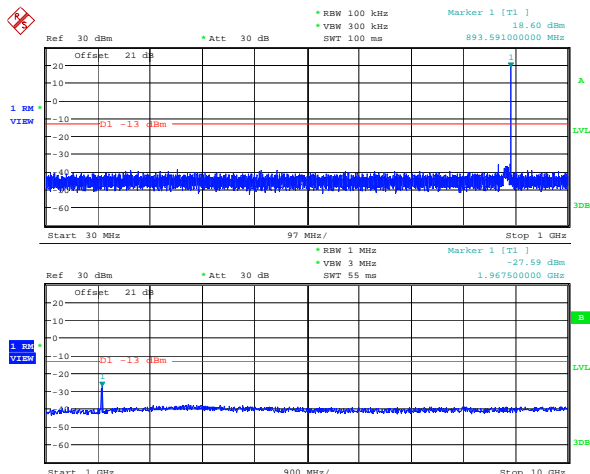
Date: 12.JUN.2009 08:11:37

869.5 MHz



Date: 12.JUN.2009 08:12:55

881.5 MHz

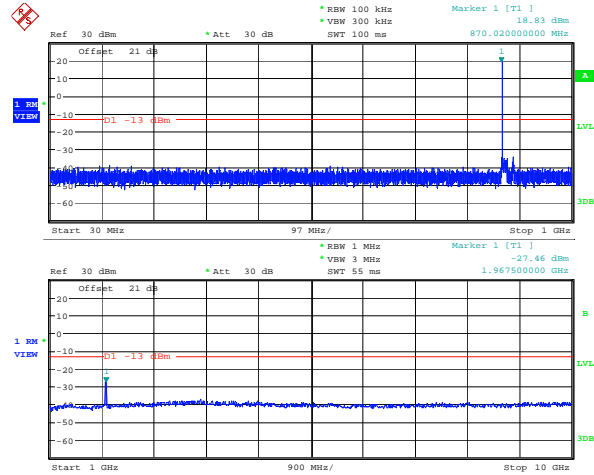


Date: 12.JUN.2009 08:13:56

893.5 MHz

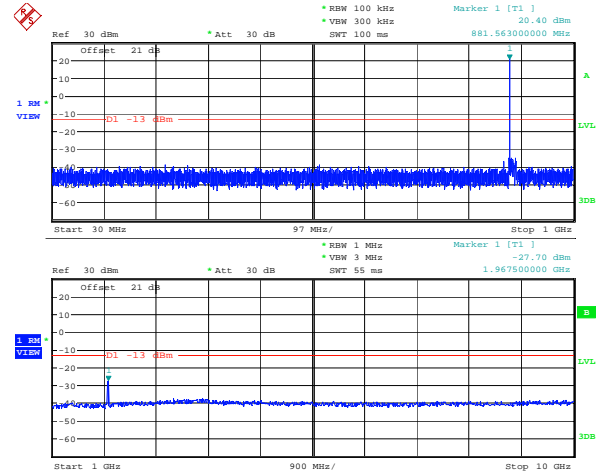
Clause 22.917 Conducted Spurious Emissions, continued

Downlink Conducted Emissions
 CDMA Modulation:



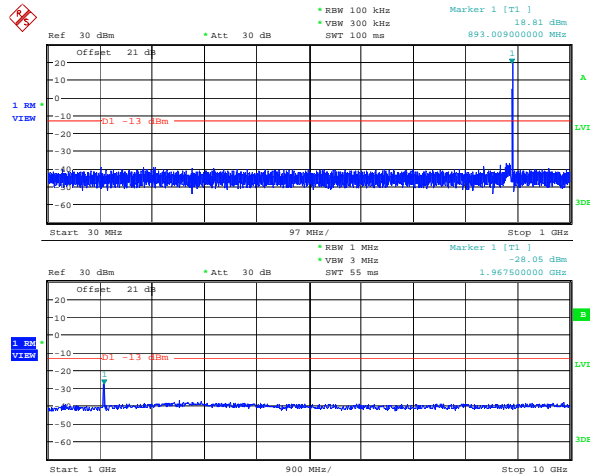
Date: 12.JUN.2009 08:15:13

870 MHz



Date: 12.JUN.2009 08:16:09

881.5 MHz



Date: 12.JUN.2009 08:16:53

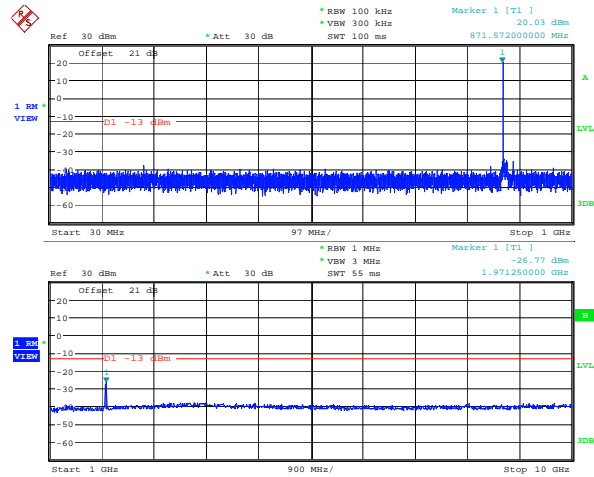
893 MHz



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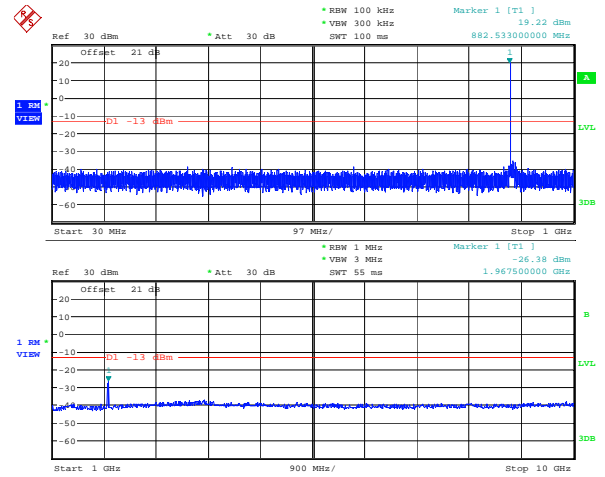
Clause 22.917 Conducted Spurious Emissions, continued

Downlink Conducted Emissions
WCDMA Modulation:



Date: 12.JUN.2009 08:19:14

871.5 MHz

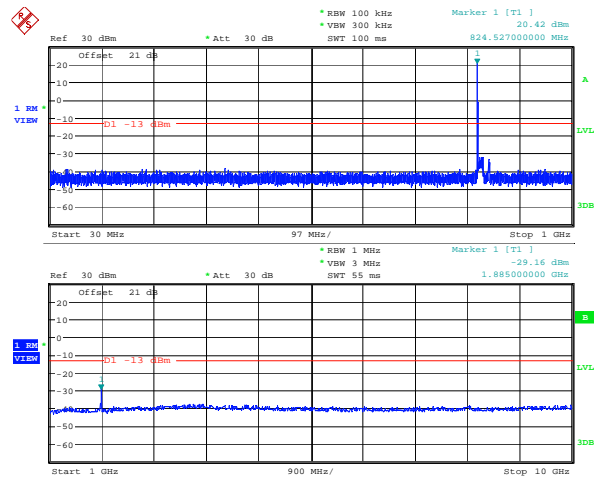


Date: 12.JUN.2009 08:17:48

882.5 MHz

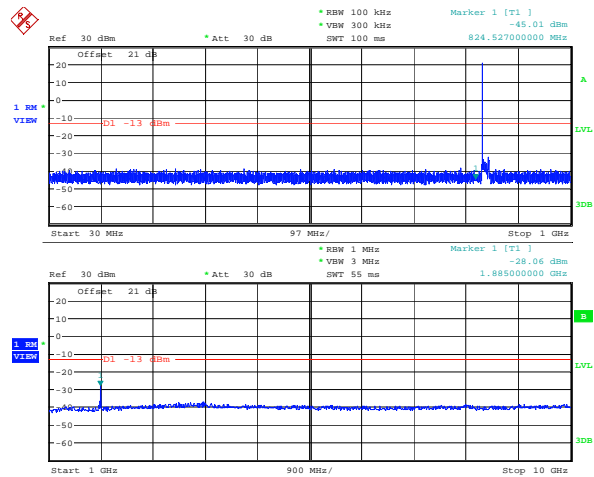
Clause 22.917 Conducted Spurious Emissions, continued

Uplink Conducted Emissions
GSM Modulation:



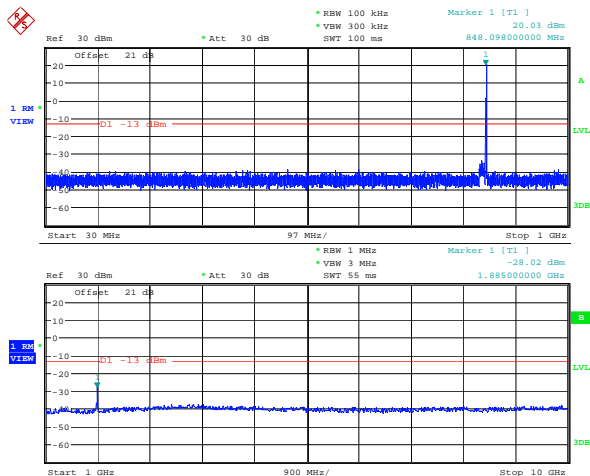
Date: 12.JUN.2009 07:56:05

824.5 MHz



Date: 12.JUN.2009 07:58:04

836.5 MHz

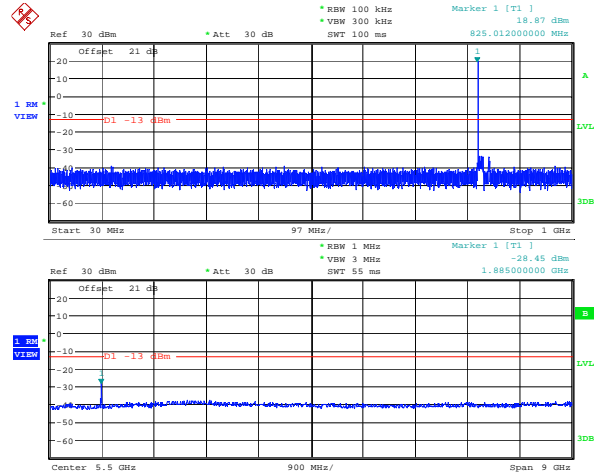


Date: 12.JUN.2009 07:59:07

848.5 MHz

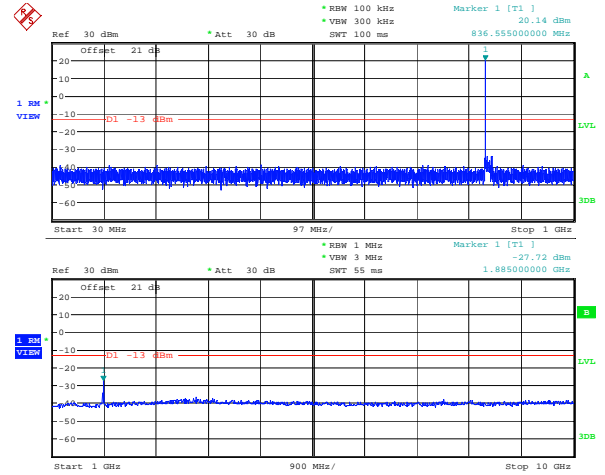
Clause 22.917 Conducted Spurious Emissions, continued

Uplink Conducted Emissions
 CDMA Modulation:



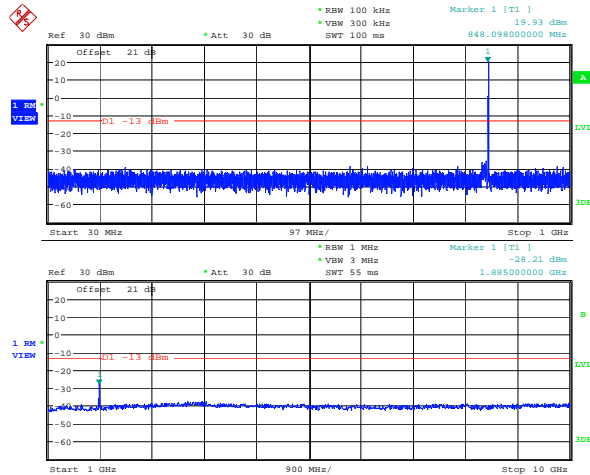
Date: 12.JUN.2009 08:04:49

825 MHz



Date: 12.JUN.2009 08:00:27

836.5 MHz



Date: 12.JUN.2009 08:01:19

848 MHz



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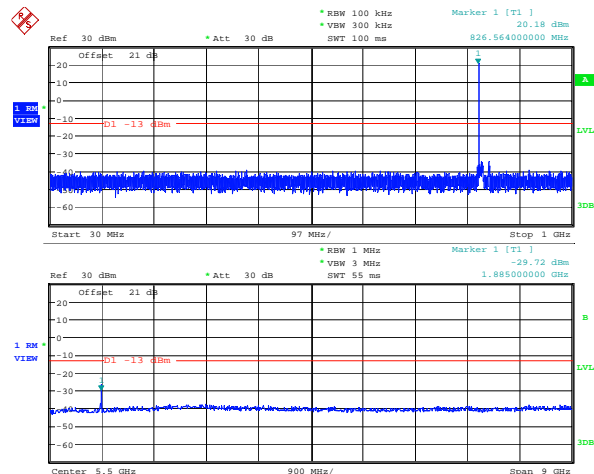
APPENDIX A : TEST RESULTS

Report Number: 128225-3TRFWL

Specification: FCC Part 22

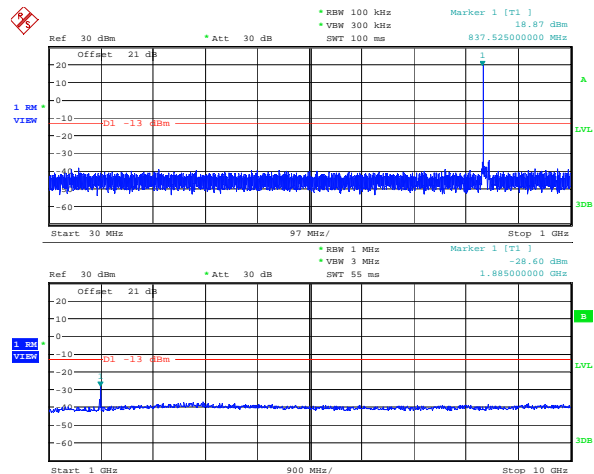
Clause 22.917 Conducted Spurious Emissions, continued

Uplink Conducted Emissions
WCDMA Modulation



Date: 12.JUN.2009 08:03:56

826.5 MHz



Date: 12.JUN.2009 08:02:38

837.5 MHz

Clause 22.917 Radiated 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 Results: Pass

Special Notes:

- The cabinet radiation was measured with the equipment transmitting a CW signal into a non-radiating 50 Ohm load at maximum output power on a single frequency
- Measurements were performed on a low, middle, and high channel for both the Uplink and Downlink
- The spectrum was searched from 30 MHz to 10 GHz. (10th Harmonic)
- All measurements were performed with a spectrum analyzer with the following settings:
 - RMS Detector, in 30 MHz to 1GHz range, using 100 kHz RBW and 300 kHz VBW
 - RMS Detector, in 1 to 22 GHz range, using 1 MHz RBW and 3 MHz VBW
- All measurements were performed at distance of 3 meters.

Test Data:

No emissions were detected within 20 dB below the limit for the Downlink direction.
No emissions were detected within 20 dB below the limit for the Uplink direction.



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

The spectral shape of the output should look similar to the input for all modulations.

Test Results: Pass

Special Notes:

The Uplink and Downlink were verified with a GSM, CDMA and WCDMA modulation signal on a single channel, using an RBW of 300 Hz or 1 % of the emission bandwidth,

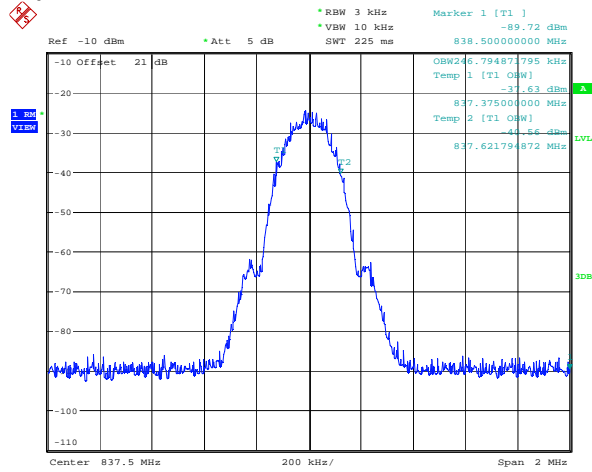
Test Data:

See plots of this section

Clause 2-11-04/EAB/RF Occupied Bandwidth, continued

Uplink:

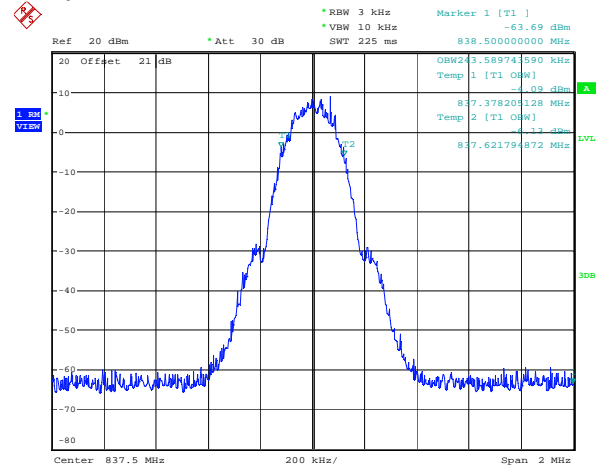
Input – GSM Modulation



Date: 11.JUN.2009 12:29:45

837.5 MHz

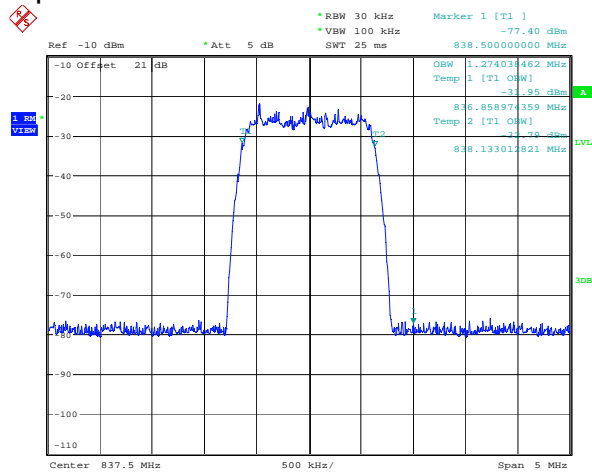
Output – GSM Modulation



Date: 11.JUN.2009 12:38:55

837.5 MHz

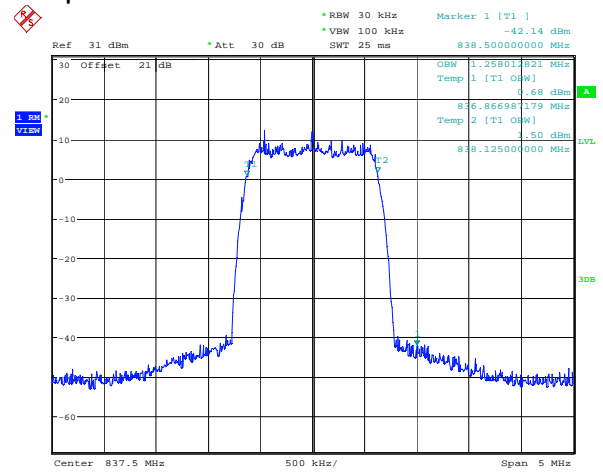
Input – CDMA Modulation



Date: 11.JUN.2009 12:30:34

837.5 MHz

Output – CDMA Modulation



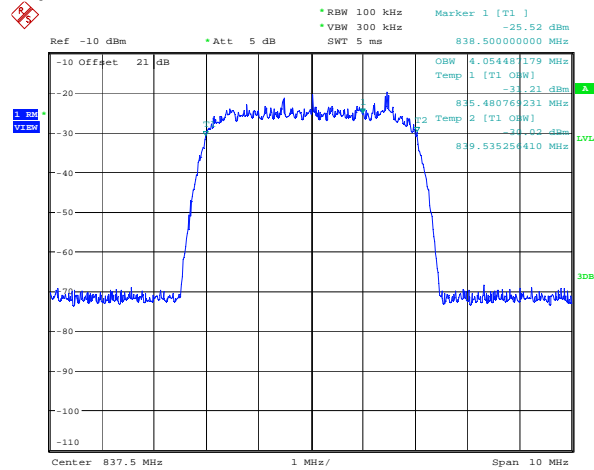
Date: 11.JUN.2009 12:36:42

837.5 MHz

Clause 2-11-04/EAB/RF Occupied Bandwidth, continued

Uplink:

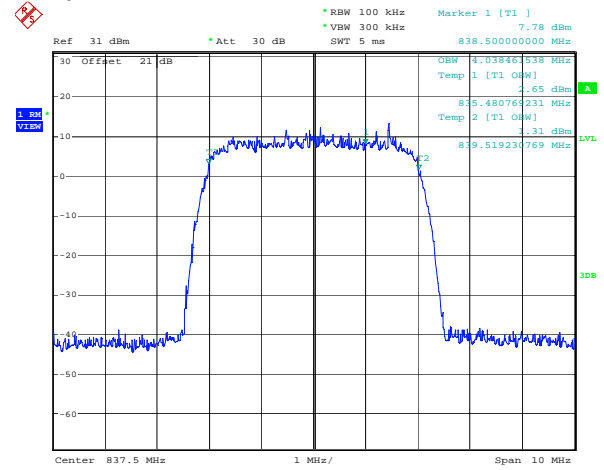
Input – WCDMA Modulation



Date: 11.JUN.2009 12:31:34

837.5 MHz

Output – WCDMA Modulation



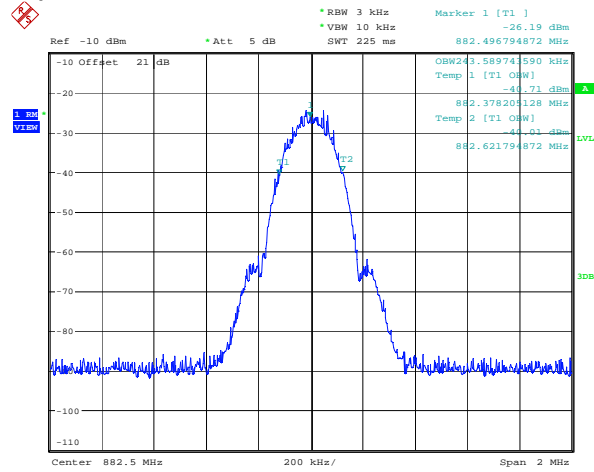
Date: 11.JUN.2009 12:34:52

837.5 MHz

Clause 2-11-04/EAB/RF Occupied Bandwidth, continued

Downlink:

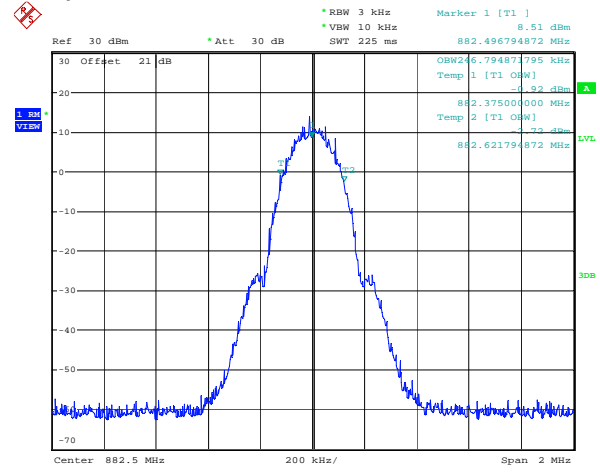
Input – GSM Modulation



Date: 11.JUN.2009 12:25:38

882.5 MHz

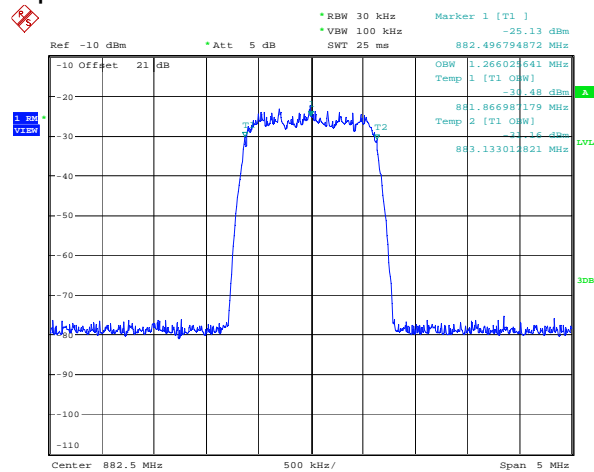
Output – GSM Modulation



Date: 11.JUN.2009 12:18:32

882.5 MHz

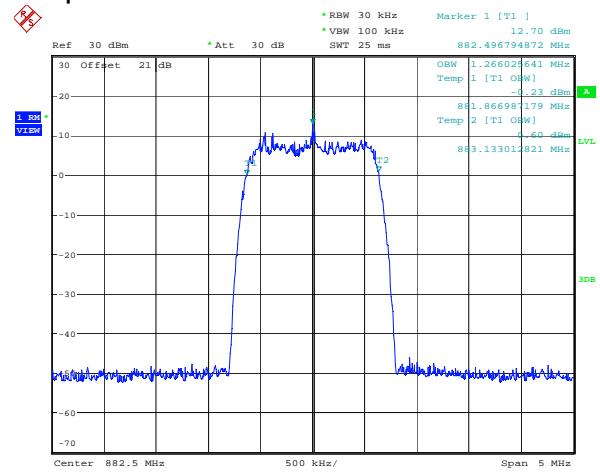
Input – CDMA Modulation



Date: 11.JUN.2009 12:24:52

882.5 MHz

Output – CDMA Modulation



Date: 11.JUN.2009 12:20:55

882.5 MHz



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APPENDIX A : TEST RESULTS

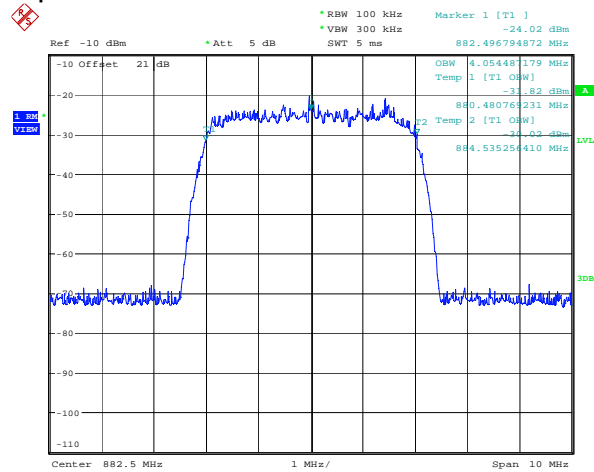
Report Number: 128225-3TRFWL

Specification: FCC Part 22

Clause 2-11-04/EAB/RF Occupied Bandwidth, continued

Uplink:

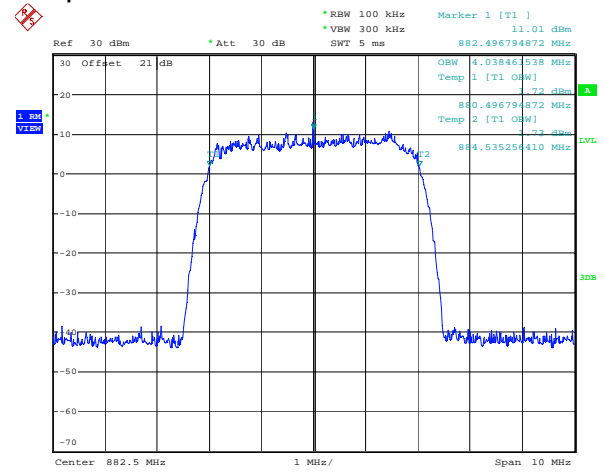
Input – WCDMA Modulation



Date: 11.JUN.2009 12:23:51

882.5 MHz

Output – WCDMA Modulation



Date: 11.JUN.2009 12:22:01

882.5 MHz



Nemko Canada Inc.

APPENDIX A : TEST RESULTS

Report Number: 128225-3TRFWL

Specification: FCC Part 22

Clause 2-11-04/EAB/RF Out of Band Rejection

Plots showing the filter frequency response.

Test Data:

See attached plots.

Special Notes:

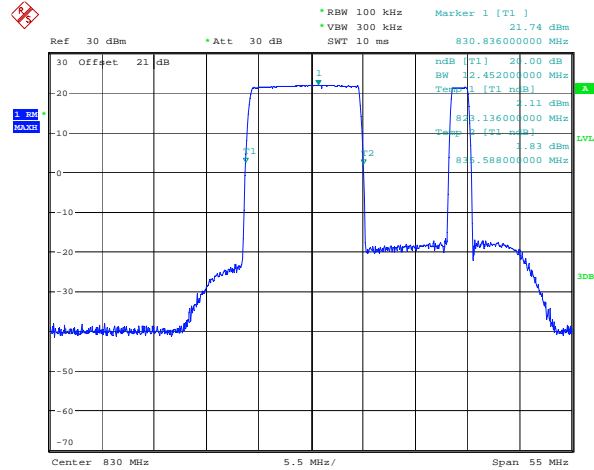
Verification of both uplink and downlink for all available filter selections.

Test Results: Pass

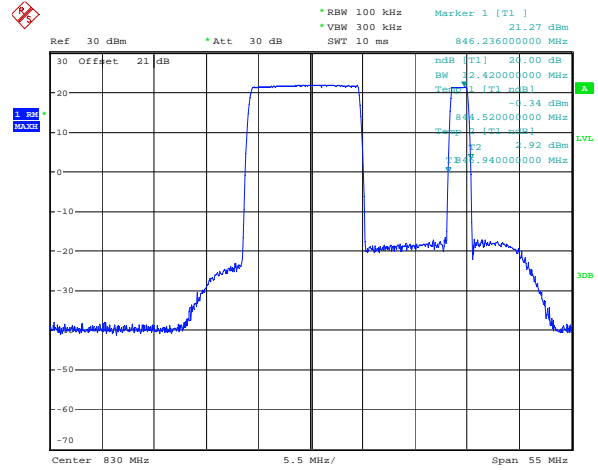
Clause 2-11-04/EAB/RF Out of Band Rejection, continued

Uplink:

11 MHz Filter



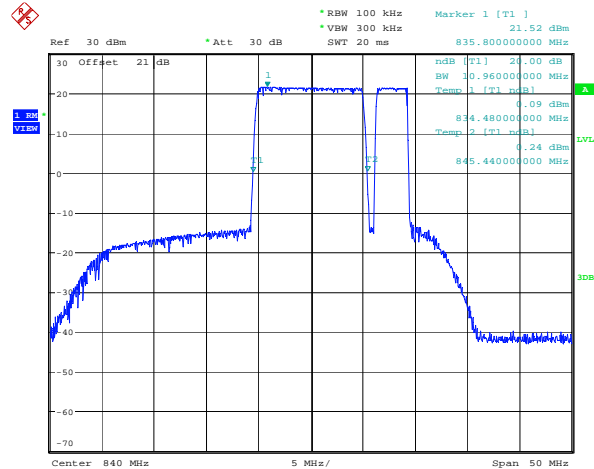
1.5 MHz Filter



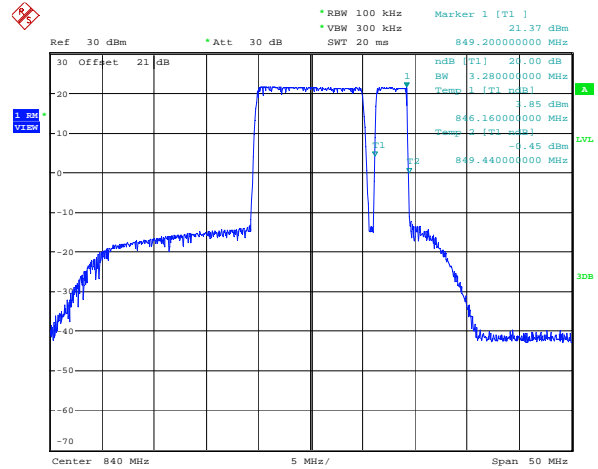
Date: 12.JUN.2009 10:29:05

Date: 12.JUN.2009 10:30:18

10 MHz Filter



2.5 MHz Filter



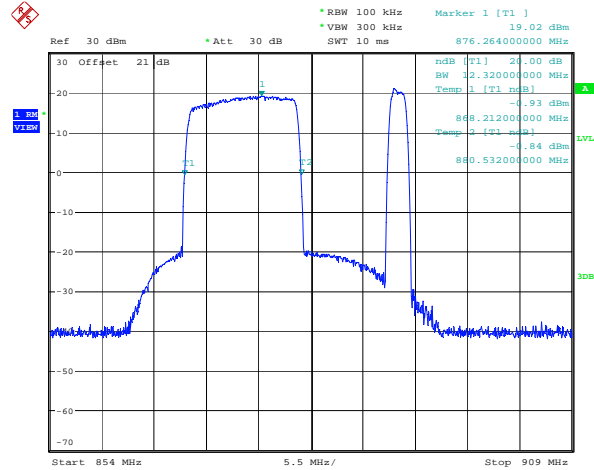
Date: 12.JUN.2009 10:36:49

Date: 12.JUN.2009 10:37:31

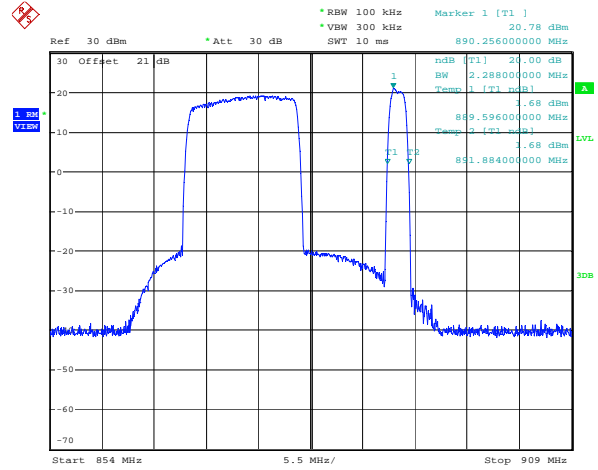
Clause 2-11-04/EAB/RF Out of Band Rejection, continued

Downlink:

11 MHz Filter



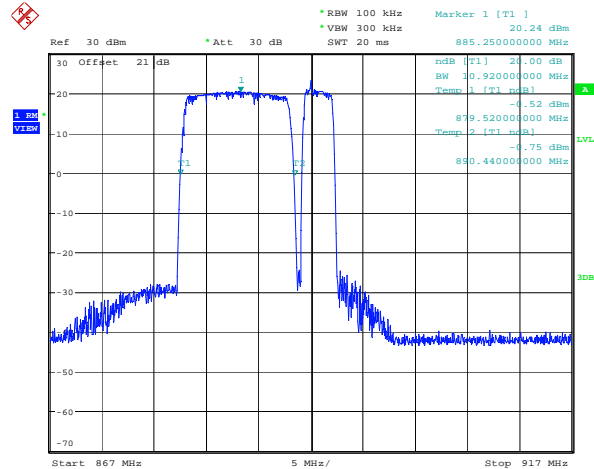
1.5 MHz Filter



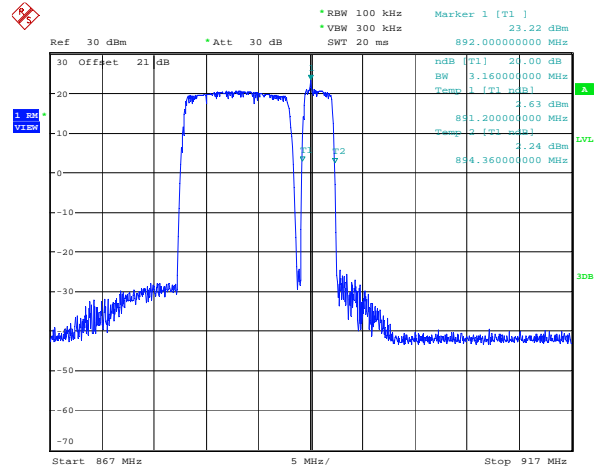
Date: 12.JUN.2009 08:55:47

Date: 12.JUN.2009 08:57:16

10 MHz Filter



2.5 MHz Filter

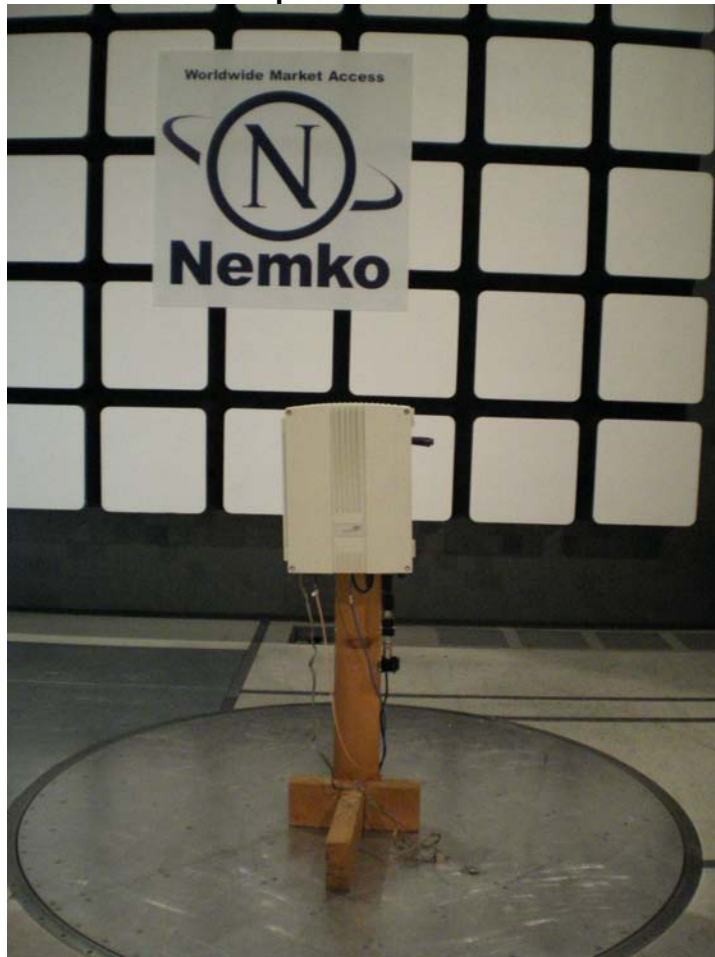


Date: 12.JUN.2009 10:14:49

Date: 12.JUN.2009 10:15:19

Appendix B : Setup Photographs

Radiated Spurious Emissions Setup:

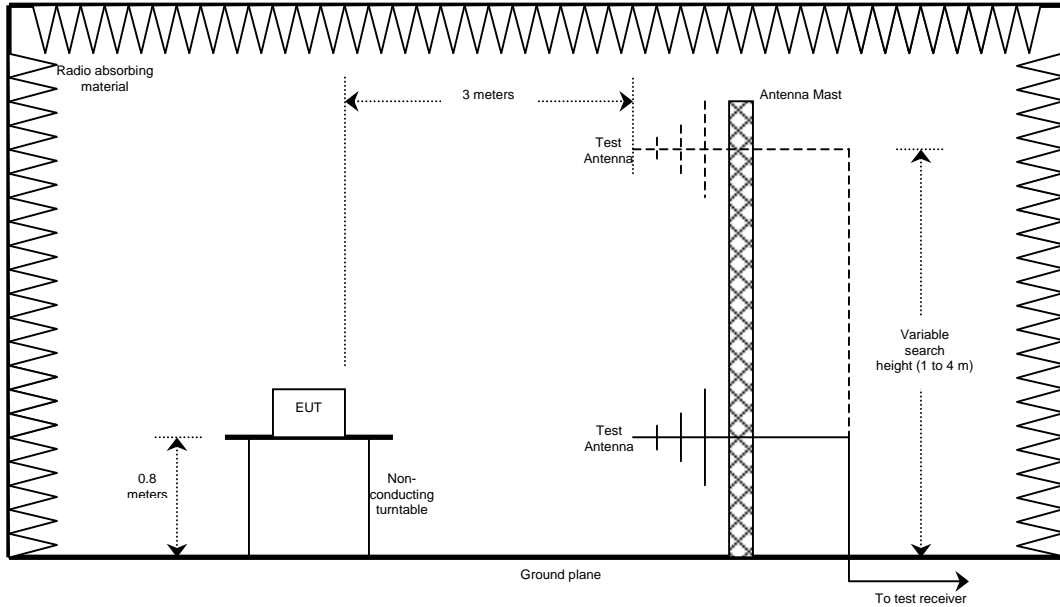


Radiated Spurious Emissions Setup, continued:



Appendix C : Block Diagram of Test Setups

Radiated Emissions above 30MHz Test Site



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

