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Test Report: 101482TRFWL


Applicant: Dekolink Wireless Ltd.
16 Bazel St. Qiryat Arie
Petah-Tikva, 49510
Israel

Apparatus: MW-DCSA-450-470-12C-20W

FCC ID: OIWDCSA45047012CH

In Accordance With: FCC Part 90, Boosters
Private Land Mobile Radio Services

Tested By: Nemko Canada Inc.
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Ottawa, Ontario
K1V 1H2

Authorized By: 
Jason Nixon, Wireless/Telecom Specialist

Date: March 5, 2008

Total Number of Pages: 29

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90. Conducted measurements were performed in accordance with ANSI TIA-603-B-2002. Radiated tests were conducted in 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: | MW-DCSA-450-470-12C-20W |
| Specification: | FCC Part 90 Private Land Mobile Radio Services |
| Compliance Status: | Complies |
| Exclusions: | None |
| Non-compliances: | None |
| Report Release History: | Original Release |

Author: Heng Lin 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.

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Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows:

Digital Channel Selective Amplifier – UHF (DCSA-UHF)
MW-DCSA-450-470-12C-20W

1.2 Samples Submitted for Assessment

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

| Sample No. | Description | Serial No. |
|-------------------|-------------------------------------|-------------------|
| 1 | Digital Channel Selective Amplifier | 08013026 |

The first samples were received on: February 13, 2008

1.3 Theory of Operation

The Digital Channel Selective Amplifier – UHF (DCSA-UHF) serves as an outstanding sub-module for UHF bi-directional amplifier system. The unit allows extending radio/wireless communication coverage area into buildings, basements, tunnels and other RF shadowed or shielded areas, where high gain and high selectivity are mandatory.

The DCSA-UHF is set to serve either as a Downlink or an Uplink path amplifier. Its functional mode is determined by the rack where it is installed (either UL-Rack A or DL-Rack B).

1.4 Technical Specifications of the EUT

Operating Frequency: 450-470 MHz

Emission Designator: F1D

Rated Power: Downlink: 35 dBm
Uplink: 35 dBm

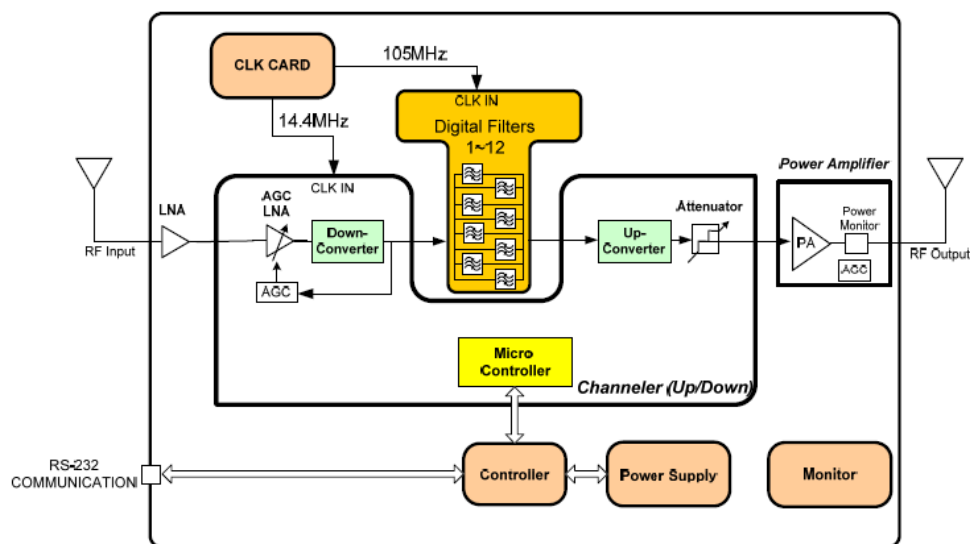
Measured Power: Downlink: 36.30 dBm
Uplink: 35.97 dBm

| Channel Information: | Downlink Bands: | Uplink Bands: |
|----------------------|-----------------|-----------------|
| | 450MHz – 452MHz | 455MHz – 457MHz |
| | 453MHz – 455MHz | 458MHz – 460MHz |
| | 460MHz – 462MHz | 465MHz – 467MHz |
| | 463MHz – 465MHz | 468MHz – 470MHz |

Modulation: FM, C4FM, CQPSK, F4FM, $\pi/4$ DQPSK (IMBE)
TDMA, F4GFSK

Power Source: +28VDC

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 90 Private Land Mobile Radio 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 °C |
| Humidity range | : | 20 - 75 % |
| Pressure range | : | 86 - 106 kPa |
| Power supply range | : | +/- 5% of rated voltages |

2.4 Test Equipment

| Equipment | Manufacturer | Model No. | Asset/Serial No. | Next Cal. |
|--|-----------------|---------------|------------------|------------|
| Electro-Magnetic Interference Test Chamber | TDK | SAC-3 | FA002047 | May 19/08 |
| Biconical | Sunol | BC2 | FA002078 | July 25/08 |
| Log Periodic Antenna | Sunol | LP5 | FA002077 | July 25/08 |
| Flush Mount Turntable | Sunol | FM2022 | FA002082 | NCR |
| Controller | Sunol | SC104V | FA002060 | NCR |
| Mast | Sunol | TLT2 | FA002061 | NCR |
| Receiver/Spectrum Analyzer | Rohde & Schwarz | ESU 40 | FA002071 | Nov. 15/08 |
| Horn Antenna #2 | EMCO | 3115 | FA000825 | Jan. 15/09 |
| 1.0 – 2.0 GHz Amplifier | JCA | 12-400 | FA001498 | Aug. 21/08 |
| 2.0 – 4.0 GHz Amplifier | JCA | 24-600 | FA001496 | Aug. 21/08 |
| 4.0 – 8.0 GHz Amplifier | JCA | 48-600 | FA001497 | Aug. 21/08 |
| 5.0 – 18.0 GHz Amplifier | NARDA | DWT-186N23U40 | FA001409 | COU |
| Spectrum Analyzer | Rohde & Schwarz | FSP | FA001920 | Mar. 19/08 |
| Spectrum Analyzer | Rohde & Schwarz | FSU | FA001877 | Jan 23/09 |

COU – Calibrate on Use

NCR – No Calibration Required

2.5 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.

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 90 : 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 90 : Test Results

| Clause | Test Method | Test Description | Required | Result |
|----------------|-------------|------------------------------|----------|--------|
| 90.205 | 2.1046 | Output power | Y | PASS |
| 90.210 | 2.1051 | Conducted spurious emissions | Y | PASS |
| 90.210 | 2.1053 | Radiated spurious emissions | Y | PASS |
| 90.213 | 2.1055 | Frequency stability | Y | PASS |
| 90.214 | — | Transient Behavior | N | |
| 90.219 | — | Use of boosters | N | |
| 2-11-04/EAB/RF | 2.1049 | Occupied bandwidth | Y | PASS |
| 2-11-04/EAB/RF | — | Out of band rejection | Y | PASS |

Notes:

Appendix A : Test Results

Clause 90.205 Output Power

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation. Except where otherwise specifically provided for, the maximum power that will be authorized for new stations authorized after August 16, 1995 is as follows in FCC Part 90.205(a) through (r).

Test Conditions:

| | | | |
|----------------------------|-------------------|---------------------|----------|
| Sample Number: | 1 | Temperature: | 23 °C |
| Date: | February 15, 2008 | Humidity: | 32 % |
| Modification State: | 0 | Tester: | Heng Lin |
| | | Laboratory: | Ottawa |

Test Results:

See Attached Table.

Additional Observations:

The output power was measured by using a Peak Detector with a 3MHz RBW/VBW.

Single Channel Power:

| Modulation | Downlink (dBm) | | |
|------------|------------------|------------------|------------------|
| | Low 450.25MHz | Mid 460.25MHz | High 464.9MHz |
| FM | 32.43 | 32.02 | 31.27 |
| C4FM | 31.91 | 32.06 | 31.45 |
| CQPSK | 36.30 | 35.75 | 35.29 |

| Modulation | Uplink (dBm) | | |
|------------|------------------|------------------|------------------|
| | Low 455.25MHz | Mid 465.25MHz | High 469.9MHz |
| FM | 32.15 | 31.20 | 30.75 |
| C4FM | 32.27 | 31.08 | 30.29 |
| CQPSK | 35.97 | 35.36 | 34.90 |

Clause 90.210 Conducted Spurious Emissions

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere, the Table below specifies the emission masks for equipment operating in the frequency bands governed under this part.

Test Conditions:

| | | | |
|----------------------------|-------------------|---------------------|----------|
| Sample Number: | 1 | Temperature: | 23 °C |
| Date: | February 15, 2008 | Humidity: | 32 % |
| Modification State: | 0 | Tester: | Heng Lin |
| | | Laboratory: | Ottawa |

Test Results:

See Attached Plots.

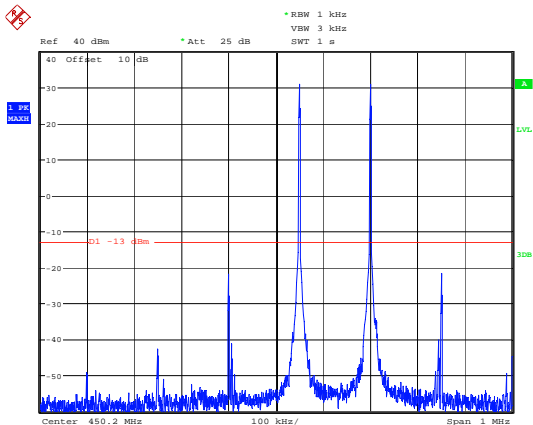
Additional Observations:

Intermodulation test was performed on both low-band edge and high-band edge with CW, C4FM and CQPSK modulation.

Conducted emissions were performed on a low, middle and high channel for FM, C4FM and CQPSK modulation. Only worst case was reported.

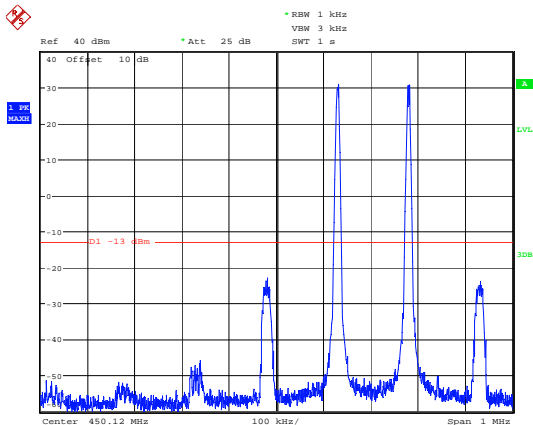
3rd order Intermodulation

Downlink – Low Bandedge
CW



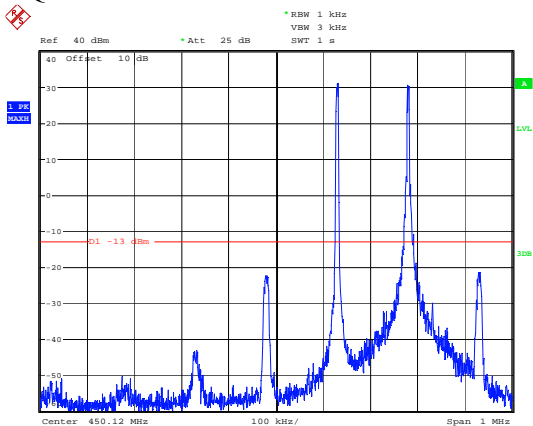
Date: 20.FEB.2008 16:43:43

C4FM



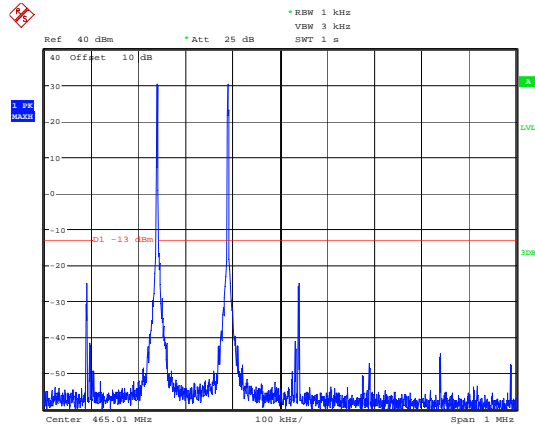
Date: 20.FEB.2008 16:47:15

CQPSK



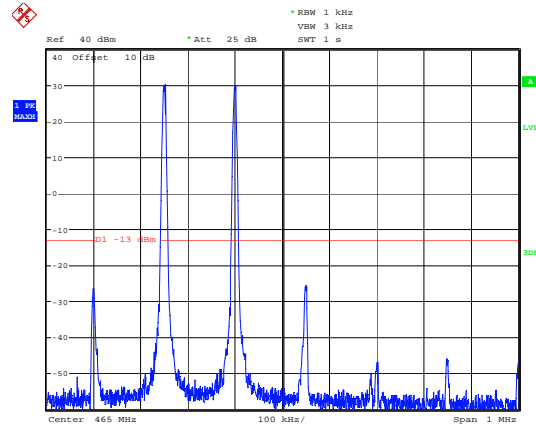
Date: 20.FEB.2008 16:46:07

Downlink – High Bandedge CW



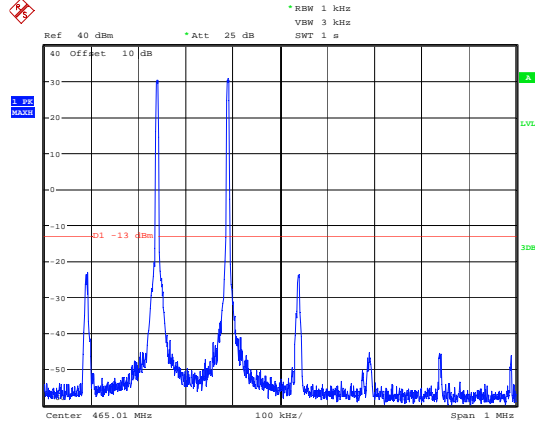
Date: 20.FEB.2008 21:11:36

C4FM



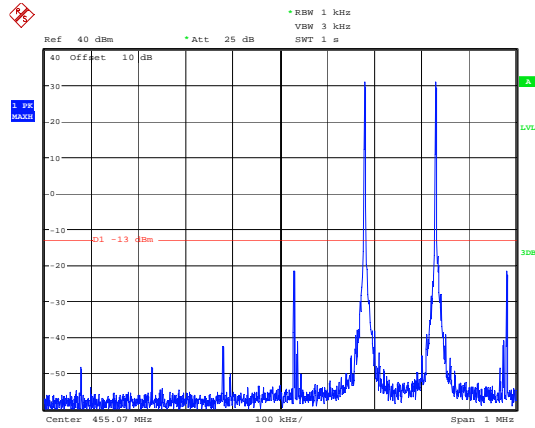
Date: 20.FEB.2008 21:08:43

CQPSK



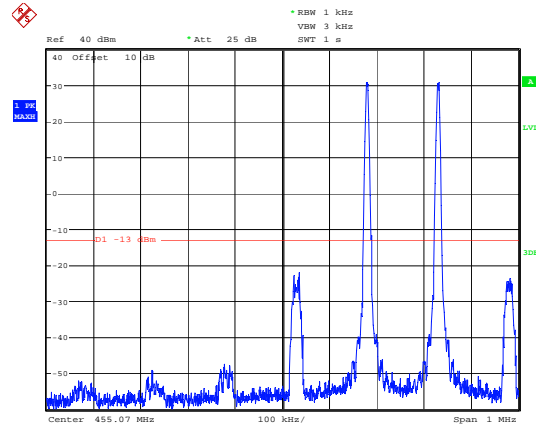
Date: 20.FEB.2008 21:10:31

Uplink – Low Bandedge CW



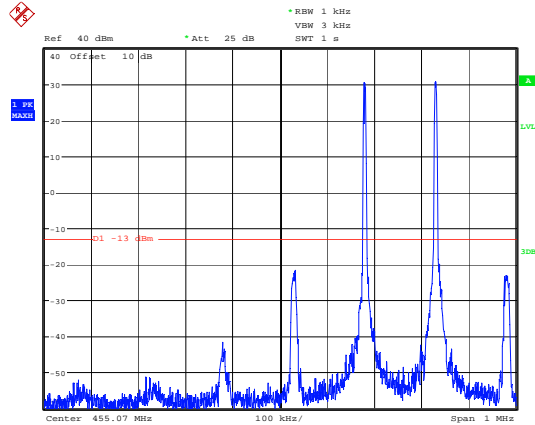
Date: 20.FEB.2008 16:36:33

C4FM



Date: 20.FEB.2008 16:33:51

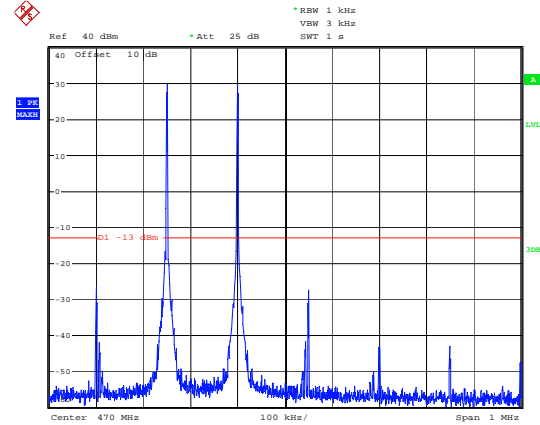
CQPSK



Date: 20.FEB.2008 16:35:30

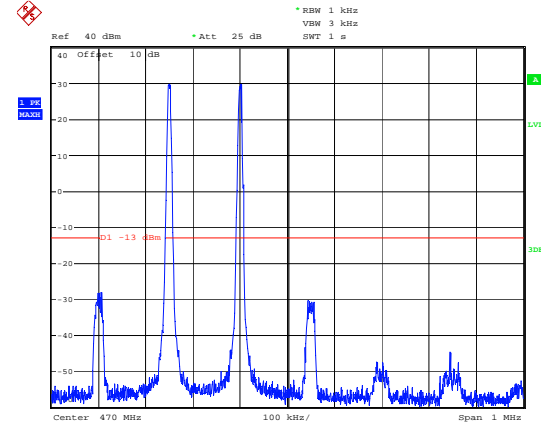
Uplink – High Bandedge

CW



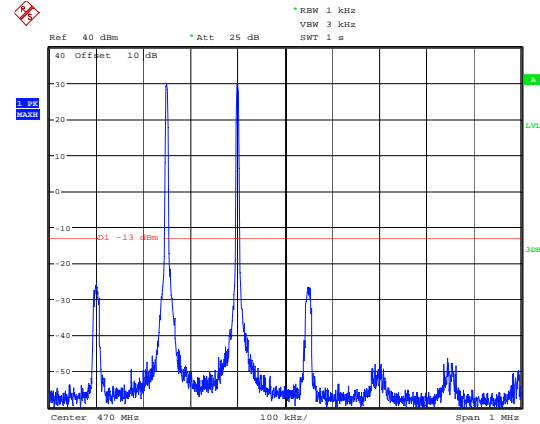
Date: 20.FEB.2008 16:40:38

C4FM



Date: 20.FEB.2008 16:26:32

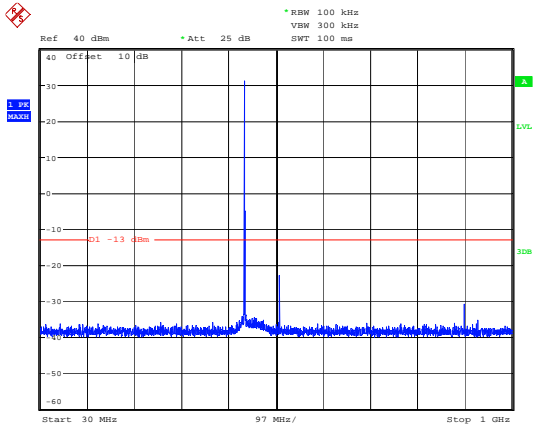
CQPSK



Date: 20.FEB.2008 16:24:55

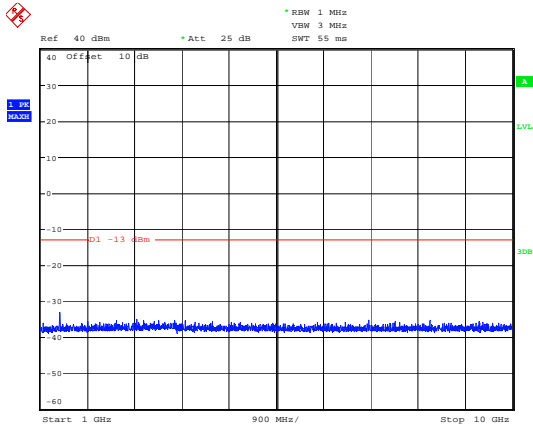
Conducted Spurious Emission

Downlink - FM



Date: 20.FEB.2008 21:37:02

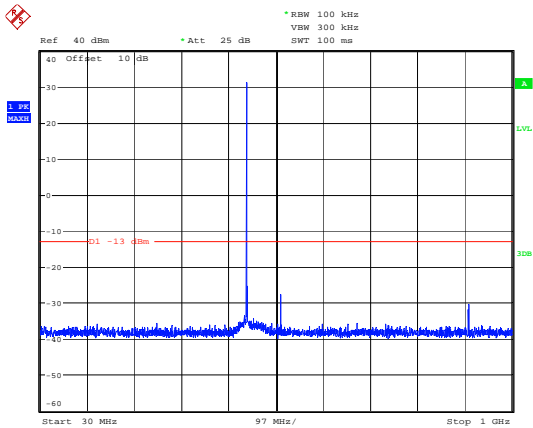
30MHz – 1GHz (Low Channel)



Date: 20.FEB.2008 21:27:56

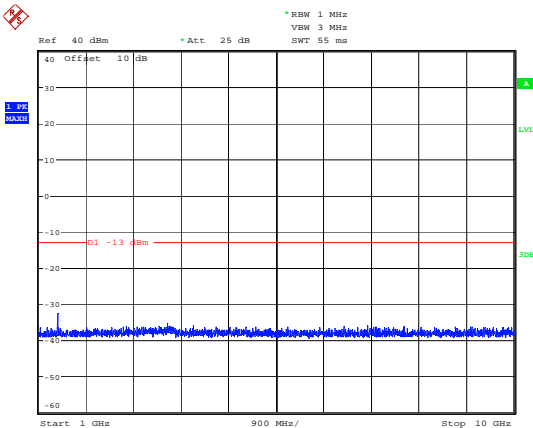
1G 10G (Mid Channel)

Downlink – C4FM



Date: 20.FEB.2008 21:30:44

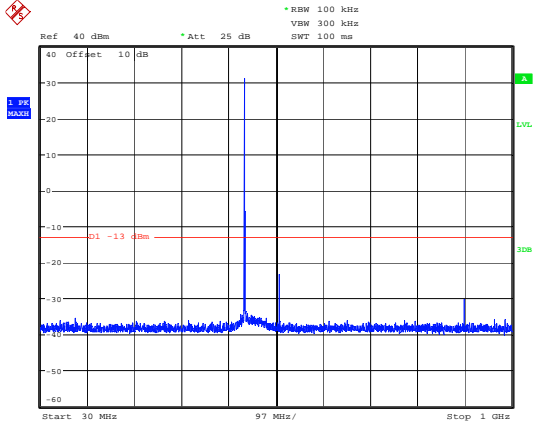
30MHz – 1GHz (High Channel)



Date: 20.FEB.2008 21:29:31

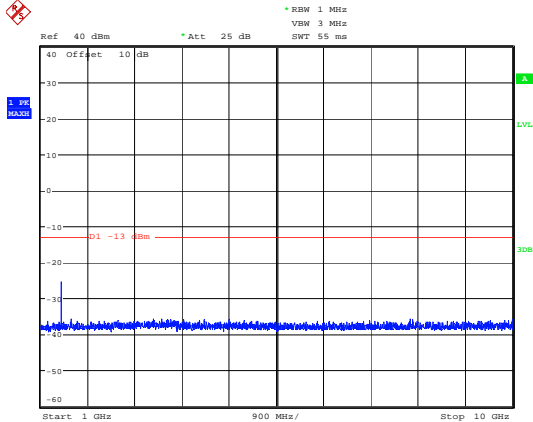
1G 10G (Mid Channel)

Downlink - CQPSK



Date: 20.FEB.2008 21:34:55

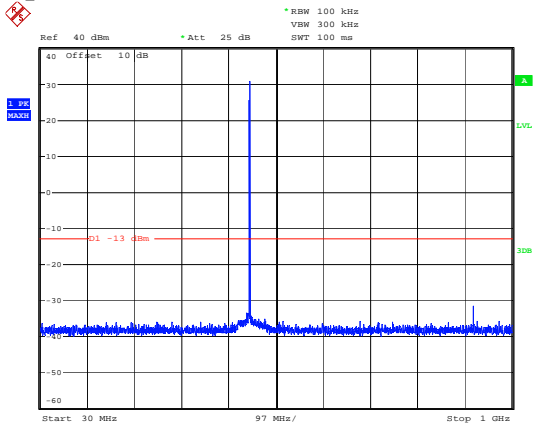
30MHz – 1GHz (Low Channel)



Date: 20.FEB.2008 21:21:05

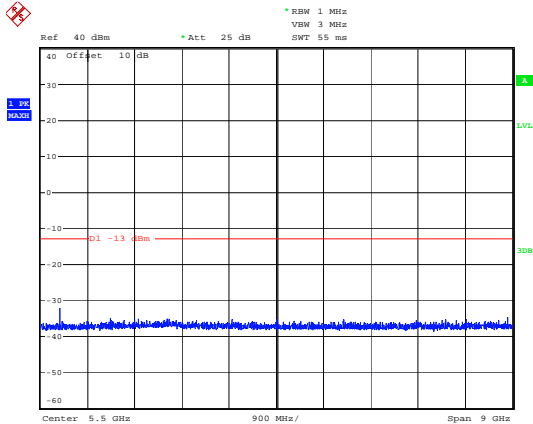
1G 10G (High Channel)

Uplink - FM



Date: 20.FEB.2008 22:09:06

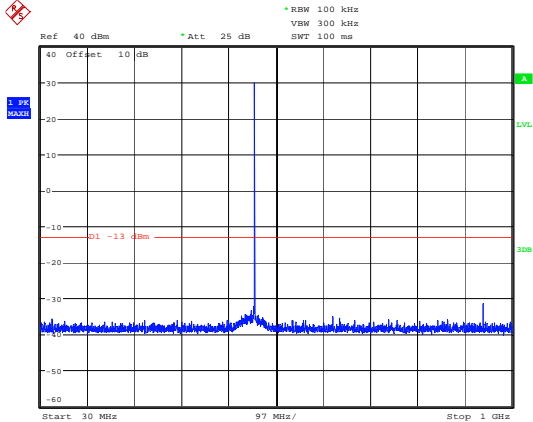
30MHz – 1GHz (Mid Channel)



Date: 20.FEB.2008 21:52:26

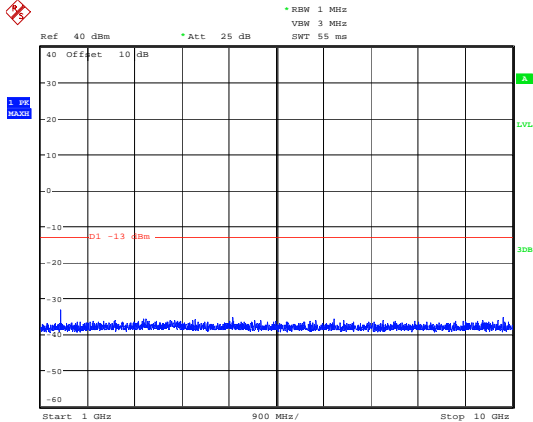
1G 10G (Low Channel)

Uplink – C4FM



Date: 20.FEB.2008 22:00:29

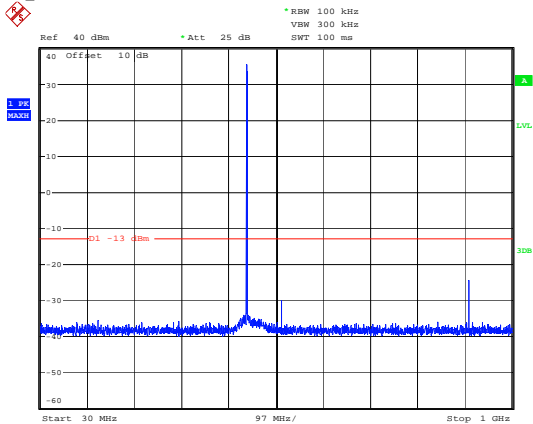
30MHz – 1GHz (High Channel)



Date: 20.FEB.2008 22:07:32

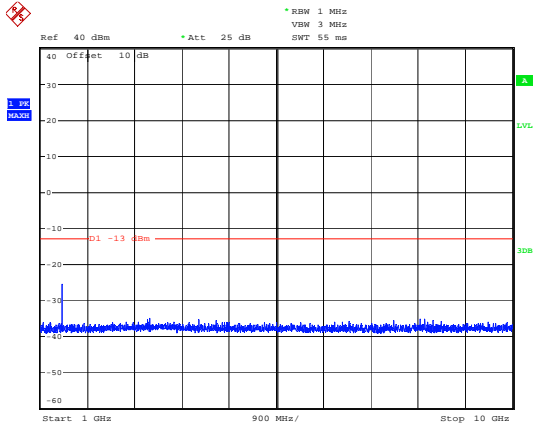
1G 10G (Mid Channel)

Uplink - CQPSK



Date: 20.FEB.2008 21:55:51

30MHz – 1GHz (Low Channel)



Date: 20.FEB.2008 22:04:09

1G 10G (High Channel)

Clause 90.210 Radiated Spurious Emissions

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere, the Table below specifies the emission masks for equipment operating in the frequency bands governed under this part.

Test Conditions:

| | | | |
|----------------------------|-------------------|---------------------|----------|
| Sample Number: | 1 | Temperature: | 23 °C |
| Date: | February 20, 2008 | Humidity: | 34 % |
| Modification State: | 0 | Tester: | Heng Lin |
| | | Laboratory: | Ottawa |

Test Results:

No emission was detected within 20dB below the limit.

Additional Observations:

The Spectrum was searched from 30MHz to the 10GHz.

Conducted emissions were performed on a low, middle and high channel.

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

Clause 90.213 Frequency Stability

a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following Table.

Minimum Frequency Stability

parts per million (ppm)

| Frequency range (MHz) | Fixed and base stations 2 watts output power | Mobile stations Over power | 2 watts or less output |
|-----------------------|---|-------------------------------|------------------------|
| Below 25 | 100 | 100 | 200 |
| 25-50 | 20 | 20 | 50 |
| 72-76 | 5 | --- | 50 |
| 150-174 | 50 | 5 | 50 |
| 216-220 | 1.0 | --- | 1.0 |
| 220-222 | 0.1 | 1.5 | 1.5 |
| 421-512 | 2.5 | 5 | 5 |
| 806-809 | 1.0 | 1.5 | 1.5 |
| 809-824 | 1.5 | 2.5 | 2.5 |
| 851-854 | 1.0 | 1.5 | 1.5 |
| 854-869 | 1.5 | 2.5 | 2.5 |
| 896-901 | 0.1 | 1.5 | 1.5 |
| 902-928 | 2.5 | 2.5 | 2.5 |
| 929-930 | 1.5 | --- | --- |
| 935-940 | 0.1 | 1.5 | 1.5 |
| 1427-1435 | 300 | 300 | 300 |
| Above 2450 | --- | --- | --- |

Test Conditions:

| | | | |
|----------------------------|-------------------|---------------------|----------|
| Sample Number: | 1 | Temperature: | 23 °C |
| Date: | February 20, 2008 | Humidity: | 36 % |
| Modification State: | 0 | Tester: | Heng Lin |
| | | Laboratory: | Ottawa |

Test Results: Complies.

Additional Observations:

The tested repeater uses the same LO for down- and up-frequency conversion in the signal-processing chain; therefore the transmitted signal is identical in frequency to the received signal. This was verified by measuring the transmitted (output) signal frequency with a frequency counter that was phase-locked to a signal generator used to generate input RF signal. Measured frequency deviation was 0 Hz and the DUT was deemed to comply with frequency stability requirement.

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:

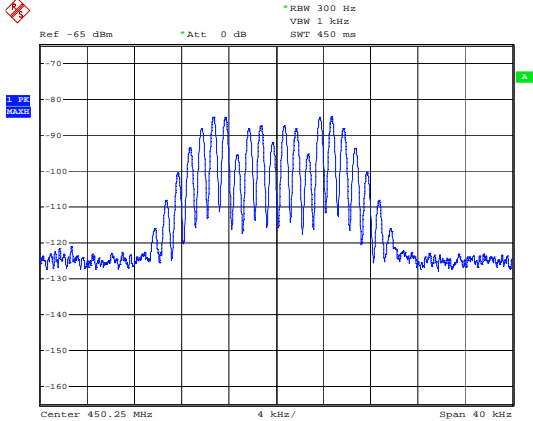
| | | | |
|----------------------------|-------------------|---------------------|----------|
| Sample Number: | 1 | Temperature: | 22 °C |
| Date: | February 15, 2008 | Humidity: | 32 % |
| Modification State: | 0 | Tester: | Heng Lin |
| | | Laboratory: | Ottawa |

Test Results:

See Attached Plots.

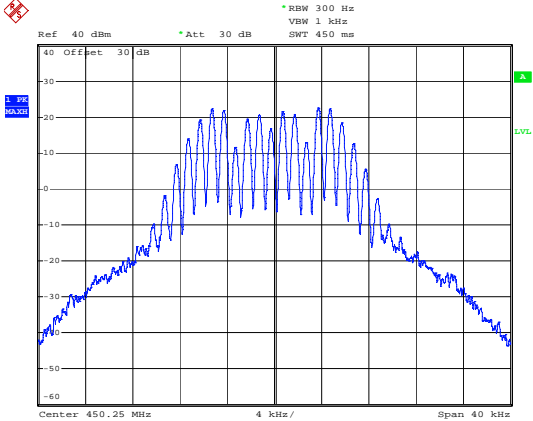
Downlink – FM

Input



Date: 15.FEB.2008 11:49:27

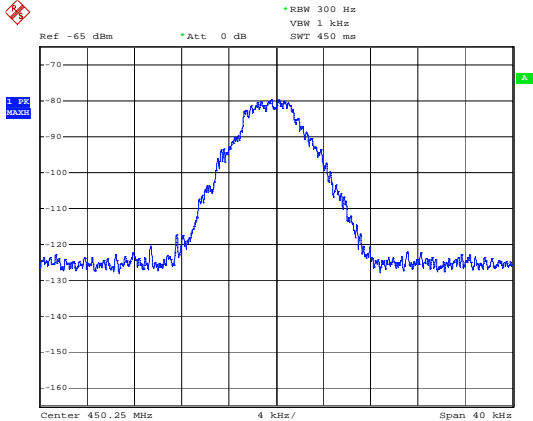
Output



Date: 15.FEB.2008 10:24:56

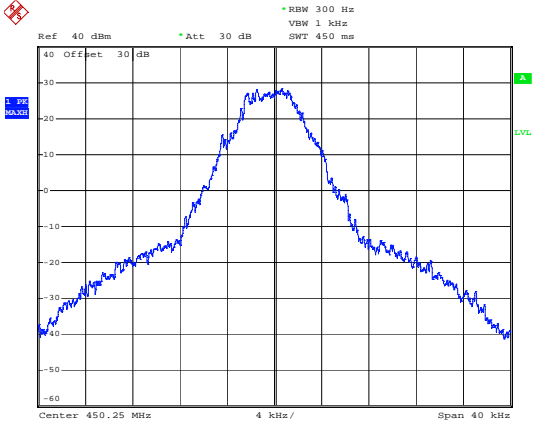
Downlink – C4FM

Input



Date: 15.FEB.2008 11:51:41

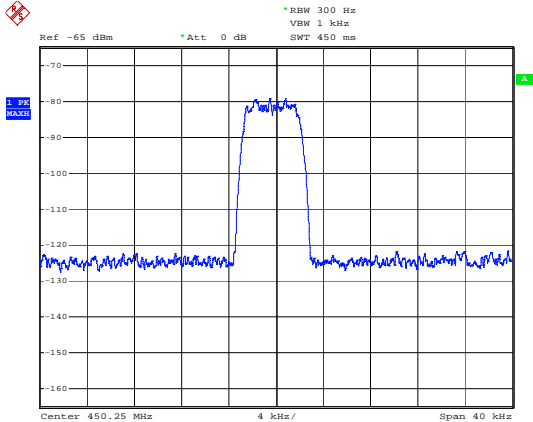
Output



Date: 15.FEB.2008 10:19:54

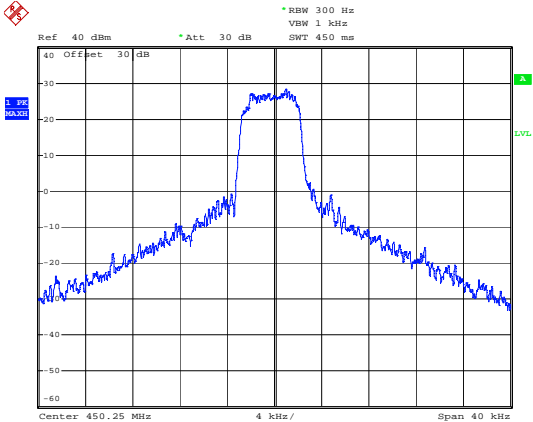
Downlink - CQPSK

Input



Date: 15.FEB.2008 11:51:02

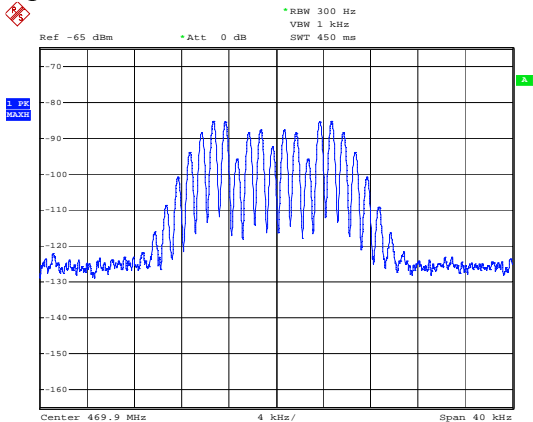
Output



Date: 15.FEB.2008 10:22:20

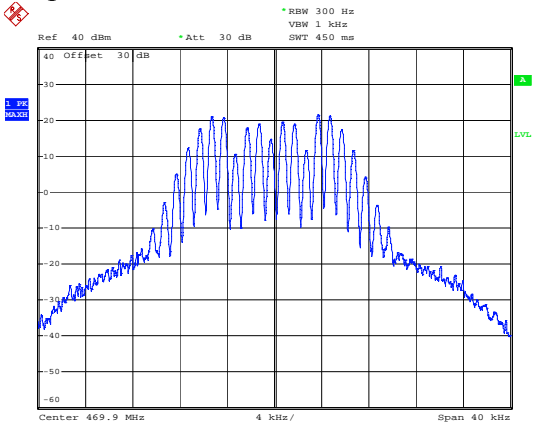
Uplink - FM

Input



Date: 15.FEB.2008 11:48:26

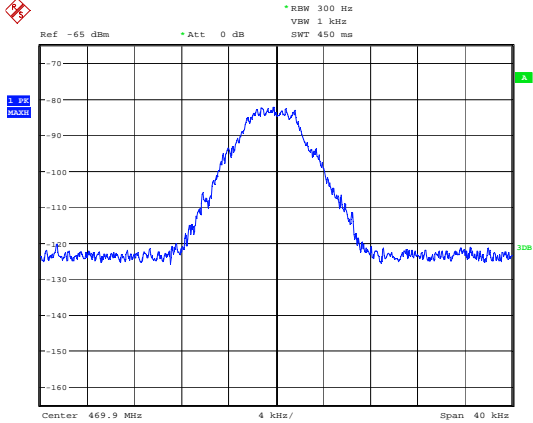
Output



Date: 15.FEB.2008 11:11:27

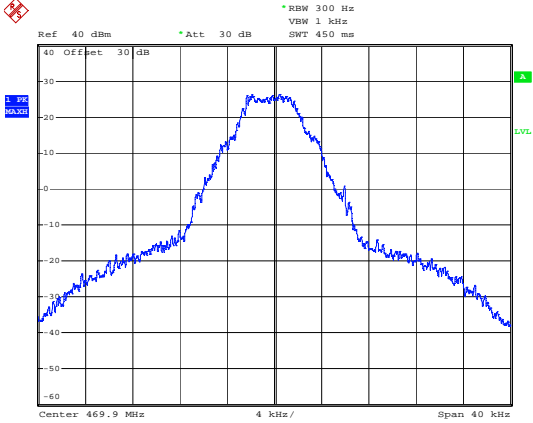
Uplink – C4FM

Input



Date: 21.FEB.2008 15:03:49

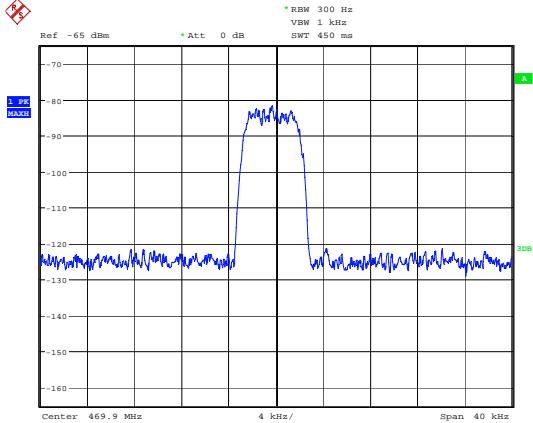
Output



Date: 15.FEB.2008 10:42:16

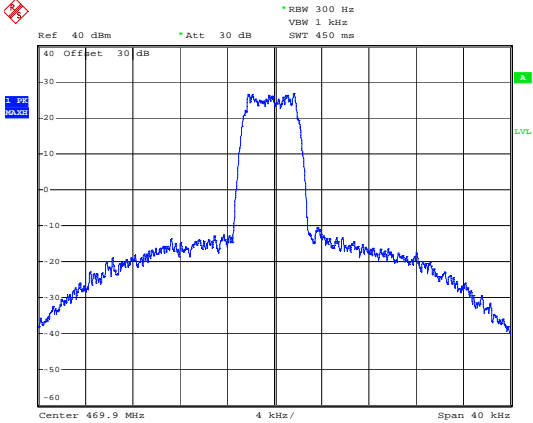
Uplink – CQPSK

Input



Date: 21.FEB.2008 15:13:35

Output



Date: 15.FEB.2008 11:09:49

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

Plots showing the filter frequency response.

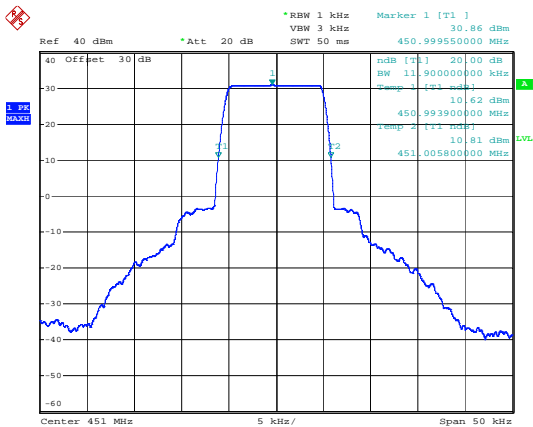
Test Conditions:

| | | | |
|---------------------|-------------------|--------------|----------|
| Sample Number: | 1 | Temperature: | 22 °C |
| Date: | February 14, 2008 | Humidity: | 32 % |
| Modification State: | 0 | Tester: | Heng Lin |
| | | Laboratory: | Ottawa |

Test Results:

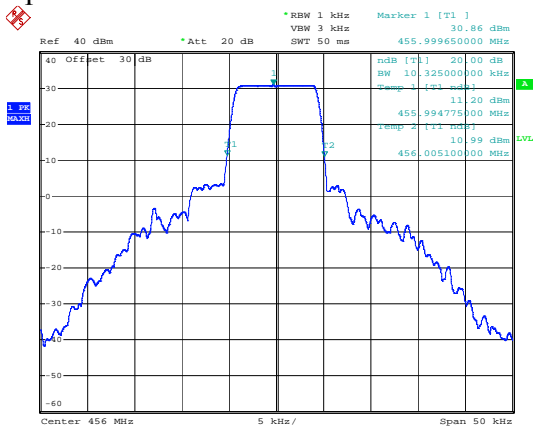
See Attached Plots.

Low Channel:
Downlink

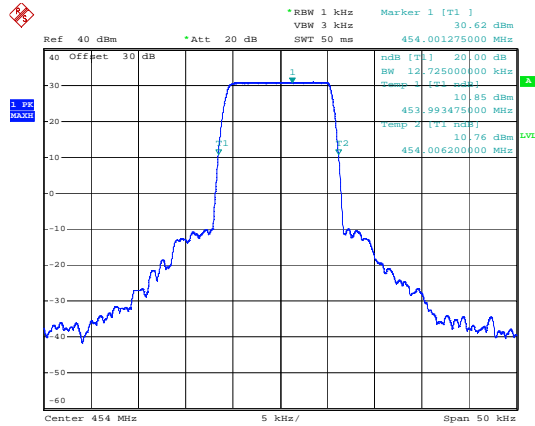


Date: 14.FEB.2008 15:17:41

Uplink

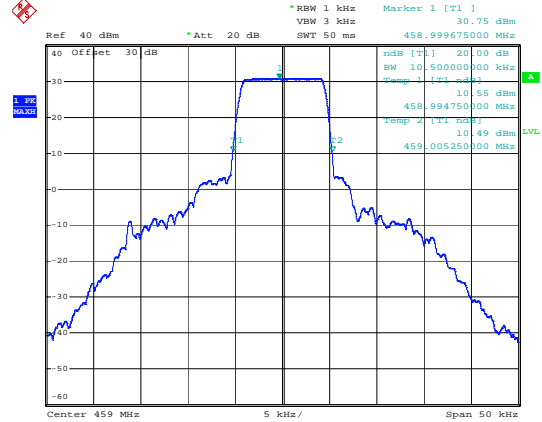


Date: 14.FEB.2008 16:01:11

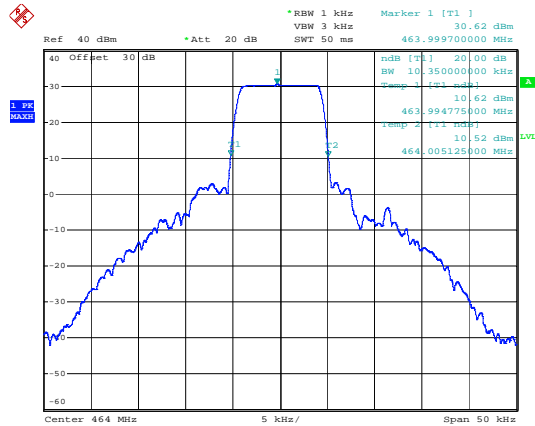
Mid Channel
Downlink

Date: 14.FEB.2008 15:34:29

Uplink

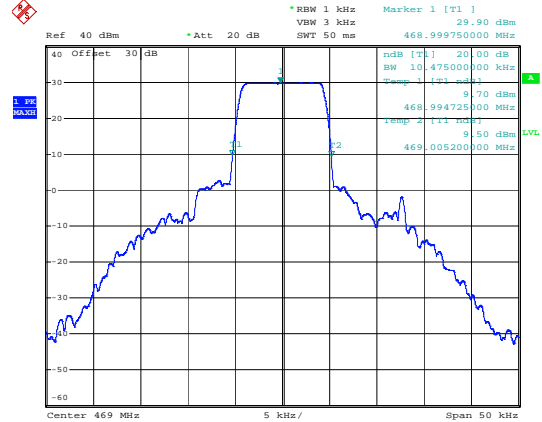


Date: 14.FEB.2008 15:59:03

High Channel
Downlink

Date: 14.FEB.2008 15:50:24

Uplink



Date: 14.FEB.2008 15:53:32

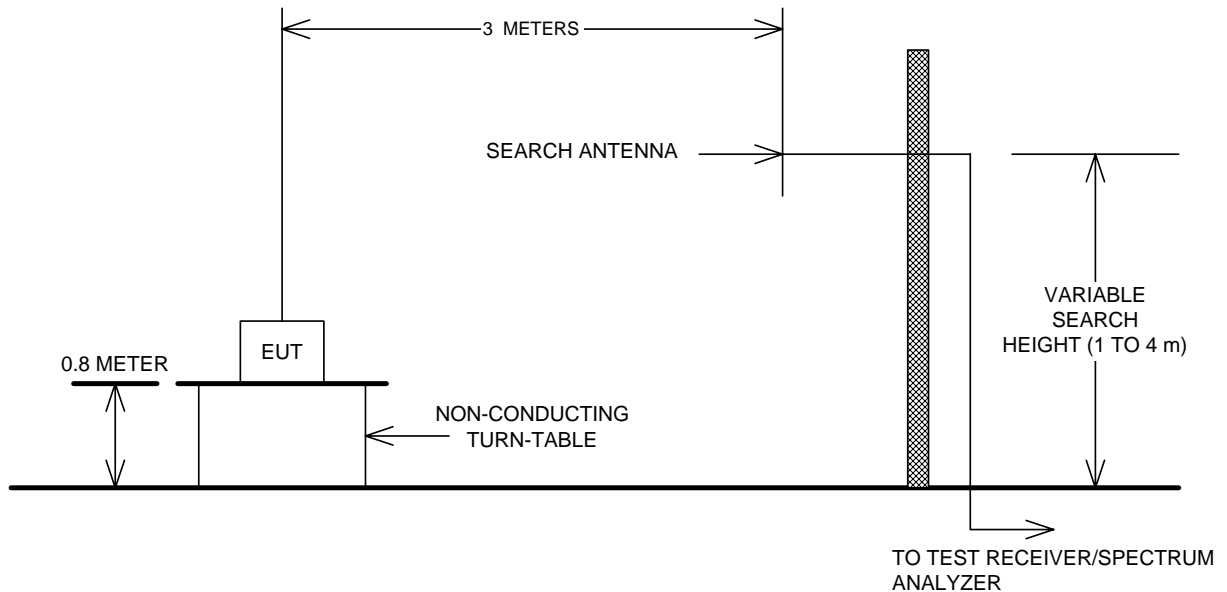
Appendix B : Setup Photographs

Radiated Spurious Emissions Setup:



Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



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

