

Nemko Test Report: 128225-1TRFWL

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

Apparatus: Axell-2117

FCC ID: NEOCCSRAWS2170

In Accordance With: FCC Part 27 Miscellaneous Wireless
Communications Services

Authorized By: 
Andrey Adelberg, EMC/Wireless Specialist

Date: July 6, 2009

Total Number of Pages: 31

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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 27. Conducted measurements were performed in accordance with TIA-603-B-2002. Radiated tests were conducted in accordance with ANSI C63.4-2003.

The assessment summary is as follows:

Apparatus Assessed:	Axell-2117
Specification:	FCC Part 27
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 contain 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:	AWS Mini-Repater
Brand Name:	Axell
Model Name or Number:	MW-CCSR-AWS-2170-5-10-15
Serial Number:	09041003
Nemko Sample Number:	4
FCC ID:	NEOCCSRAWS2170
Date of Receipt:	May 28, 2009

2.2 Accessories

Description:	Laptop
Brand Name:	IBM
Model Name or Number:	FA001894
Serial Number:	
Connection Port:	RS-232
Cable Length and Type:	RS-232 Cable 2 m

2.3 EUT Description

Mini-Repeater Axell 2117 is an AWS Block Selective RF Mini-Repeater that amplifies signals bi-directionally between base stations and mobile handsets, in cellular and other wireless systems.

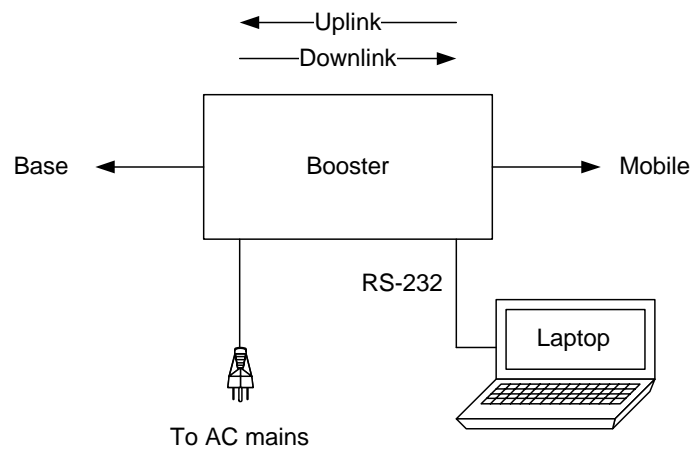
Axell 2117 provides high selectivity capability by employing an advanced up/down conversion and Intermediate Frequency (IF) SAW filtering architecture. This product features the Smart ALC algorithm that provides "plug-and-play" capability for fast response and immediate solution to your coverage needs, while preventing degradation in network performance. This repeater is provided with a SAW Switcher that can be configured with pre-determined different frequency blocks so as to enable complex frequency plans, as well as providing two units in one Repeater.

Mini-Repeater Axell 2117 is provided with 80 dB gain as default. Some units are configured with 70 dB gain only.

2.4 Technical Specifications of the EUT

Operating Band:	Uplink: 1710–1775 MHz Downlink: 2110–2155 MHz
Operating Frequencies:	Uplink: 1710.5–1754.5 MHz Downlink: 2110.5–2154.5 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 27 Miscellaneous Wireless Communications Services

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 27 : 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 27 : Test Results

Clause	Test Method	Test Description	Required	Result
27.50(h)	2.1046	Equivalent isotropically radiated power	Y	PASS
2-11-04/EAB/RF	2.1049	Occupied bandwidth	Y	PASS
27.53(l)	2.1051	Spurious emissions at the antenna terminal	Y	PASS
27.53(l)	2.1053	Field strength of spurious radiation	Y	PASS
27.54	2.1055	Frequency stability	N	
2-11-04/EAB/RF	—	Out of band rejection	Y	PASS

Appendix A : Test Results

Clause 27.50(h) Equivalent Isotropically Radiated Power

(h) The following power limits shall apply in the BRS and EBS:

(1) Main, booster and base stations.

(i) The maximum EIRP of a main, booster or base station shall not exceed $33 \text{ dBW} + 10\log(X/Y) \text{ dBW}$, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

Test Results: Pass

Special Notes:

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

Clause 27.50(h) Equivalent Isotropically Radiated Power, continued

Test Data:

Maximum Downlink RF output power: 1640 W (62.15 dBm) EIRP

Maximum Uplink RF output power: 1 W (30 dBm) EIRP

The peak to average ratio (PAR) of the transmission may not exceed 13 dB.

Uplink Output Power (dBm)			
Modulation			
GSM	1710.5 MHz	1732.5 MHz	1754.5 MHz
	AV 17.4 dBm	AV 21.2 dBm	AV 18.2 dBm
	PK 20.9 dBm	PK 24.7 dBm	PK 21.2 dBm
	PAR 3.5 dB	PAR 3.5 dB	PAR 3 dB
CDMA	1711.0 MHz	1732.5 MHz	1754.0 MHz
	AV 19.74 dBm	AV 20.9 dBm	AV 18.9 dBm
	PK 25.7 dBm	PK 26.9 dBm	PK 25.0 dBm
	PAR 5.96 dB	PAR 6 dB	PAR 6.1 dB
WCDMA	1712.5 MHz	1732.5 MHz	1752.5 MHz
	AV 20.3 dBm	AV 20.8 dBm	AV 19.3 dBm
	PK 26.5 dBm	PK 27.1 dBm	PK 25.6 dBm
	PAR 6.2 dB	PAR 6.3 dB	PAR 6.3 dB
Maximum output power= 27.1 dBm <i>(Antenna connected to Uplink should not have a gain of greater than 2.9 dBi. Amplifier gain should be reduced accordingly to accommodate antennas with higher gains.)</i>			
Maximum peak to average ratio = 6.3 dB			

Downlink Output Power (dBm)			
Modulation			
GSM	2110.5 MHz	2132.5 MHz	2154.5 MHz
	AV 20.8 dBm	AV 20.8 dBm	AV 19.9 dBm
	PK 21 dBm	PK 21 dBm	PK 20 dBm
	PAR 0.2 dB	PAR 0.2 dB	PAR 0.1 dB
CDMA	2111.0 MHz	2132.5 MHz	2154.0 MHz
	AV 20.8 dBm	AV 20.8 dBm	AV 19.9 dBm
	PK 26.9 dBm	PK 27 dBm	PK 26.4 dBm
	PAR 6.1 dB	PAR 6.2 dB	PAR 6.5 dB
WCDMA	2112.5 MHz	2132.5 MHz	2152.5 MHz
	AV 20.9 dBm	AV 21 dBm	AV 19.9 dBm
	PK 26.8 dBm	PK 26.7 dBm	PK 25.7 dBm
	PAR 5.9 dB	PAR 5.7 dB	PAR 5.8 dB
Maximum output power = 27 dBm <i>(Antenna connected to downlink should not have a gain of greater than 35.15 dBi. Amplifier gain should be reduced accordingly to accommodate antennas with higher gains.)</i>			
Maximum peak to average ratio = 6.5 dB			



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APPENDIX A : TEST RESULTS

Report Number: 128225-1TRFWL

Specification: FCC Part 27

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.



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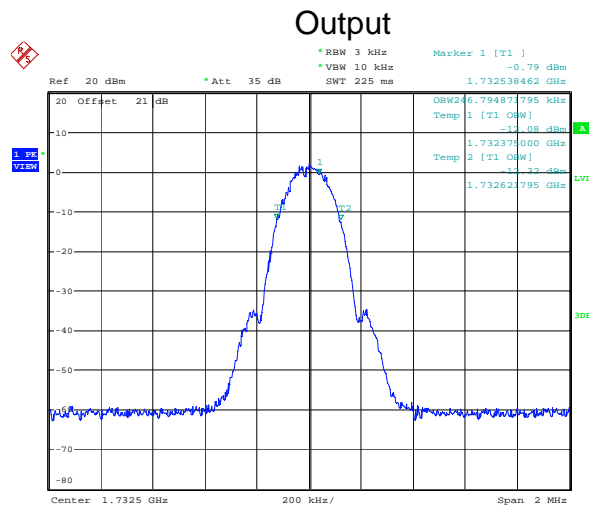
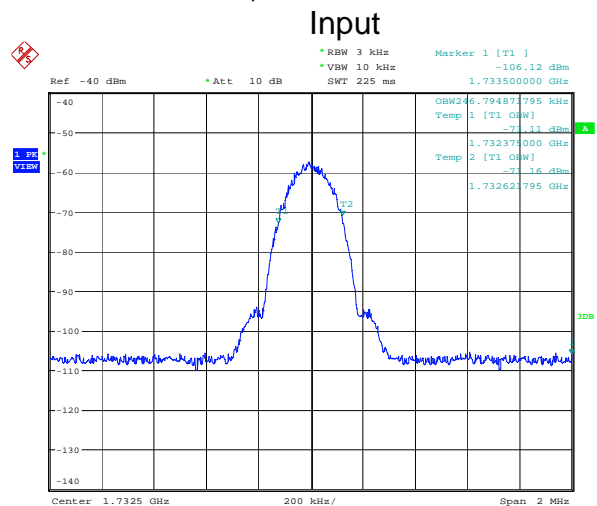
APPENDIX A : TEST RESULTS

Report Number: 128225-1TRFWL

Specification: FCC Part 27

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

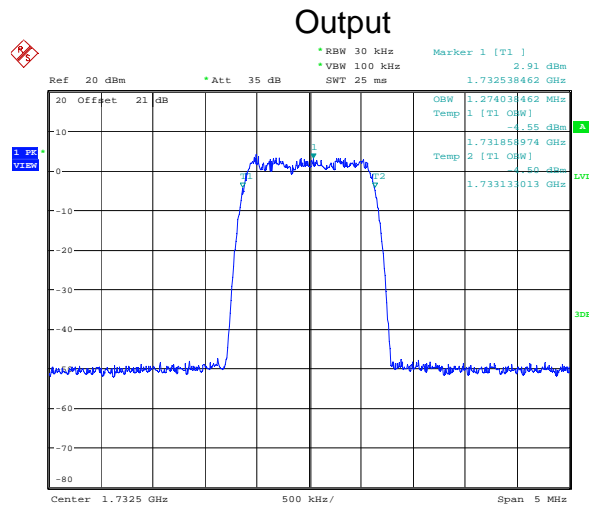
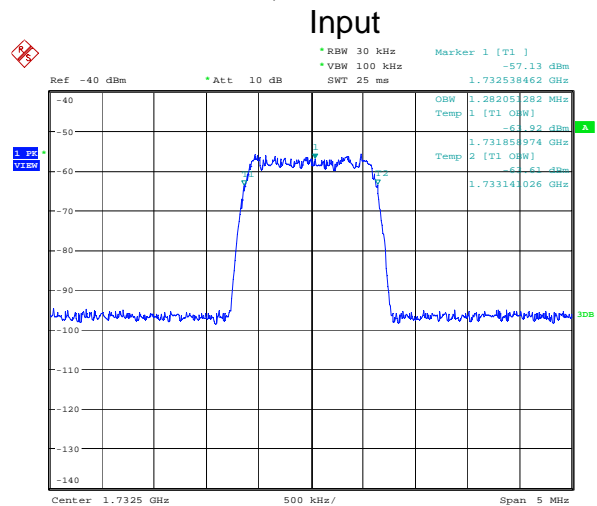
Uplink: GSM Modulation, 1732.5 MHz:



Date: 10.JUN.2009 14:12:04

Date: 10.JUN.2009 14:17:45

CDMA Modulation, 1732.5 MHz:



Date: 10.JUN.2009 14:13:17

Date: 10.JUN.2009 14:18:40



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APPENDIX A : TEST RESULTS

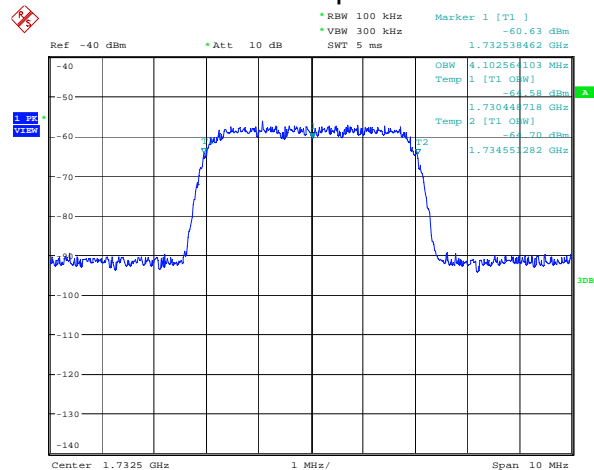
Report Number: 128225-1TRFWL

Specification: FCC Part 27

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

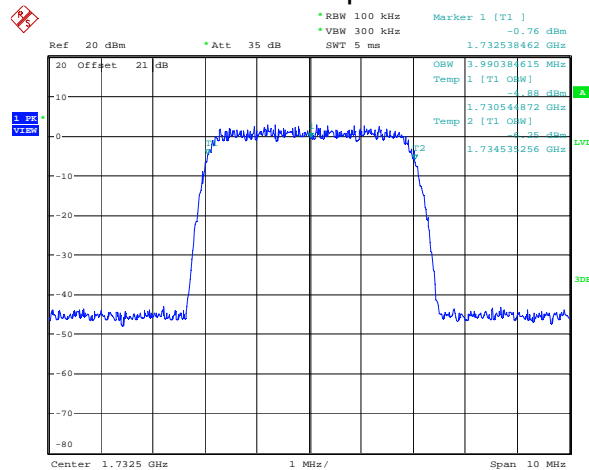
Uplink:
WCDMA Modulation, 1732.5 MHz:

Input



Date: 10.JUN.2009 14:14:19

Output



Date: 10.JUN.2009 14:19:40



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APPENDIX A : TEST RESULTS

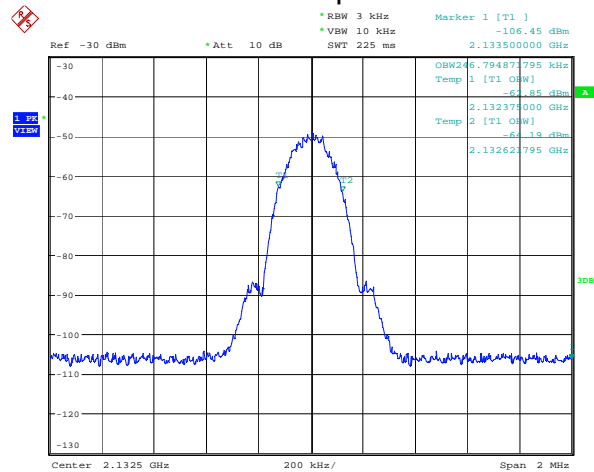
Report Number: 128225-1TRFWL

Specification: FCC Part 27

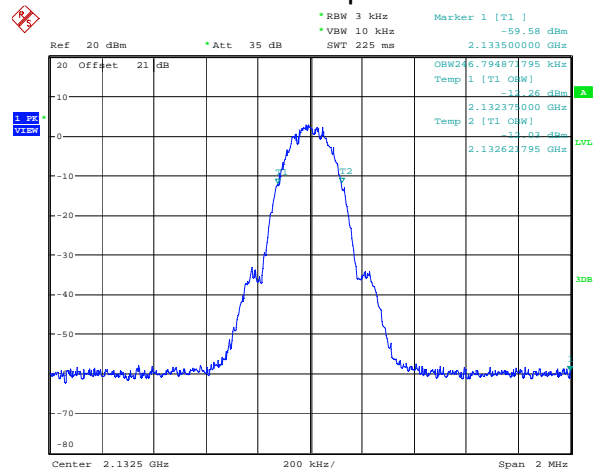
Clause 2-11-04/EAB/RF Occupied Bandwidth, continued

Downlink: GSM Modulation, 2132.5 MHz:

Input



Output

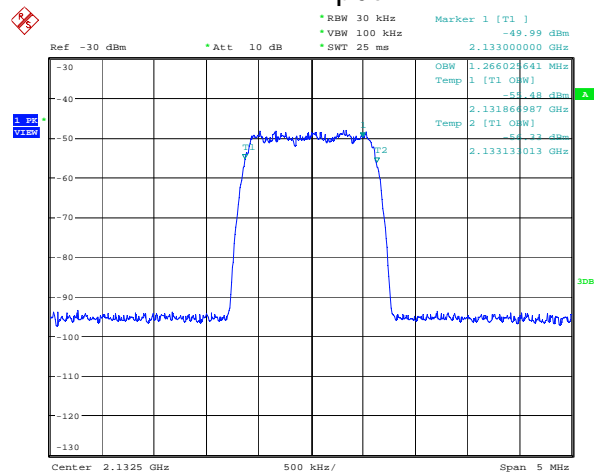


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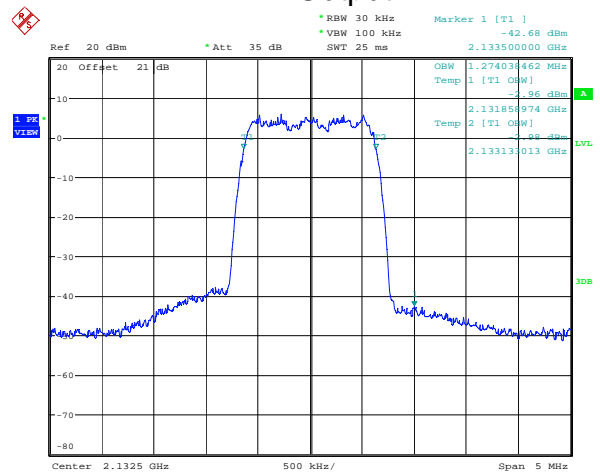
Date: 10.JUN.2009 13:52:36

CDMA Modulation, 2132.5 MHz:

Input



Output



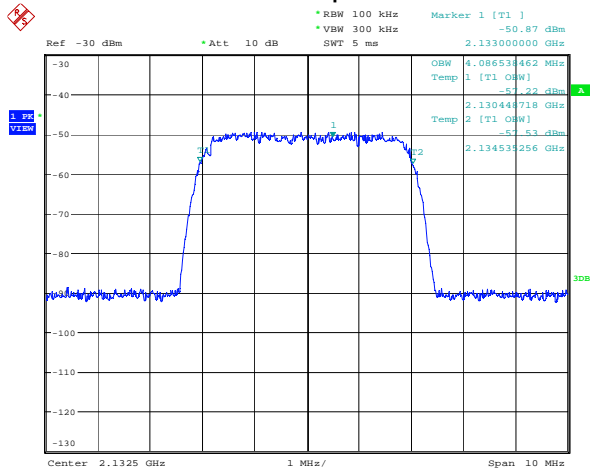
Date: 10.JUN.2009 14:01:38

Date: 10.JUN.2009 13:54:56

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

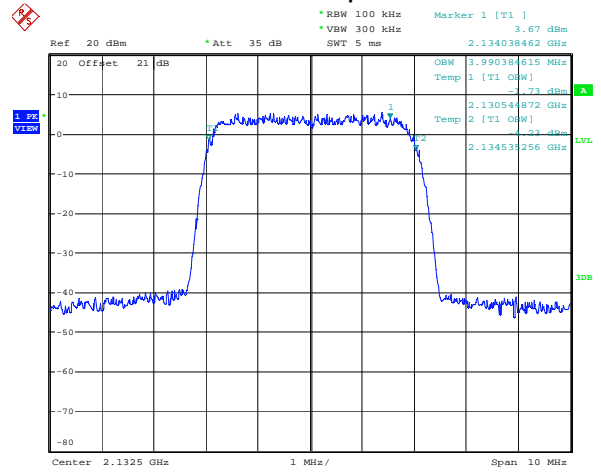
**Downlink:
WCDMA Modulation, 2132.5 MHz:**

Input



Date: 10.JUN.2009 14:03:03

Output



Date: 10.JUN.2009 13:56:39



Clause 27.53(l) Spurious emissions at the antenna terminal

(1) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts.

(2) For fixed and temporary fixed digital stations, the attenuation shall be not less than $43 + 10 \log (P)$ dB, unless a documented interference complaint is received from an adjacent channel licensee.

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.

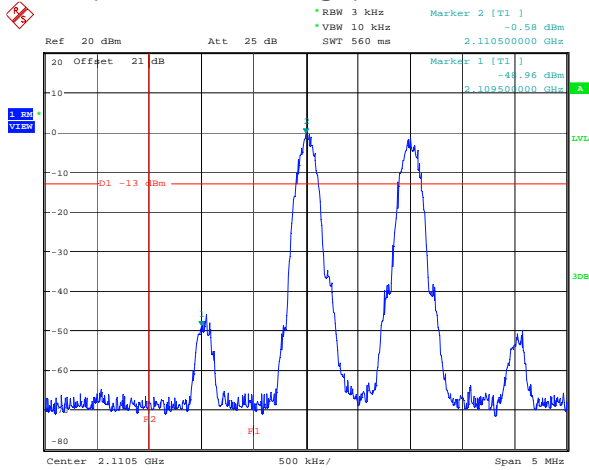
Test Data:

See spectral plots of this section.

Clause 27.53(l) Spurious emissions at the antenna terminal, continued

Downlink 3rd Order Intermodulation

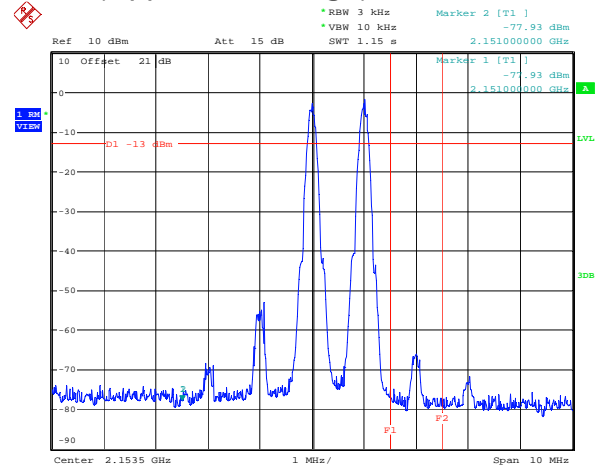
GSM (Lower Band Edge)



Date: 10.JUN.2009 15:59:33

2110.5 MHz + 2111.5 MHz

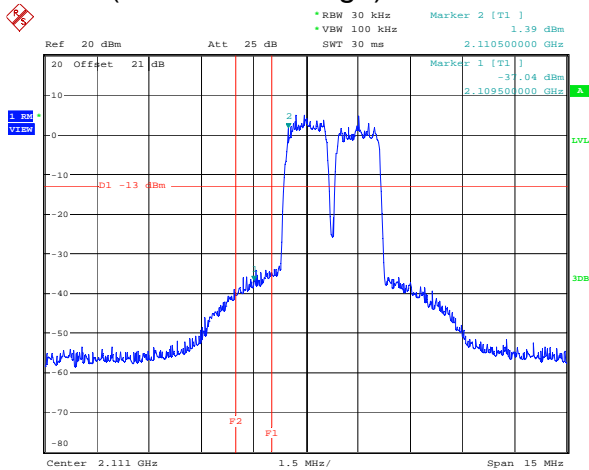
GSM (Upper Band Edge)



Date: 10.JUN.2009 16:13:00

2153.5 MHz + 2154.5 MHz

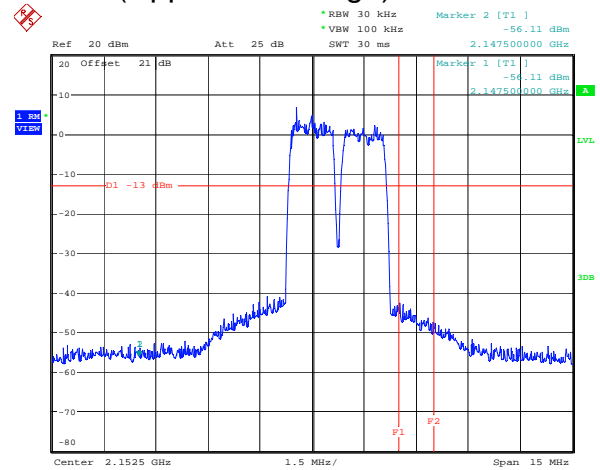
CDMA (Lower Band Edge)



Date: 10.JUN.2009 16:02:14

2111 MHz + 2112.5 MHz

CDMA (Upper Band Edge)



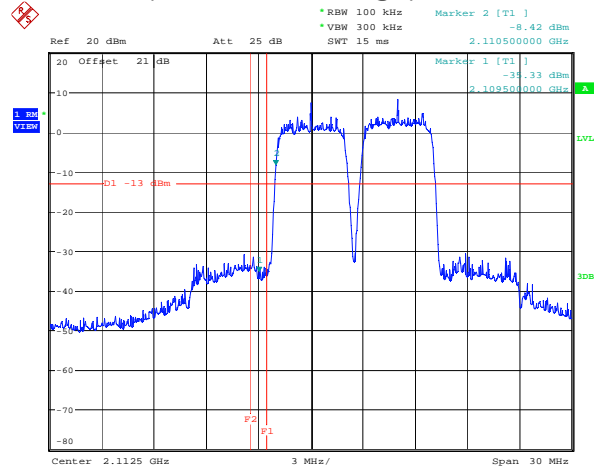
Date: 10.JUN.2009 16:10:04

2152.5 MHz + 2154 MHz

Clause 27.53(l) Spurious emissions at the antenna terminal, continued

Downlink 3rd Order Intermodulation

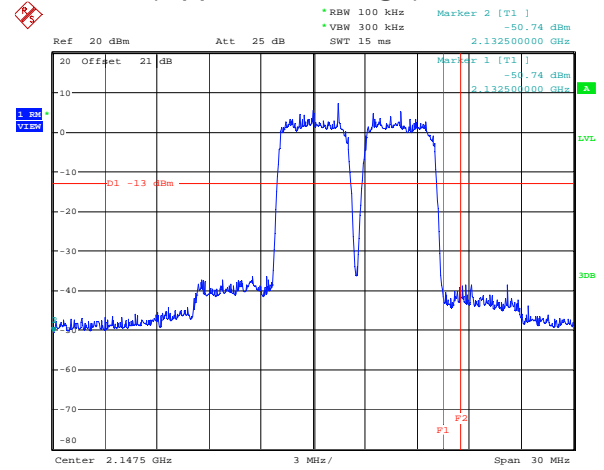
WCDMA (Lower Band Edge)



Date: 10.JUN.2009 16:05:16

2112.5 MHz + 2117.5 MHz

WCDMA (Upper Band Edge)



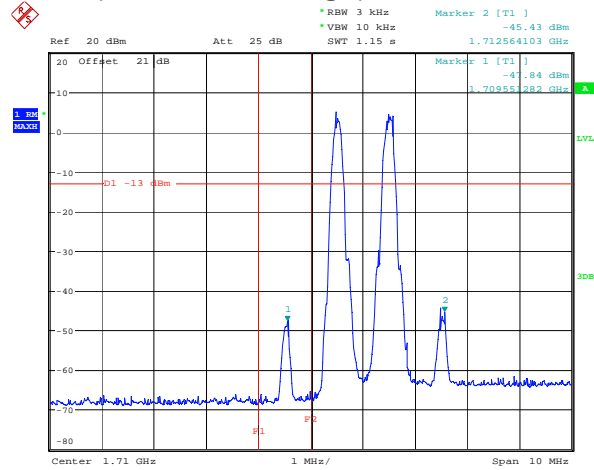
Date: 10.JUN.2009 16:07:32

2147.5 MHz + 2152.5 MHz

Clause 27.53(l) Spurious emissions at the antenna terminal, continued

Uplink 3rd Order Intermodulation

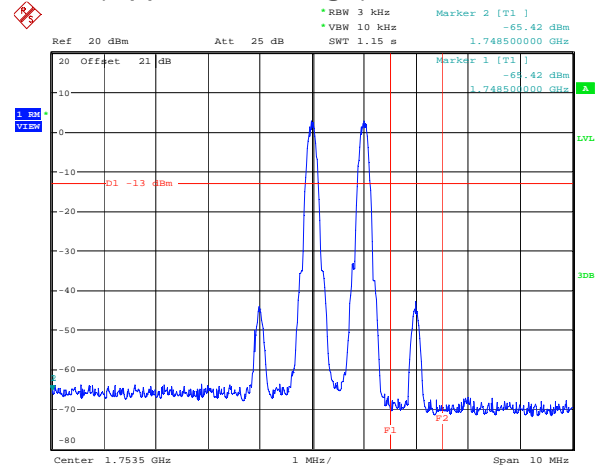
GSM (Lower Band Edge)



Date: 10.JUN.2009 14:58:51

1710.5 MHz + 1711.5 MHz

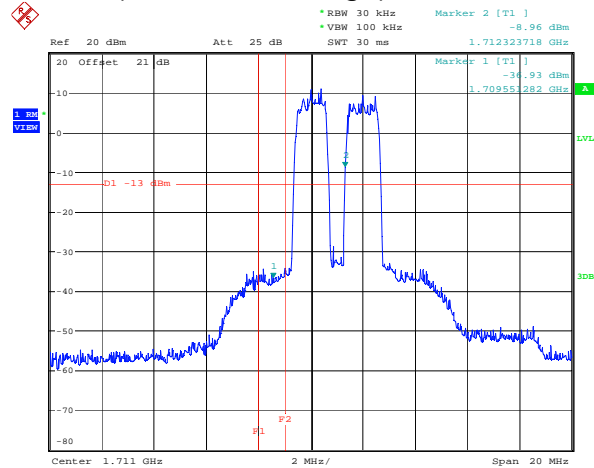
GSM (Upper Band Edge)



Date: 10.JUN.2009 15:26:19

1753.5 MHz + 1754.5 MHz

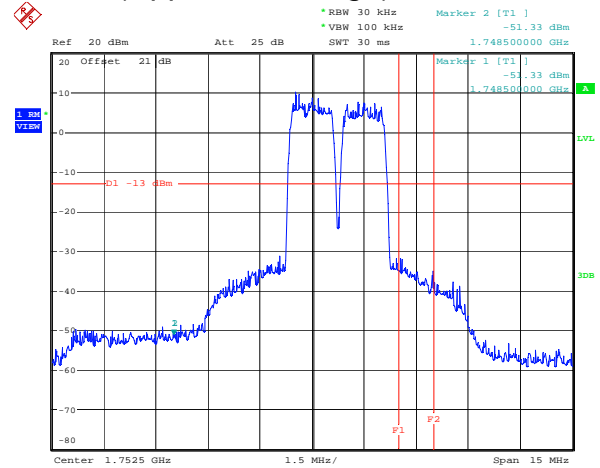
CDMA (Lower Band Edge)



Date: 10.JUN.2009 15:07:04

1711 MHz + 1713 MHz

CDMA (Upper Band Edge)



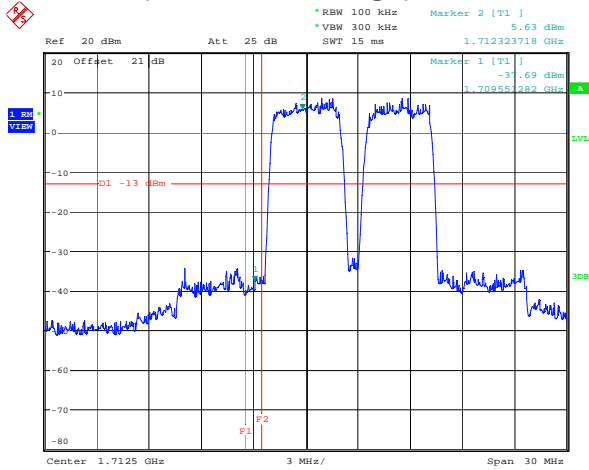
Date: 10.JUN.2009 15:29:47

1752.5 MHz + 1754 MHz

Clause 27.53(l) Spurious emissions at the antenna terminal, continued

Uplink 3rd Order Intermodulation

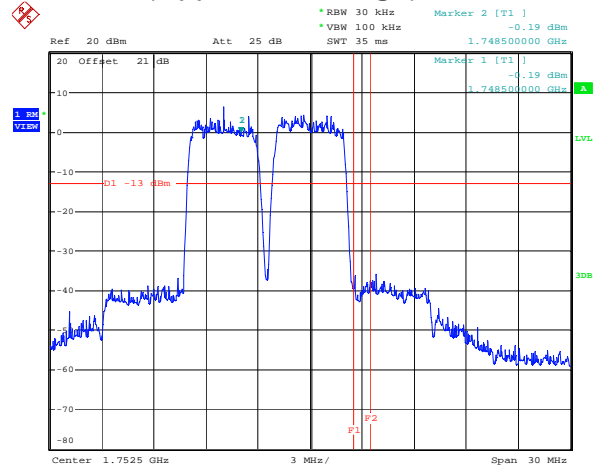
WCDMA (Lower Band Edge)



Date: 10.JUN.2009 15:11:00

1712.5 MHz + 1717.5 MHz

WCDMA (Upper Band Edge)

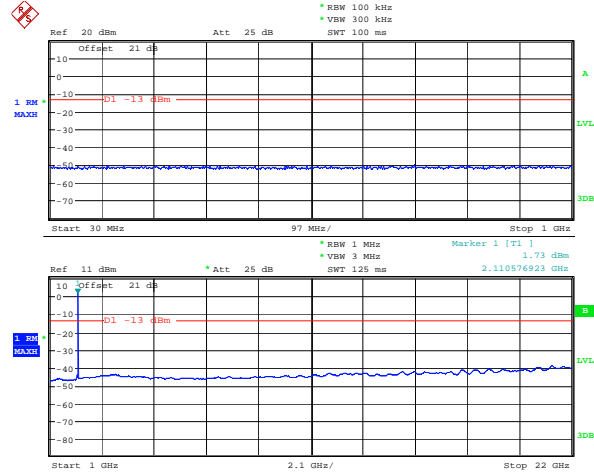


Date: 10.JUN.2009 15:31:32

1747.5 MHz + 1752.5 MHz

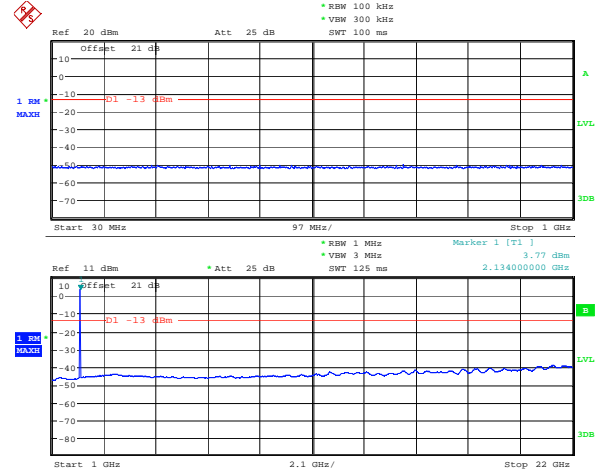
Clause 27.53(l) Spurious emissions at the antenna terminal, continued

**Downlink Conducted Emissions
 GSM Modulation**



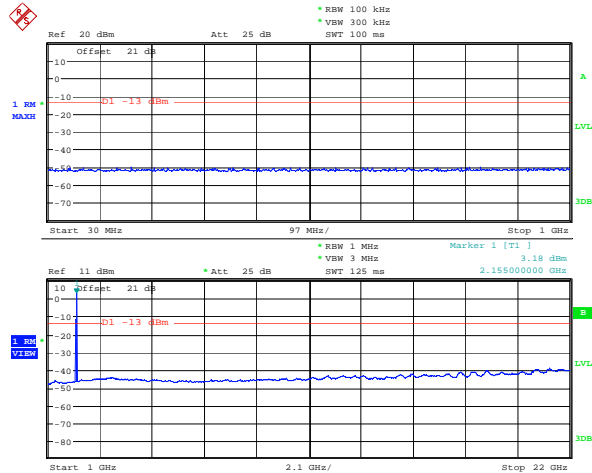
Date: 11.JUN.2009 08:40:25

2110.5 MHz



Date: 11.JUN.2009 08:49:04

2132.5 MHz

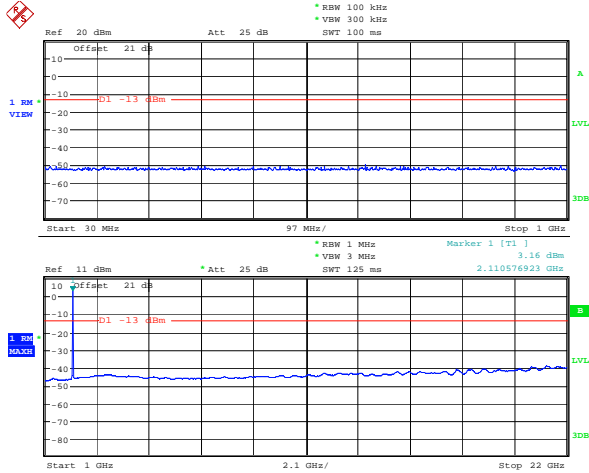


Date: 11.JUN.2009 08:52:13

2154.5 MHz

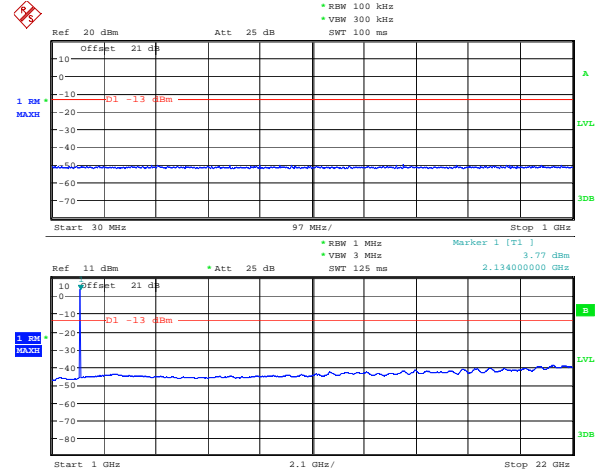
Clause 27.53(l) Spurious emissions at the antenna terminal, continued

**Downlink Conducted Emissions
 CDMA Modulation**



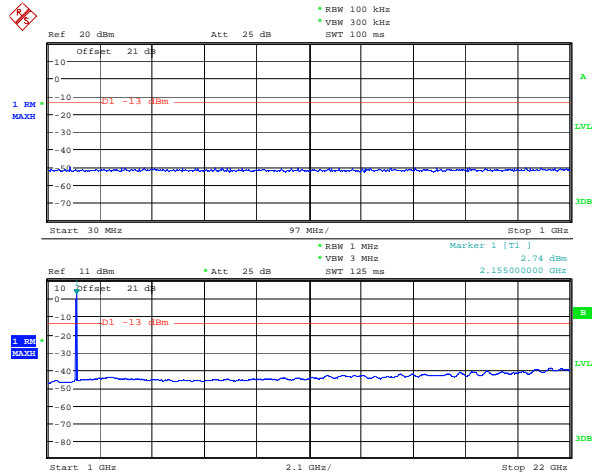
Date: 11.JUN.2009 08:38:27

2111 MHz



Date: 11.JUN.2009 08:49:04

2132.5 MHz

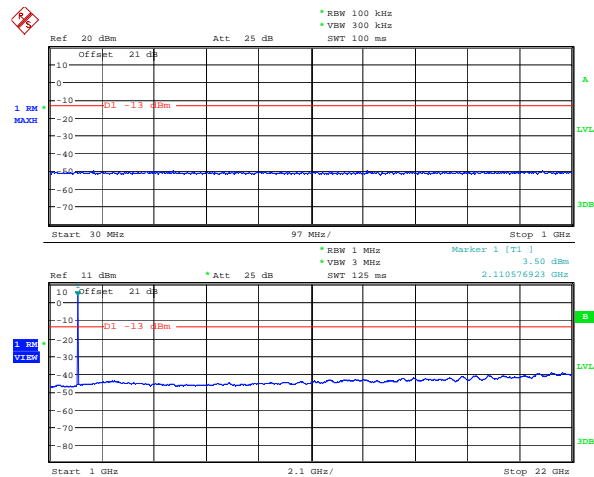


Date: 11.JUN.2009 08:53:33

2154 MHz

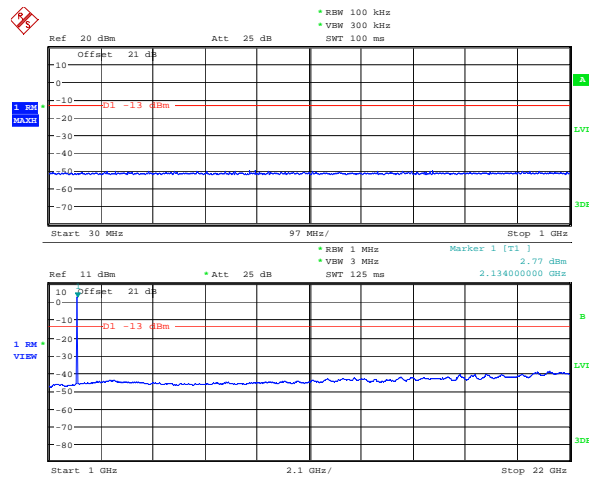
Clause 27.53(l) Spurious emissions at the antenna terminal, continued

Downlink Conducted Emissions
WCDMA Modulation



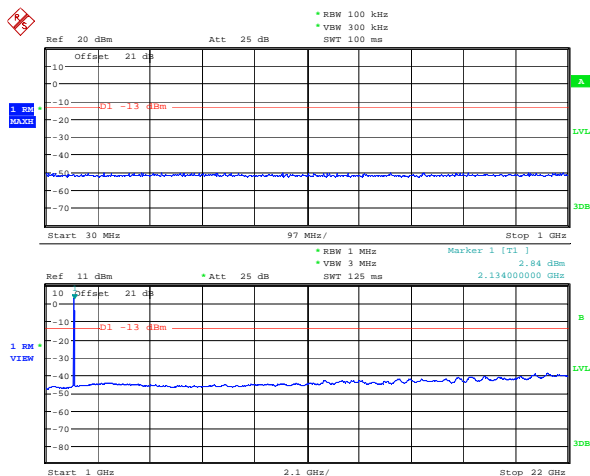
Date: 11.JUN.2009 08:43:59

2112.5 MHz



Date: 11.JUN.2009 08:50:20

2132.5 MHz

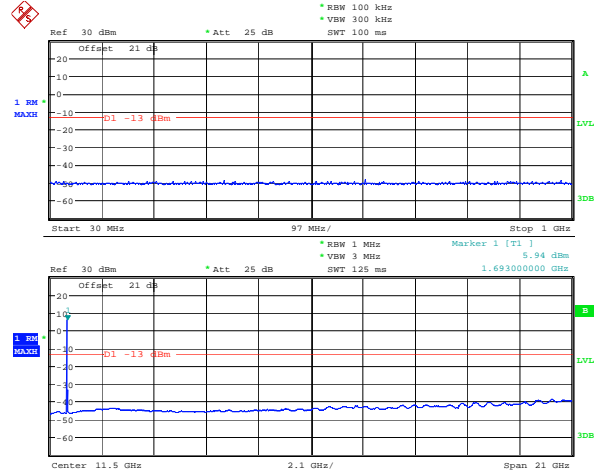


Date: 11.JUN.2009 08:54:36

2152.5 MHz

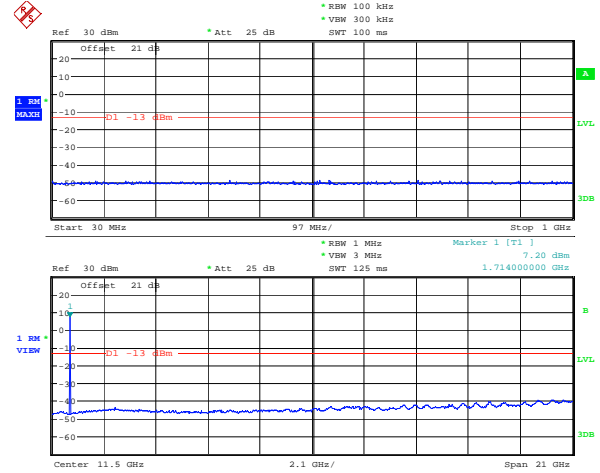
Clause 27.53(l) Spurious emissions at the antenna terminal, continued

**Uplink Conducted Emissions
 GSM Modulation**



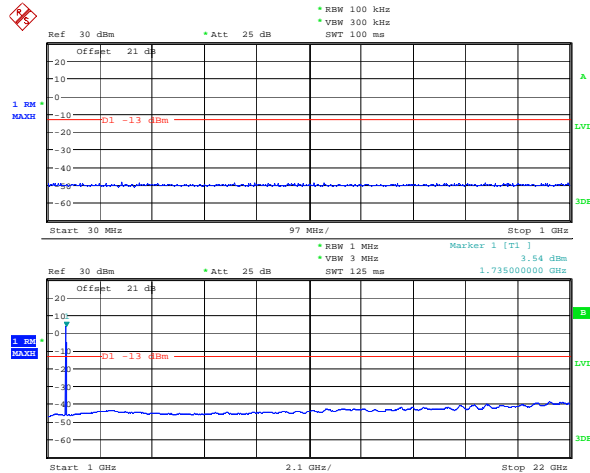
Date: 11.JUN.2009 09:06:56

1710.5 MHz



Date: 11.JUN.2009 09:10:46

1732.5 MHz



Date: 11.JUN.2009 09:15:02

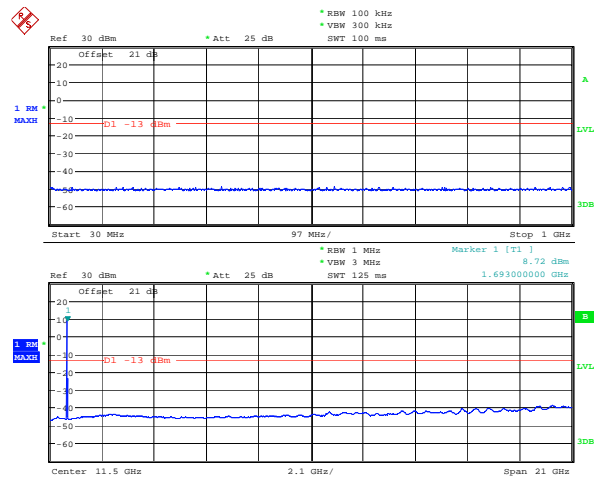
1754.5 MHz



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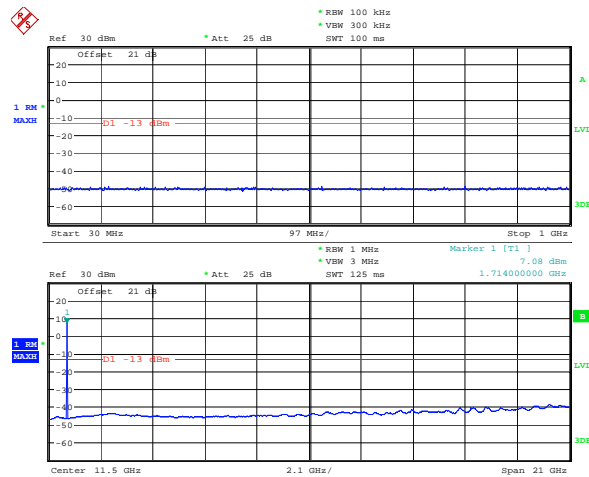
Clause 27.53(l) Spurious emissions at the antenna terminal, continued

Uplink Conducted Emissions
CDMA Modulation



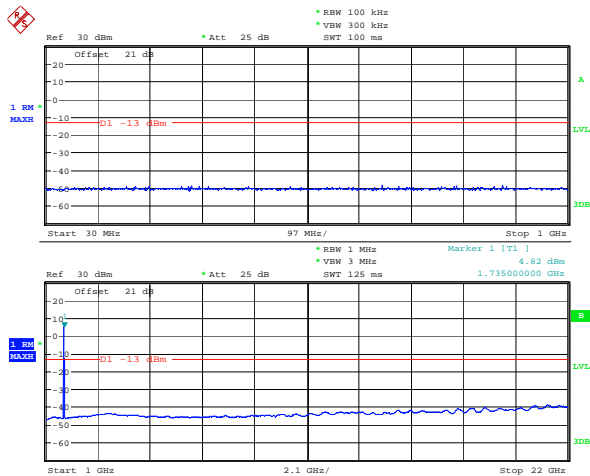
Date: 11.JUN.2009 09:08:01

1711 MHz



Date: 11.JUN.2009 09:11:59

1732.5 MHz

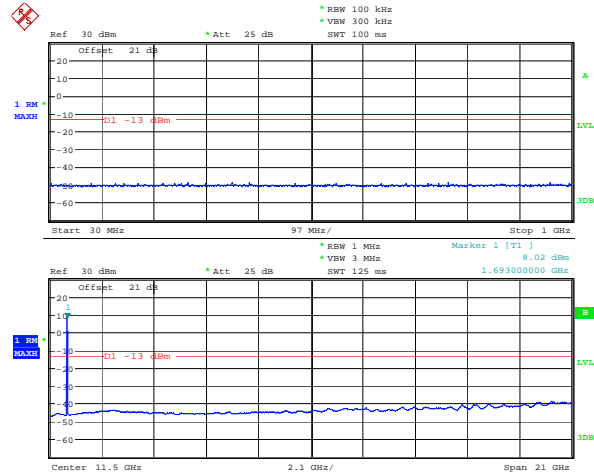


Date: 11.JUN.2009 09:15:58

1754 MHz

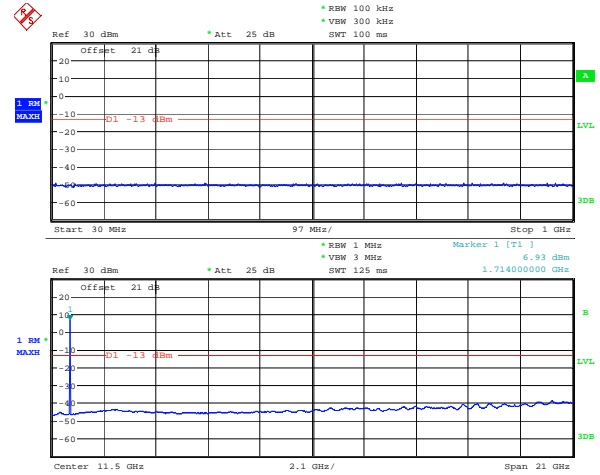
Clause 27.53(l) Spurious emissions at the antenna terminal, continued

**Uplink Conducted Emissions
WCDMA Modulation**



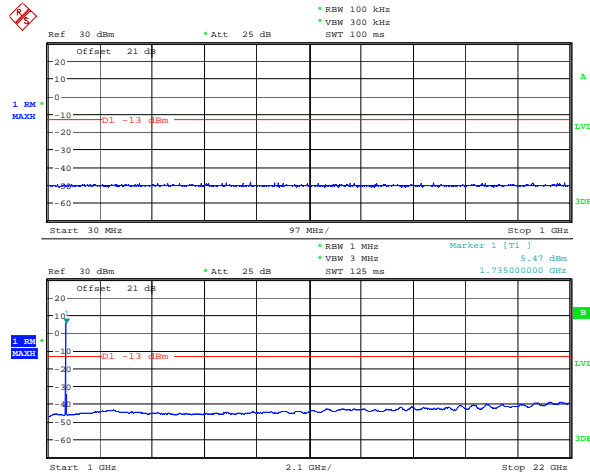
Date: 11.JUN.2009 09:09:14

2112.5 MHz



Date: 11.JUN.2009 09:13:05

2132.5 MHz



Date: 11.JUN.2009 09:17:26

2152.5 MHz

Clause 27.53(l) Field Strength of Spurious emissions

- | |
|--|
| <p>(1) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts.</p> <p>(2) For fixed and temporary fixed digital stations, the attenuation shall be not less than $43 + 10 \log (P)$ dB, unless a documented interference complaint is received from an adjacent channel licensee.</p> |
|--|

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 22 GHz. (10th Harmonic)
- All measurements were performed with a spectrum analyzer with the following settings:
 - RMS Detector, in 30 MHz to 1GHz range with 100 kHz RBW and 300 kHz VBW
 - RMS Detector, in 1 to 22 GHz range with 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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APPENDIX A : TEST RESULTS

Report Number: 128225-1TRFWL

Specification: FCC Part 27

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

Plots showing the filter frequency response.

Test Results: Pass

Special Notes:

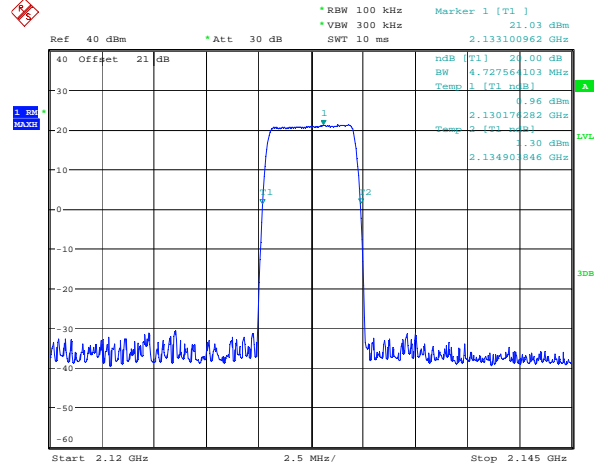
Measurements performed on the Uplink and Downlink.

Test Data:

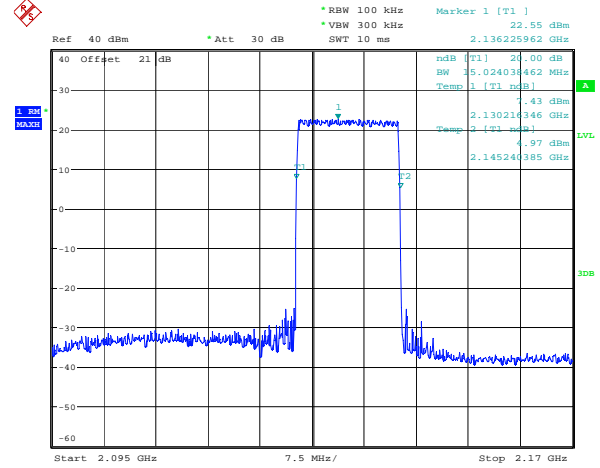
See spectral plots of this section.

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

Downlink – 5 MHz Filter



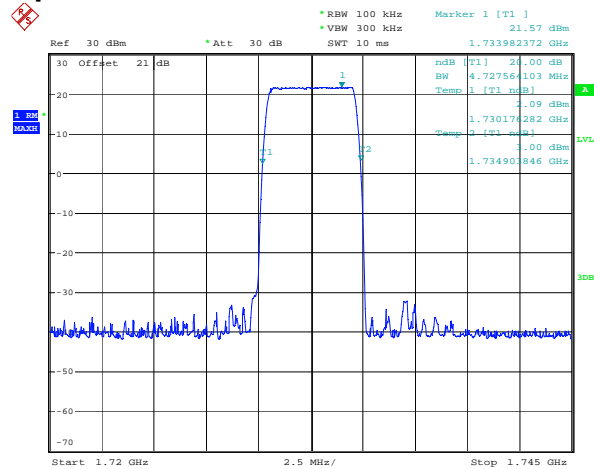
Downlink – 15 MHz Filter



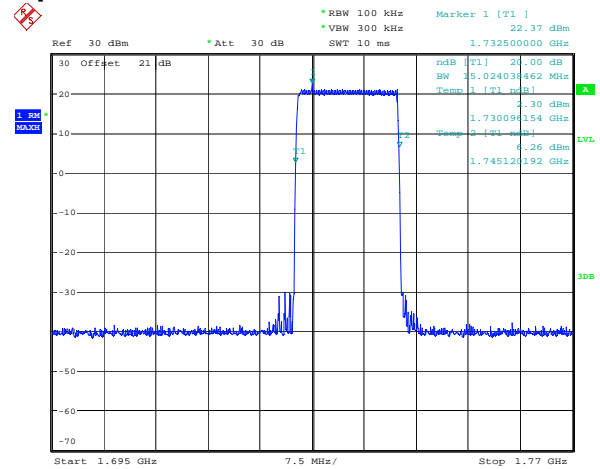
Date: 11.JUN.2009 09:59:01

Date: 11.JUN.2009 09:55:43

Uplink – 5 MHz Filter



Uplink – 15 MHz Filter

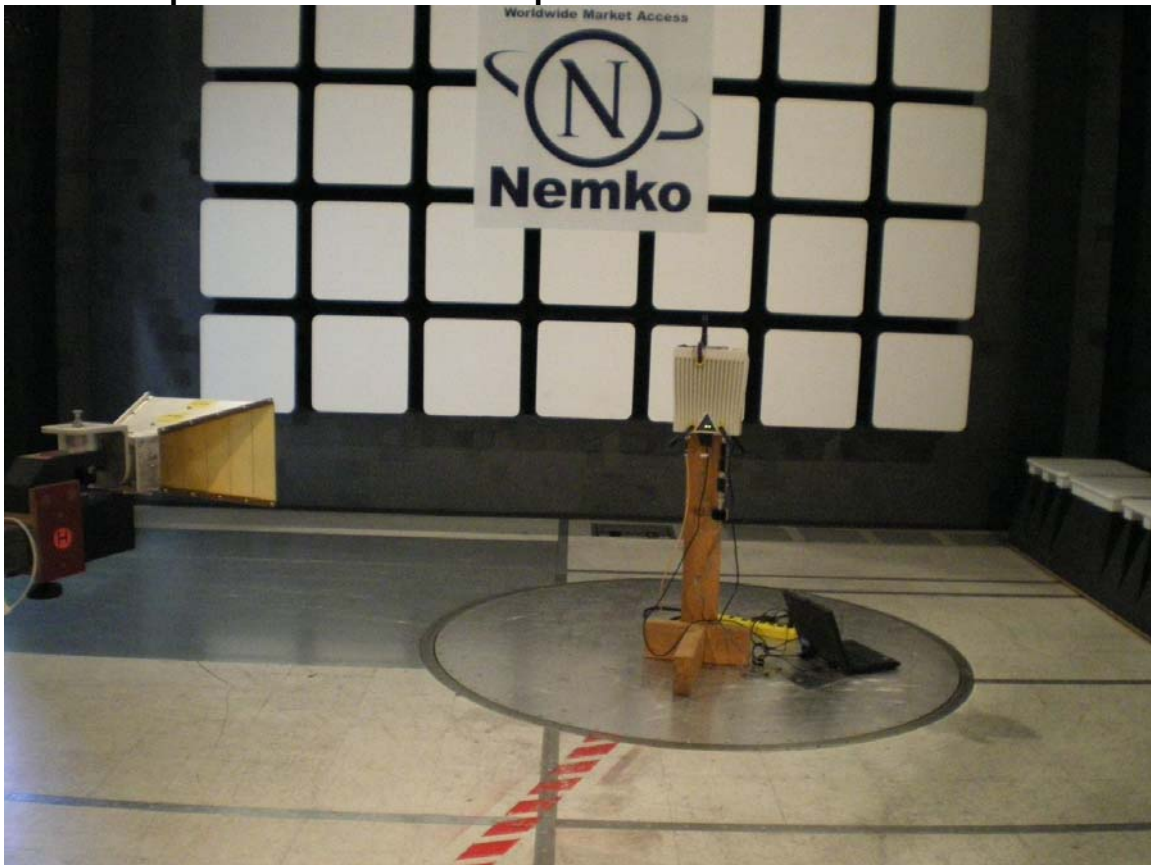


Date: 11.JUN.2009 09:51:48

Date: 11.JUN.2009 09:46:40

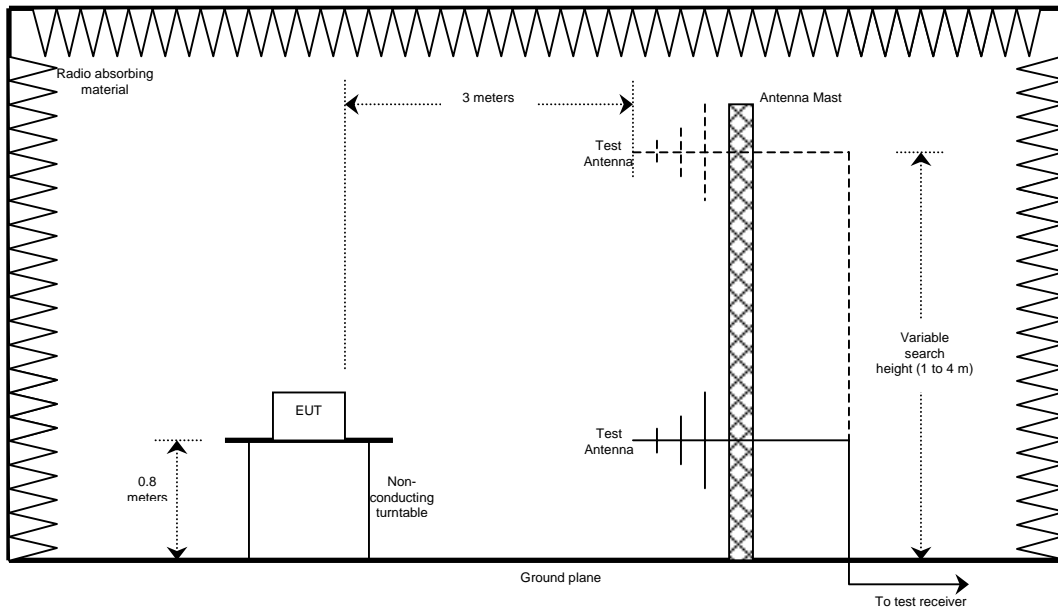
Appendix B : Setup Photographs

Radiated Spurious Emissions Setup:

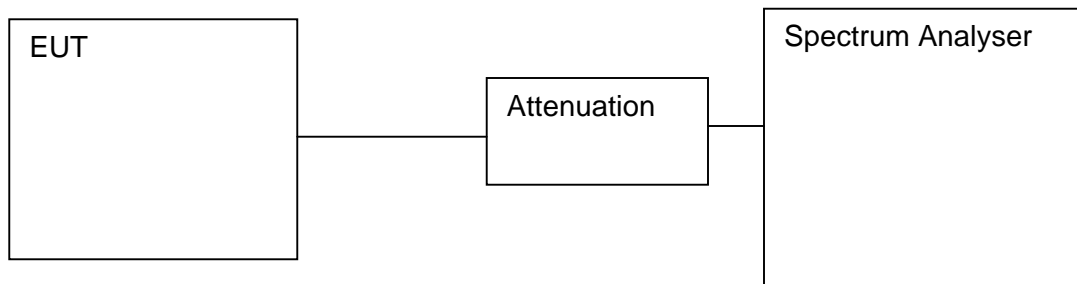


Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions, Output power, Occupied Bandwidth



Frequency Stability

