

Nemko Test Report: 112659R1TRFWL

Applicant: Redline Communications
302 Town Centre Blvd., Suite 100
Markham, Ontario
L3R 0E8

Apparatus: AN-80i (3.3-3.8GHz)

FCC ID: QC8-AN80IE

In Accordance With: FCC Part 90 Subpart Z
Wireless Broadband Services in the
3650–3700 MHz Band

Authorized By:

A handwritten signature in blue ink, appearing to read 'Andrey Adelberg', is written over a faint, large 'NEMKO' watermark.

Andrey Adelberg, EMC/Wireless Specialist

Date: September 16, 2008

Total Number of Pages: 51

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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 90. 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:	AN-80i (3.3-3.8GHz)
Specification:	FCC Part 90 Subpart Z
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Revision 1 – Revised product description
Test Location:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Registration Number:	176392 (3m Semi-Anechoic Chamber)
Tests Performed By:	Jason Nixon, Wireless/Telecom Specialist
Test Dates:	September 2 to 10, 2008

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:	Broadband Fixed Wireless system
Brand Name:	RedCONNEX MAX+
Model Name or Number:	AN-80i (3.3-3.8GHz)
Serial Number:	None
Nemko Sample Number:	1
FCC ID:	QC8-AN80IE
Date of Receipt:	August 26, 2008

2.2 Accessories

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

Description:	AC Adapter
Brand Name:	Cincon Electronics Co., Ltd.
Model Name or Number:	TR60A-POE-L
Serial Number:	002191
Nemko Sample Number:	2
Connection Port:	Shielded Ethernet
Cable Length and Type:	3m

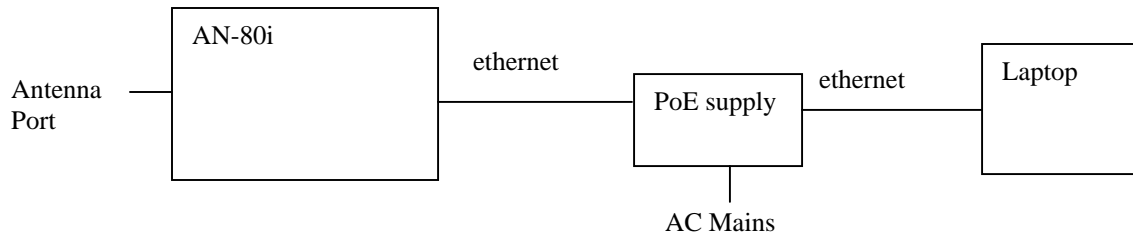
2.3 EUT Description

The EUT is a Point-to-Multipoint base station using OFDM modulation with software selectable channel bandwidths.

2.4 Technical Specifications of the EUT

Operating Band:	3650-3700MHz
Operating Frequency:	3.5MHz Channel: 3652-3698MHz 7MHz Channel: 3653.5-3696.5MHz 14MHz Channel: 3657-3693MHz 5MHz Channel: 3652.5-3697.5MHz 10MHz Channel: 3655-3695MHz 20MHz Channel: 3660-3690MHz 28MHz Channel: 3664-3686MHz
Modulation:	OFDM using 64QAM, 16QAM, QPSK and BPSK modulation for sub-carriers
Contention-based protocol:	Dynamic Frequency Selection
Emission Designator:	2M93W7D (3.5MHz), 5M76W7D (7MHz), 11M7W7D (14MHz), 4M19W7D (5MHz), 8M58W7D (10MHz), 16M8W7D (20MHz), 23M0W7D (28MHz)
Antenna Data:	A2014ARF, deg 13.8; gain 20dBi; band 3.3-3.8GHz; H or V A2408MTF, deg 8; gain 24dBi; band 3.3-3.8GHz; H or V A1815MTS, deg 15; gain 18dBi; band 3.3-3.8GHz; H or V A2510PWP, deg 10; gain 25dBi; band 3.3-3.8GHz; H or V A2808PWP, deg 8; gain 28dBi; band 3.3-3.8GHz; H or V PA1760EAS, deg 60; gain 17dBi; band 3.3-3.8GHz; V only PA1660EASH, deg 60; gain 16dBi; band 3.3-3.8GHz; H only PA1590EAS, deg 90; gain 15dBi; band 3.3-3.8GHz; V only PA1590EASH, deg 90; gain 15dBi; band 3.3-3.8GHz; H only PA14120EAS, deg 120; gain 14dBi; band 3.3-3.8GHz; V only PA14120EASH, deg 120; gain 14dBi; band 3.3-3.8GHz; H only
Power Requirements:	-48VDC PoE

2.5 EUT Setup diagram



2.6 Operation of the EUT during testing

The EUT was in a continuous transmit mode with random data frames. The modulation/channel bandwidth and channel frequency was changed using a Web-base interface of the Ethernet port.

2.7 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 90 Private Land Mobile Radio 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.	Cal. Date	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSP40	FA001920	April 14/08	April 14/09
Signal Generator	Rohde & Schwarz	SMR40	FA001879	Aug 13/08	Aug 13/09
Attenuator	Narda	776B-20	FA001153	COU	COU
Frequency Counter	HP	5352B	FA001915	Dec 3/07	Dec 3/08
Temperature Chamber	Thermotron	SM-16C	FA001030	NCR	NCR
Multimeter	Fluke	16	FA001831	Jan 14/08	Jan 14/09
Air probe	Fluke	None	FA001248	NCR	NCR
Electro-Magnetic Interference Test Chamber	TDK	SAC-3	FA002047	May 06/08	May 06/09
Bilog	Sunol	JB3	FA002108	Jan. 21/08	Jan. 21/09
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR	NCR
Controller	Sunol	SC104V	FA002060	NCR	NCR
Mast	Sunol	TLT2	FA002061	NCR	NCR
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Dec. 07/07	Dec. 07/08
50 Coax cable	HUBER + SUHNER	None	FA002015	Aug. 05/08	Aug. 05/09
50 Coax cable	HUBER + SUHNER	None	FA002022	July 07/08	July 07/09
Horn Antenna #2	EMCO	3115	FA000825	Jan. 15/08	Jan. 15/09
18.0 – 40.0GHz Horn Antenna	EMCO	3116	FA001847	May 12/08	May 12/09
1 – 18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 2/07	Oct 2/08
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU	COU
26 – 40.0 GHz Amplifier	NARDA	DBL-2640N610	FA001556	COU	COU

COU – Calibrate on Use

NCR – No Calibration Required

Section 4 : Results Summary

This section contains the following:

FCC Part 90 : Test Results
 FCC Part 90 Subpart Z : 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 90 : Test Results

Clause	Test Method	Test Description	Required	Result
90.205	2.1046	Output power and antenna limits	Y	PASS
90.207	2.1047	Modulation Characteristics	N	
90.209	2.1049	Occupied bandwidth	Y	PASS
90.210	2.1051	Emission Limits	Y	PASS
90.210	2.1053	Field strength of surious radiation	Y	PASS
90.213	2.1055	Frequency stability	Y	PASS
90.214	—	Transient Behavior	N	
90.219	—	Use of boosters	N	

4.2 FCC Part 90 Subpart Z : Test Results

Clause	Test Description	Required	Result
90.1319	Policies governing the use of the 3650-3700MHz Band	Y	PASS *
90.1321	Power and antenna limits	Y	PASS
90.1323	Emission Limits	Y	PASS
90.1333	Restrictions on the operation of mobile and portable stations	Y	PASS
90.1335	RF Safety	Y	PASS

Notes:

* - The EUT will incorporate a dynamic frequency selection function to comply with the contention-based protocol.

Appendix A : Test Results

Clause 90.205/90.1321 Power and antenna limits

- (a) Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 watt in any one-megahertz slice of spectrum.
- (b) In addition to the provisions in paragraph (a) of this section, transmitters operating in the 3650–3700 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:
- (1) Different information must be transmitted to each receiver.
 - (2) If the transmitter employs an antenna system that emits multiple directional beams but does not emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, *i.e.*, the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (a) of this section, as applicable. The directional antenna gain shall be computed as follows:
 - (i) The directional gain, in dBi, shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain, in dBi, of the individual element or staff having the highest gain.
 - (ii) A lower value for the directional gain than that calculated in paragraph (b)(2)(i) of this section will be accepted if sufficient evidence is presented, *e.g.*, due to shading of the array or coherence loss in the beam-forming.
 - (3) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels and if transmitted beams overlap, the power shall be reduced to ensure that the aggregate power from the overlapping beams does not exceed the limit specified in paragraph (b)(2) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (b)(2) of this section by more than 8 dB.
 - (4) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (b)(2) of this section.
- (c) Mobile and portable stations are limited to 1 watt/25 MHz EIRP. In any event, the peak EIRP density shall not exceed 40 milliwatts in any one-megahertz slice of spectrum.

Test Results: Pass

All channel bandwidths have been assessed over 4 modulation types, 64QAM, 16QAM, QPSK and BPSK. Tabular data is presented for all modulation types, but plots only include worst-case results.

Output Power
3.5MHz Channel

Frequency	Modulation	Power Setting (dBm)	Measured Power (dBm)	EIRP Limit (dBm)	Maximum Antenna Gain (dBi)
3652MHz	64QAM	25	24.99	35.4	10
	16QAM	25	24.96	35.4	10
	QPSK	25	24.93	35.4	10
	BPSK	25	24.85	35.4	10
3675MHz	64QAM	25	24.56	35.4	10
	16QAM	25	24.46	35.4	10
	QPSK	25	24.48	35.4	10
	BPSK	25	24.49	35.4	10
3698MHz	64QAM	25	24.23	35.4	10
	16QAM	25	24.28	35.4	10
	QPSK	25	24.22	35.4	10
	BPSK	25	24.19	35.4	10

PSD
3.5MHz Channel

Frequency	Modulation	Power Setting (dBm)	Measured PSD (dBm)	EIRP PSD Limit (dBm)	Maximum Antenna Gain (dBi)
3652MHz	64QAM	25	20.70	30.0	9
	16QAM	25	20.89	30.0	9
	QPSK	25	20.84	30.0	9
	BPSK	25	20.76	30.0	9
3675MHz	64QAM	25	20.26	30.0	9
	16QAM	25	20.18	30.0	9
	QPSK	25	20.22	30.0	9
	BPSK	25	20.51	30.0	9
3698MHz	64QAM	25	19.91	30.0	9
	16QAM	25	19.95	30.0	9
	QPSK	25	20.02	30.0	9
	BPSK	25	19.78	30.0	9

When using a 3.5MHz channel, any gain above 9dBi, the power setting must be reduced by Gain – 9.



**Output Power
7MHz Channel**

Frequency	Modulation	Power Setting (dBm)	Measured Power (dBm)	EIRP Limit (dBm)	Maximum Antenna Gain (dBi)
3653.5MHz	64QAM	25	25.11	38.5	13
	16QAM	25	25.08	38.5	13
	QPSK	25	25.11	38.5	13
	BPSK	25	25.10	38.5	13
3675MHz	64QAM	25	24.51	38.5	13
	16QAM	25	24.53	38.5	13
	QPSK	25	24.46	38.5	13
	BPSK	25	24.45	38.5	13
3696.5MHz	64QAM	25	24.35	38.5	13
	16QAM	25	24.33	38.5	13
	QPSK	25	24.35	38.5	13
	BPSK	25	24.33	38.5	13

**PSD
7MHz Channel**

Frequency	Modulation	Power Setting (dBm)	Measured PSD (dBm)	EIRP PSD Limit (dBm)	Maximum Antenna Gain (dBi)
3653.5MHz	64QAM	25	18.60	30.0	11
	16QAM	25	18.61	30.0	11
	QPSK	25	18.58	30.0	11
	BPSK	25	17.75	30.0	11
3675MHz	64QAM	25	17.23	30.0	11
	16QAM	25	17.18	30.0	11
	QPSK	25	17.19	30.0	11
	BPSK	25	17.22	30.0	11
3696.5MHz	64QAM	25	17.03	30.0	11
	16QAM	25	17.01	30.0	11
	QPSK	25	17.03	30.0	11
	BPSK	25	17.08	30.0	11

When using a 7MHz channel, any gain above 11dBi, the power setting must be reduced by Gain – 11.

Output Power
14MHz Channel

Frequency	Modulation	Power Setting (dBm)	Measured Power (dBm)	EIRP Limit (dBm)	Maximum Antenna Gain (dBi)
3657MHz	64QAM	25	25.19	41.46	16
	16QAM	25	25.20	41.46	16
	QPSK	25	25.20	41.46	16
	BPSK	25	25.18	41.46	16
3675MHz	64QAM	25	24.75	41.46	16
	16QAM	25	24.75	41.46	16
	QPSK	25	24.74	41.46	16
	BPSK	25	24.76	41.46	16
3693MHz	64QAM	25	24.19	41.46	16
	16QAM	25	24.18	41.46	16
	QPSK	25	24.17	41.46	16
	BPSK	25	24.19	41.46	16

PSD
14MHz Channel

Frequency	Modulation	Power Setting (dBm)	Measured PSD (dBm)	EIRP PSD Limit (dBm)	Maximum Antenna Gain (dBi)
3657MHz	64QAM	25	14.95	30.0	14
	16QAM	25	14.92	30.0	14
	QPSK	25	14.92	30.0	14
	BPSK	25	15.77	30.0	14
3675MHz	64QAM	25	14.53	30.0	14
	16QAM	25	14.49	30.0	14
	QPSK	25	14.52	30.0	14
	BPSK	25	14.58	30.0	14
3693MHz	64QAM	25	14.44	30.0	14
	16QAM	25	14.42	30.0	14
	QPSK	25	14.35	30.0	14
	BPSK	25	14.27	30.0	14

When using a 14MHz channel, any gain above 14dBi, the power setting must be reduced by Gain – 14.

**Output Power
5MHz Channel**

Frequency	Modulation	Power Setting (dBm)	Measured Power (dBm)	EIRP Limit (dBm)	Maximum Antenna Gain (dBi)
3652.5MHz	64QAM	25	24.39	37	12
	16QAM	25	24.39	37	12
	QPSK	25	24.44	37	12
	BPSK	25	24.41	37	12
3675MHz	64QAM	25	23.79	37	12
	16QAM	25	23.76	37	12
	QPSK	25	23.74	37	12
	BPSK	25	23.74	37	12
3697.5MHz	64QAM	25	24.04	37	12
	16QAM	25	24.01	37	12
	QPSK	25	23.97	37	12
	BPSK	25	23.96	37	12

**PSD
5MHz Channel**

Frequency	Modulation	Power Setting (dBm)	Measured PSD (dBm)	EIRP PSD Limit (dBm)	Maximum Antenna Gain (dBi)
3657MHz	64QAM	25	18.80	30.0	11
	16QAM	25	18.81	30.0	11
	QPSK	25	18.80	30.0	11
	BPSK	25	18.83	30.0	11
3675MHz	64QAM	25	18.74	30.0	11
	16QAM	25	18.69	30.0	11
	QPSK	25	18.63	30.0	11
	BPSK	25	18.63	30.0	11
3693MHz	64QAM	25	18.58	30.0	11
	16QAM	25	18.74	30.0	11
	QPSK	25	18.53	30.0	11
	BPSK	25	18.54	30.0	11

When using a 5MHz channel, any gain above 11dBi, the power setting must be reduced by Gain – 11.



**Output Power
10MHz Channel**

Frequency	Modulation	Power Setting (dBm)	Measured Power (dBm)	EIRP Limit (dBm)	Maximum Antenna Gain (dBi)
3655MHz	64QAM	25	24.41	40	15
	16QAM	25	24.40	40	15
	QPSK	25	24.43	40	15
	BPSK	25	24.39	40	15
3675MHz	64QAM	25	23.85	40	15
	16QAM	25	23.84	40	15
	QPSK	25	23.85	40	15
	BPSK	25	23.84	40	15
3695MHz	64QAM	25	23.42	40	15
	16QAM	25	23.41	40	15
	QPSK	25	23.39	40	15
	BPSK	25	23.35	40	15

**PSD
10MHz Channel**

Frequency	Modulation	Power Setting (dBm)	Measured PSD (dBm)	EIRP PSD Limit (dBm)	Maximum Antenna Gain (dBi)
3657MHz	64QAM	25	15.84	30.0	14
	16QAM	25	15.66	30.0	14
	QPSK	25	15.64	30.0	14
	BPSK	25	15.60	30.0	14
3675MHz	64QAM	25	15.25	30.0	14
	16QAM	25	15.18	30.0	14
	QPSK	25	15.30	30.0	14
	BPSK	25	15.23	30.0	14
3693MHz	64QAM	25	14.82	30.0	14
	16QAM	25	14.86	30.0	14
	QPSK	25	14.78	30.0	14
	BPSK	25	14.82	30.0	14

When using a 10MHz channel, any gain above 14dBi, the power setting must be reduced by Gain - 14.



**Output Power
20MHz Channel**

Frequency	Modulation	Power Setting (dBm)	Measured Power (dBm)	EIRP Limit (dBm)	Maximum Antenna Gain (dBi)
3660MHz	64QAM	25	24.34	43.0	18
	16QAM	25	24.39	43.0	18
	QPSK	25	24.37	43.0	18
	BPSK	25	24.39	43.0	18
3675MHz	64QAM	25	23.96	43.0	18
	16QAM	25	23.92	43.0	18
	QPSK	25	23.91	43.0	18
	BPSK	25	23.85	43.0	18
3690MHz	64QAM	25	23.82	43.0	18
	16QAM	25	23.81	43.0	18
	QPSK	25	23.85	43.0	18
	BPSK	25	23.84	43.0	18

**PSD
20MHz Channel**

Frequency	Modulation	Power Setting (dBm)	Measured PSD (dBm)	EIRP PSD Limit (dBm)	Maximum Antenna Gain (dBi)
3660MHz	64QAM	25	12.65	30.0	17
	16QAM	25	12.69	30.0	17
	QPSK	25	12.62	30.0	17
	BPSK	25	12.72	30.0	17
3675MHz	64QAM	25	12.35	30.0	17
	16QAM	25	12.34	30.0	17
	QPSK	25	12.35	30.0	17
	BPSK	25	12.39	30.0	17
3690MHz	64QAM	25	12.30	30.0	17
	16QAM	25	12.25	30.0	17
	QPSK	25	12.34	30.0	17
	BPSK	25	12.41	30.0	17

When using a 20MHz channel, any gain above 17dBi, the power setting must be reduced by Gain – 17.

Output Power
28MHz Channel

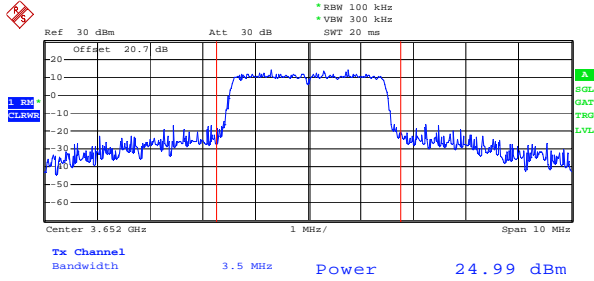
Frequency	Modulation	Power Setting (dBm)	Measured Power (dBm)	EIRP Limit (dBm)	Maximum Antenna Gain (dBi)
3664MHz	64QAM	25	25.05	44.0	18
	16QAM	25	25.03	44.0	18
	QPSK	25	24.99	44.0	18
	BPSK	25	24.95	44.0	18
3675MHz	64QAM	25	24.72	44.0	18
	16QAM	25	24.71	44.0	18
	QPSK	25	24.72	44.0	18
	BPSK	25	24.72	44.0	18
3686MHz	64QAM	25	24.62	44.0	18
	16QAM	25	24.63	44.0	18
	QPSK	25	24.62	44.0	18
	BPSK	25	24.58	44.0	18

PSD
28MHz Channel

Frequency	Modulation	Power Setting (dBm)	Measured PSD (dBm)	EIRP PSD Limit (dBm)	Maximum Antenna Gain (dBi)
3664MHz	64QAM	25	11.91	30.0	18
	16QAM	25	11.90	30.0	18
	QPSK	25	11.97	30.0	18
	BPSK	25	11.88	30.0	18
3675MHz	64QAM	25	11.59	30.0	18
	16QAM	25	11.56	30.0	18
	QPSK	25	11.61	30.0	18
	BPSK	25	11.65	30.0	18
3686MHz	64QAM	25	11.62	30.0	18
	16QAM	25	11.74	30.0	18
	QPSK	25	11.60	30.0	18
	BPSK	25	11.76	30.0	18

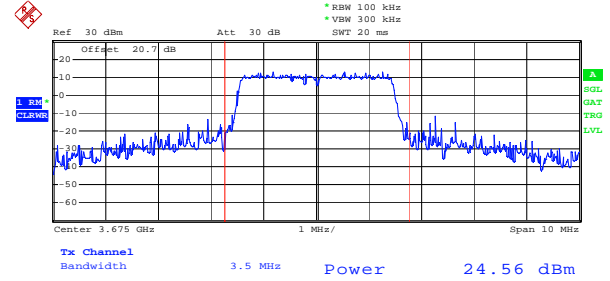
When using a 28MHz channel, any gain above 18dBi, the power setting must be reduced by Gain – 18.

Output Power
3.5MHz – low channel



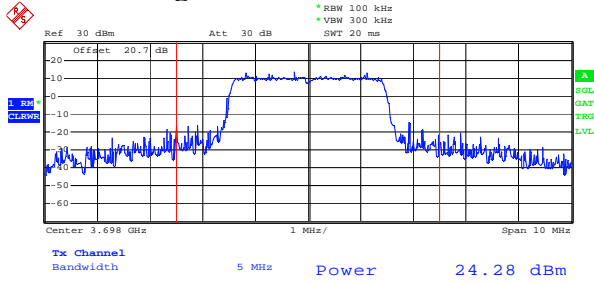
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3.5MHz – mid channel



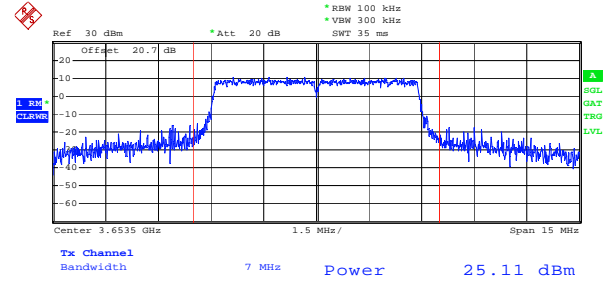
Date: 5.SEP.2008 13:22:30

3.5MHz – high channel



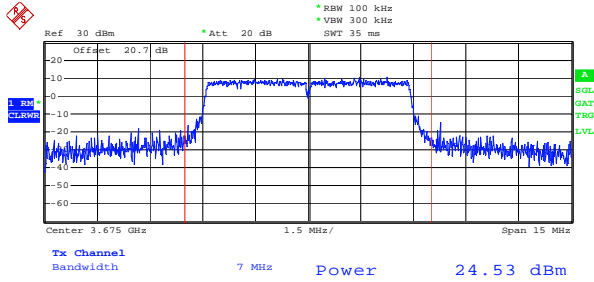
Date: 5.SEP.2008 13:50:42

7MHz – low channel

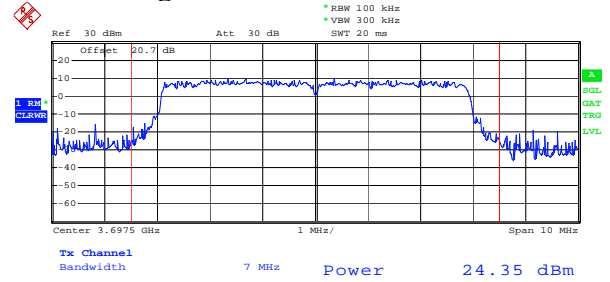


Date: 5.SEP.2008 14:23:52

7MHz – mid channel



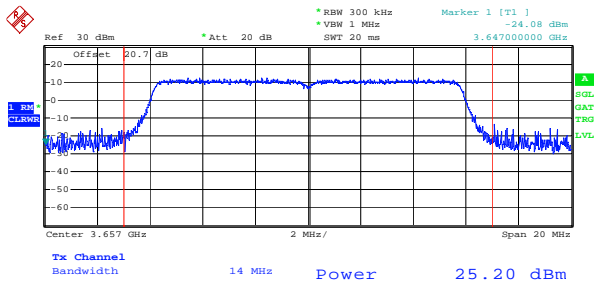
7MHz – high channel



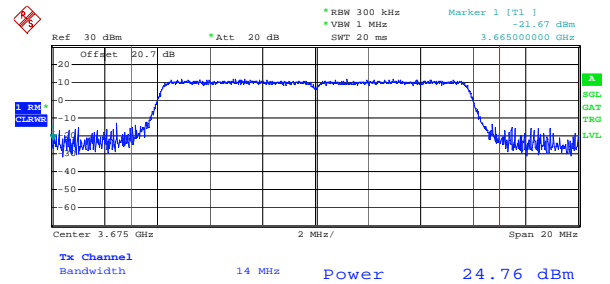
Date: 5.SEP.2008 14:22:30

Date: 5.SEP.2008 13:55:03

14MHz – low channel



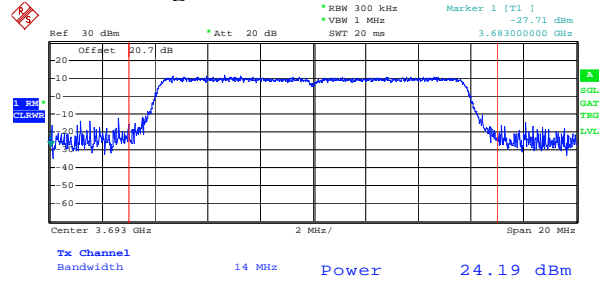
14MHz – mid channel



Date: 5.SEP.2008 14:50:26

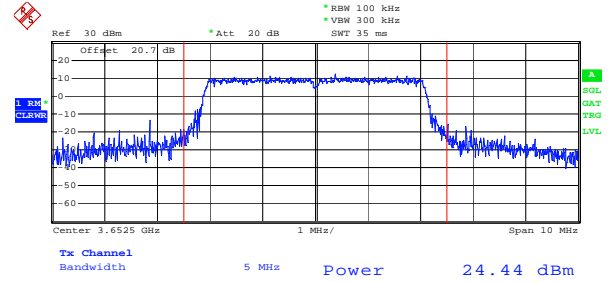
Date: 5.SEP.2008 14:52:49

14MHz – high channel



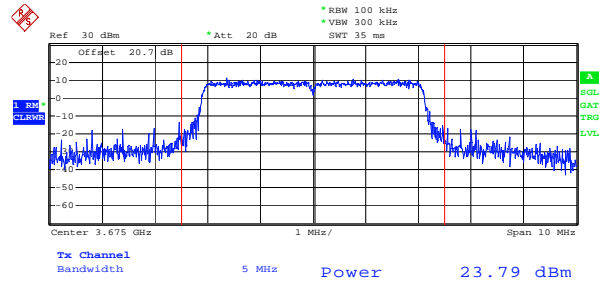
Date: 5.SEP.2008 15:31:38

5MHz – low channel



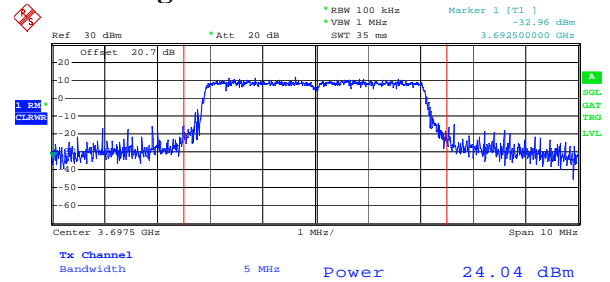
Date: 8.SEP.2008 09:16:04

5MHz – mid channel



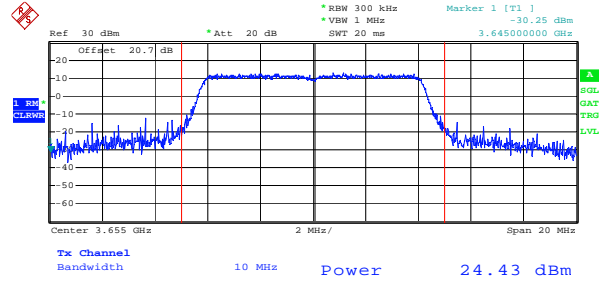
Date: 8.SEP.2008 09:14:30

5MHz – high channel



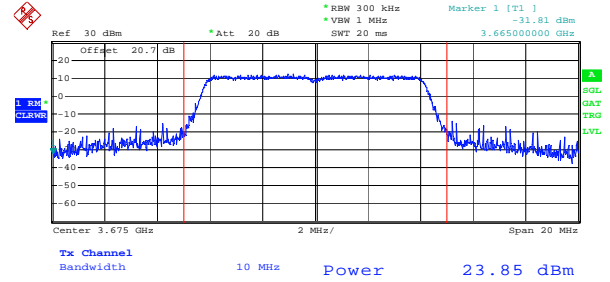
Date: 8.SEP.2008 08:32:49

10MHz – low channel



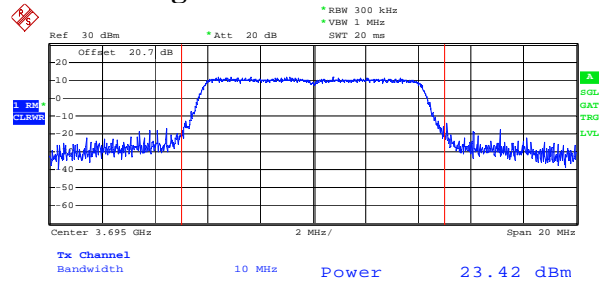
Date: 8.SEP.2008 09:32:48

10MHz – mid channel



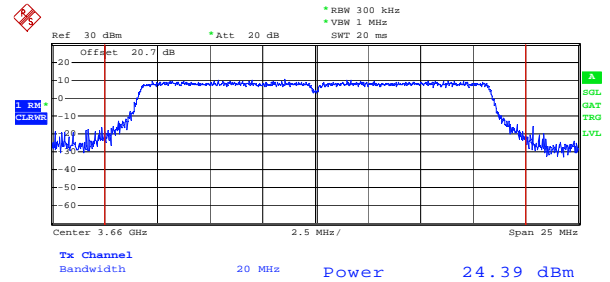
Date: 8.SEP.2008 09:39:54

10MHz – high channel



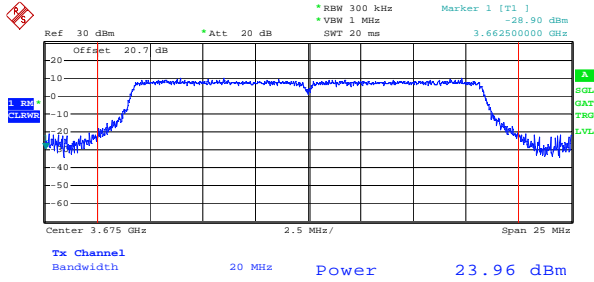
Date: 8.SEP.2008 10:02:42

20MHz – low channel



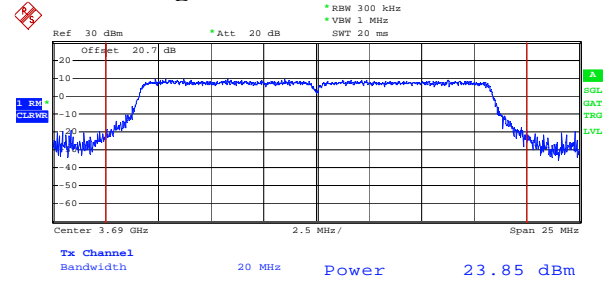
Date: 8.SEP.2008 10:29:01

20MHz – mid channel



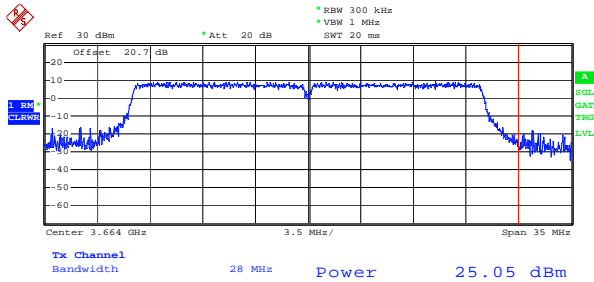
Date: 8.SEP.2008 10:27:49

20MHz – high channel



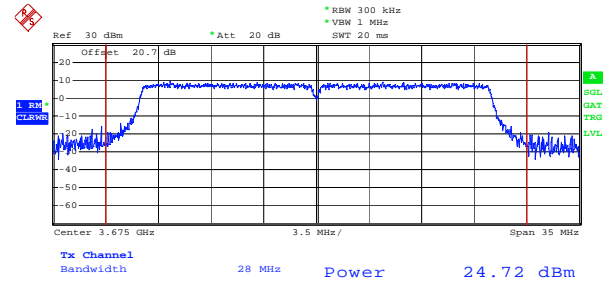
Date: 8.SEP.2008 10:05:02

28MHz – low channel



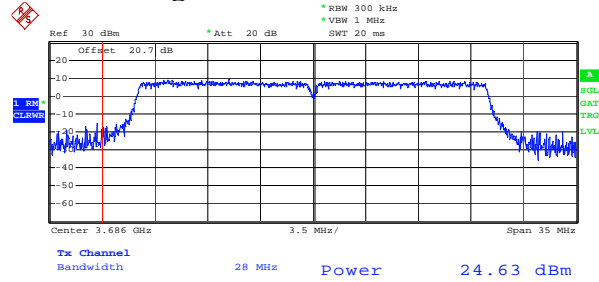
Date: 8.SEP.2008 11:21:57

28MHz – mid channel



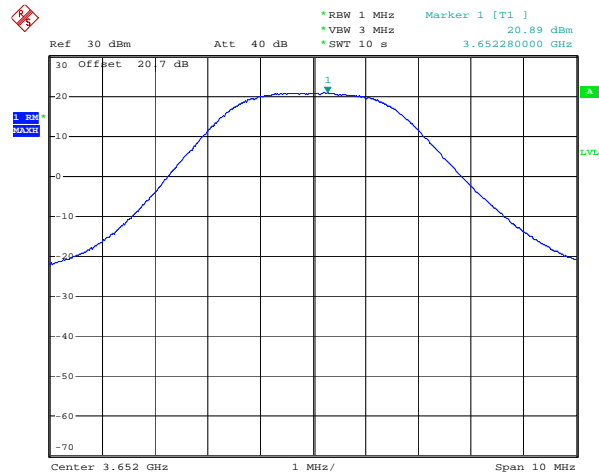
Date: 8.SEP.2008 11:22:27

28MHz – high channel



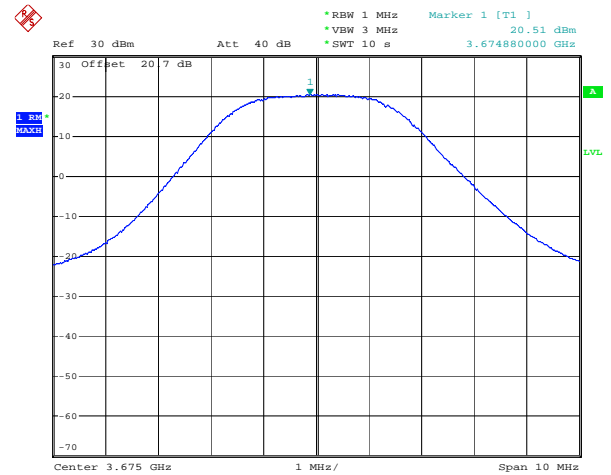
Date: 8.SEP.2008 11:52:49

PSD 3.5MHz – low channel



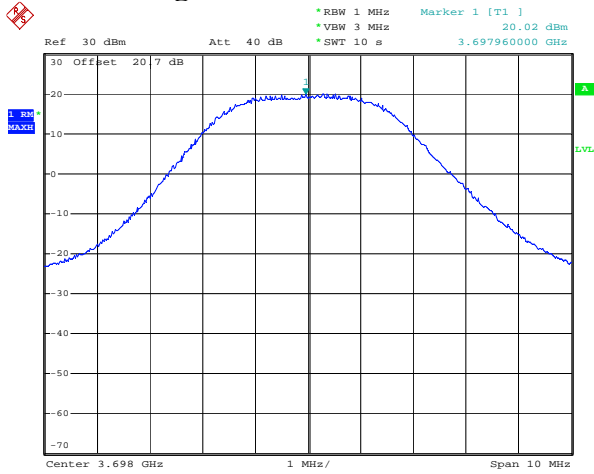
Date: 5.SEP.2008 13:14:34

3.5MHz – mid channel

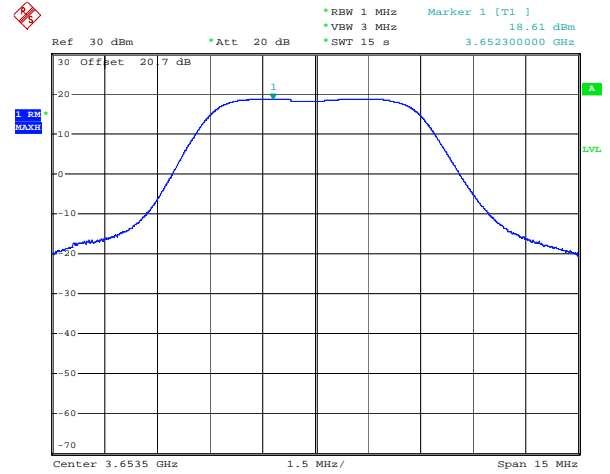


Date: 5.SEP.2008 13:32:25

3.5MHz – high channel



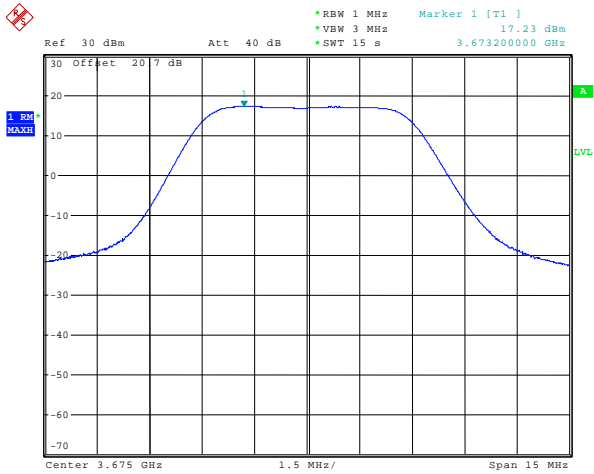
7MHz – low channel



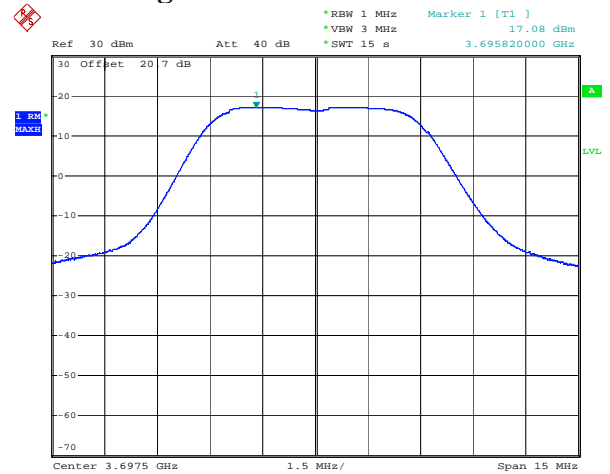
Date: 5.SEP.2008 13:47:02

Date: 5.SEP.2008 14:33:35

7MHz – mid channel

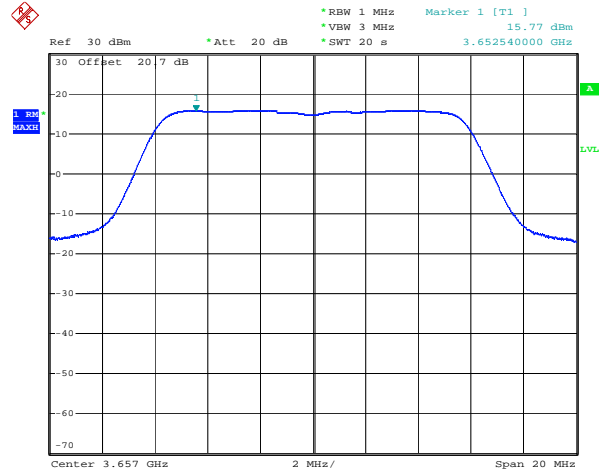


7MHz – high channel



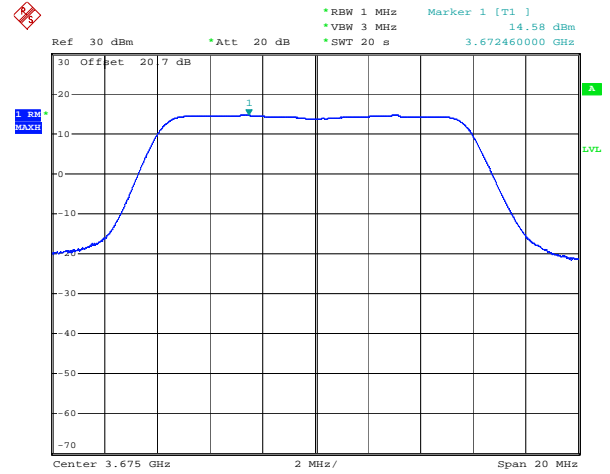
Date: 5.SEP.2008 14:04:28

14MHz – low channel



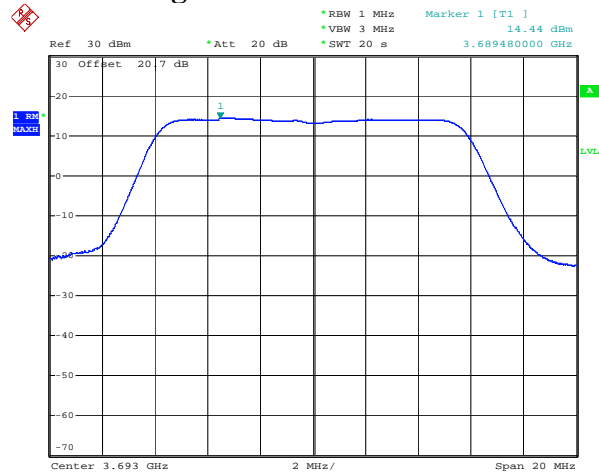
Date: 5.SEP.2008 14:47:58

14MHz – mid channel



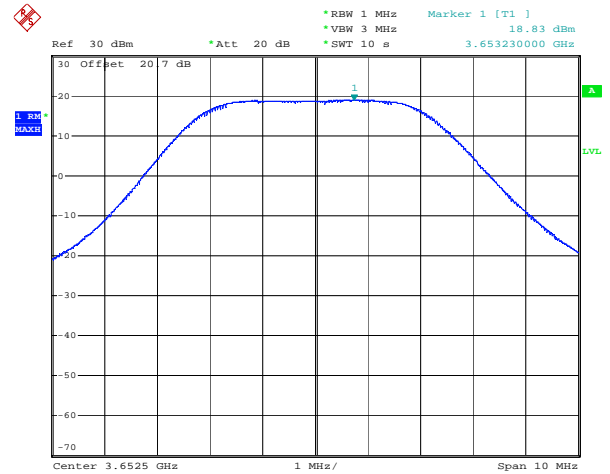
Date: 5.SEP.2008 14:54:19

14MHz – high channel



Date: 5.SEP.2008 15:04:52

5MHz – low channel



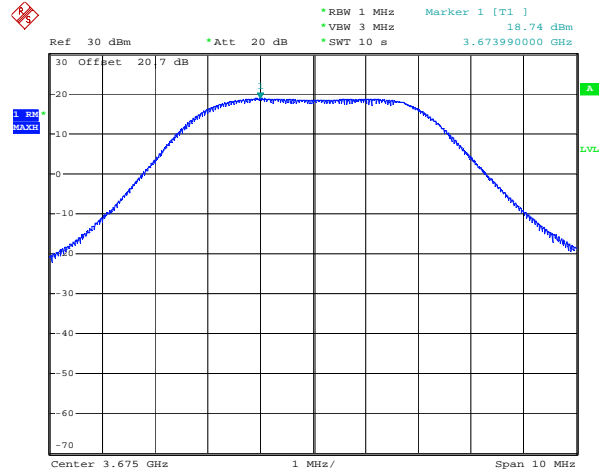
Date: 8.SEP.2008 09:19:20



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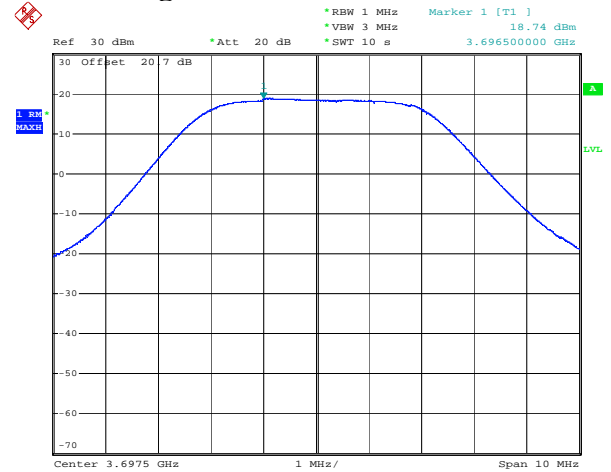
Report Number: 112659R1TRFWL
Specification: FCC Part 90 Subpart Z

5MHz – mid channel



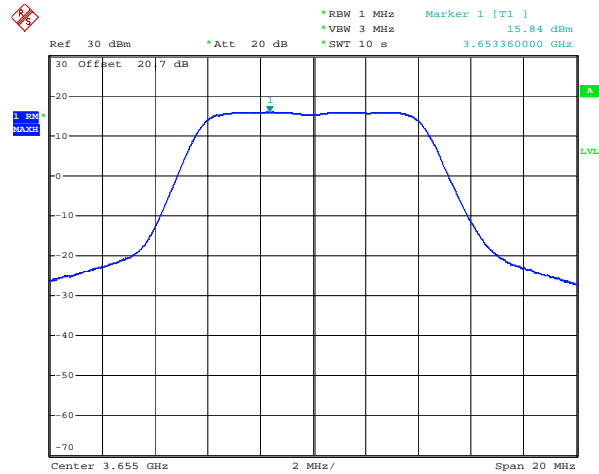
Date: 8.SEP.2008 08:49:07

5MHz – high channel



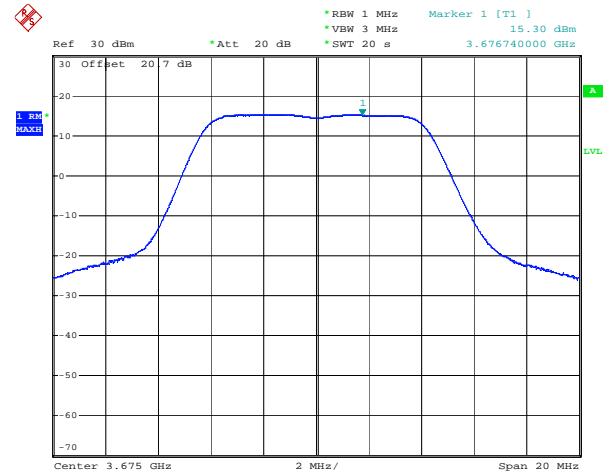
Date: 8.SEP.2008 08:44:57

10MHz – low channel



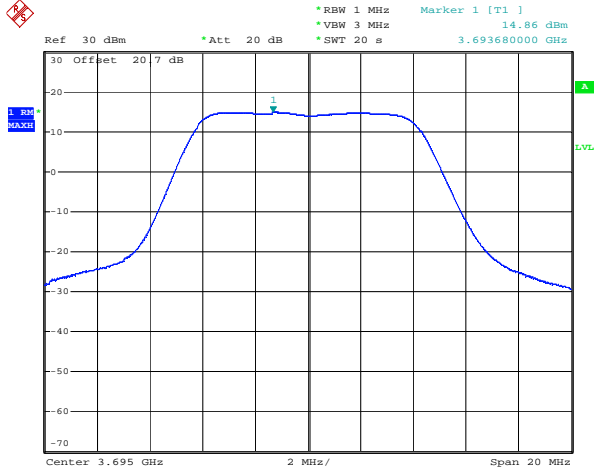
Date: 8.SEP.2008 09:26:04

10MHz – mid channel



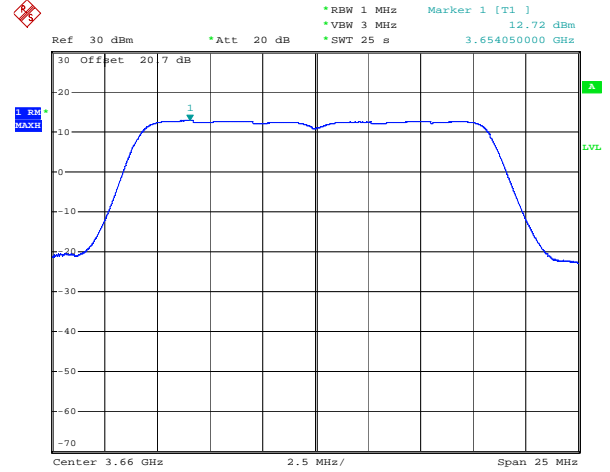
Date: 8.SEP.2008 09:43:38

10MHz – high channel



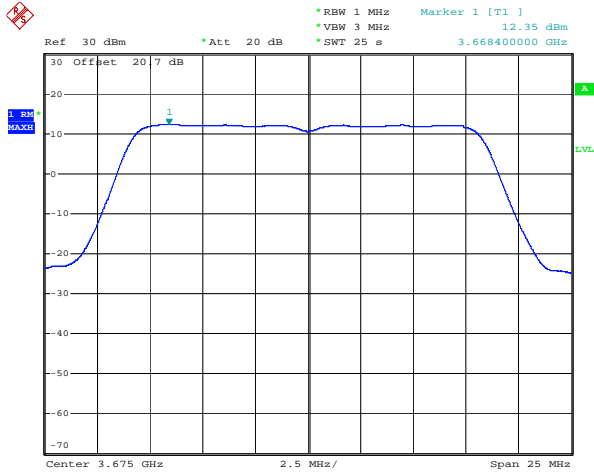
Date: 8.SEP.2008 09:57:45

20MHz – low channel



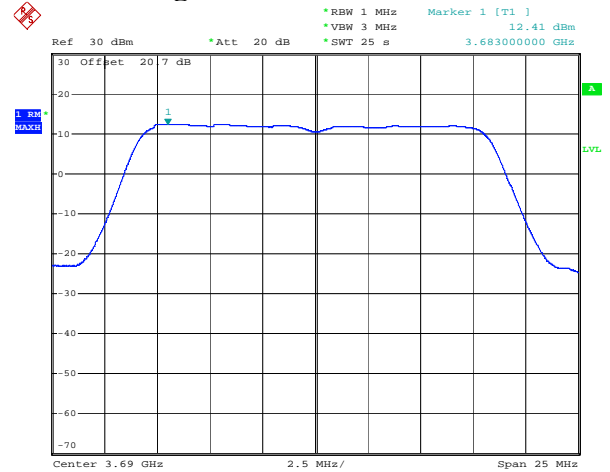
Date: 8.SEP.2008 10:32:22

20MHz – mid channel



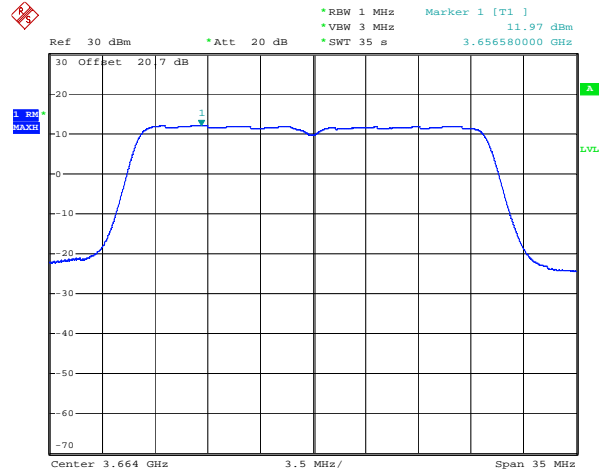
Date: 8.SEP.2008 10:18:24

20MHz – high channel



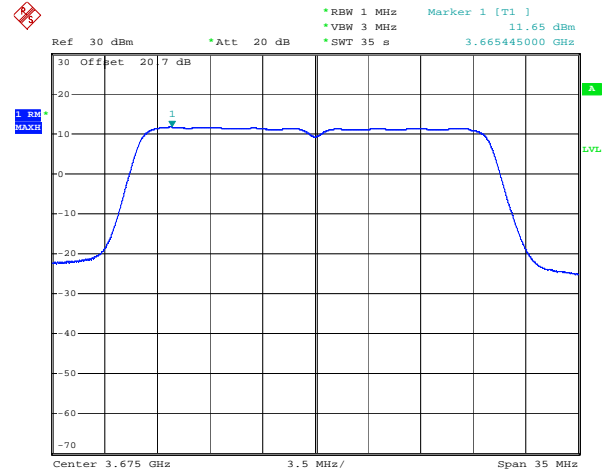
Date: 8.SEP.2008 10:09:49

28MHz – low channel



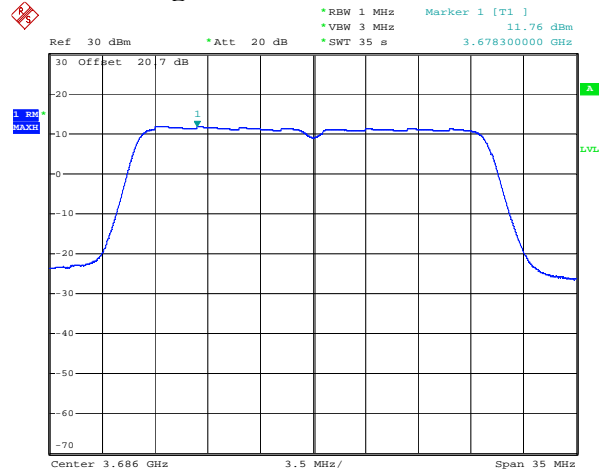
Date: 8.SEP.2008 11:08:41

28MHz – mid channel



Date: 8.SEP.2008 11:28:49

28MHz – high channel



Date: 8.SEP.2008 11:51:12

Clause 90.209 Occupied Bandwidth

(5) Unless specified elsewhere, channel spacings and bandwidths that will be authorized in the following frequency bands are given in the following Table.

Standard Channel Spacing/Bandwidth

Frequency Band (MHz)	Channel Spacing (kHz)	Authorized Bandwidth (kHz)
Below 25	--	--
25-50	20	20
72-76	20	20
150-174	7.5	20/11.25/6
216-220	6.25	20/11.25/6
220-222	5	4
406-512	6.25	20/11.25/6
806-809/851-854	12.5	20
809-824/854-869	25	20
896-901/935-940	12.5	13.6
902-928	--	--
929-930	25	20
1427-1432	12.5	12.5
2450-2483.5	--	--
Above 2500	--	--

Test Results: Pass

Measured values are 99% Occupied Bandwidth, all modulations were evaluated, but only worst-case plots are shown.

3.5MHz Channel

Modulation	3652MHz	3675MHz	3692MHz
64QAM	2.91MHz	2.92MHz	2.92MHz
16QAM	2.92MHz	2.92MHz	2.92MHz
QPSK	2.92MHz	2.93MHz	2.92MHz
BPSK	2.91MHz	2.92MHz	2.92MHz

7MHz Channel

Modulation	3653.5MHz	3675MHz	3696.5MHz
64QAM	5.76MHz	5.73MHz	5.76MHz
16QAM	5.76MHz	5.76MHz	5.76MHz
QPSK	5.76MHz	5.76MHz	5.76MHz
BPSK	5.76MHz	5.76MHz	5.76MHz

14MHz Channel

Modulation	3657MHz	3675MHz	3693MHz
64QAM	11.66MHz	11.66MHz	11.66MHz
16QAM	11.66MHz	11.66MHz	11.64MHz
QPSK	11.66MHz	11.66MHz	11.66MHz
BPSK	11.66MHz	11.66MHz	11.64MHz

5MHz Channel

Modulation	3652.5MHz	3675MHz	3697.5MHz
64QAM	4.19MHz	4.19MHz	4.18MHz
16QAM	4.19MHz	4.19MHz	4.18MHz
QPSK	4.17MHz	4.17MHz	4.18MHz
BPSK	4.19MHz	4.18MHz	4.18MHz

10MHz Channel

Modulation	3655MHz	3675MHz	3695MHz
64QAM	8.58MHz	8.56MHz	8.58MHz
16QAM	8.54MHz	8.58MHz	8.56MHz
QPSK	8.58MHz	8.58MHz	8.52MHz
BPSK	8.54MHz	8.58MHz	8.56MHz

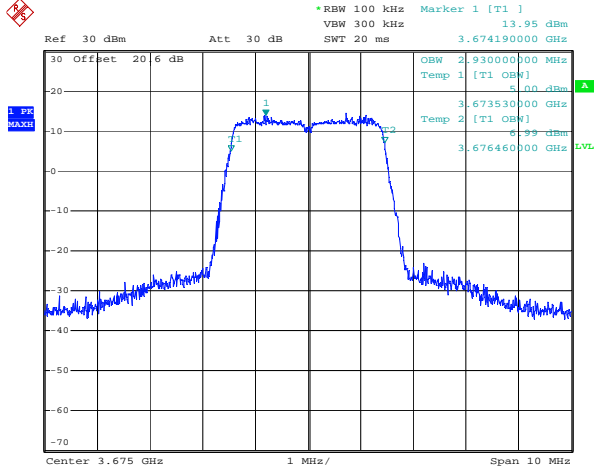
20MHz Channel

Modulation	3660MHz	3675MHz	3690MHz
64QAM	16.68MHz	16.71MHz	16.65MHz
16QAM	16.71MHz	16.71MHz	16.68MHz
QPSK	16.68MHz	16.68MHz	16.71MHz
BPSK	16.71MHz	16.74MHz	16.71MHz

28MHz Channel

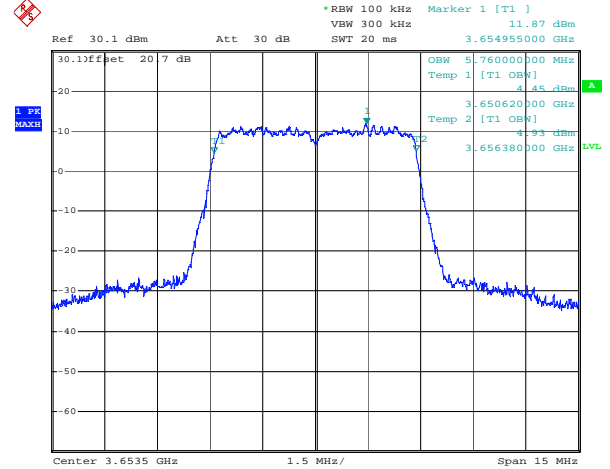
Modulation	3664MHz	3675MHz	3686MHz
64QAM	22.995MHz	22.995MHz	22.995MHz
16QAM	22.995MHz	22.995MHz	22.995MHz
QPSK	22.995MHz	22.995MHz	22.995MHz
BPSK	22.960MHz	22.995MHz	22.995MHz

3.5MHz Channel



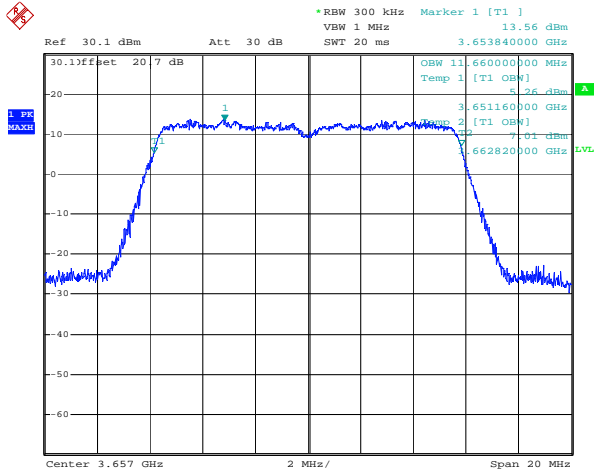
Date: 2.SEP.2008 12:21:14

7MHz Channel



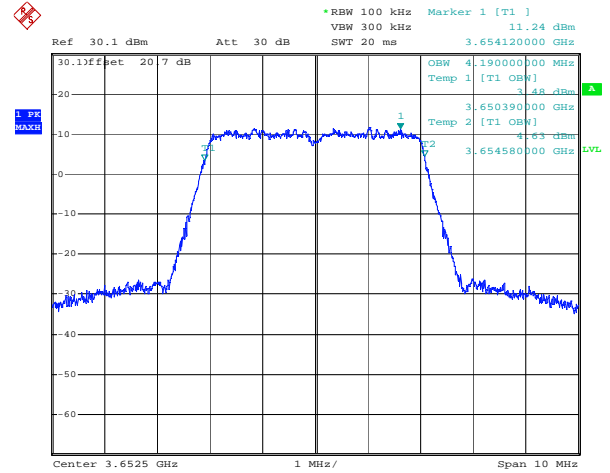
Date: 2.SEP.2008 12:58:19

14MHz Channel



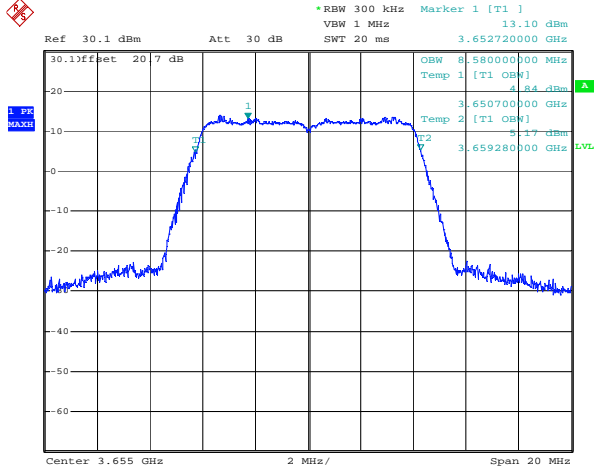
Date: 2.SEP.2008 13:12:56

5MHz Channel



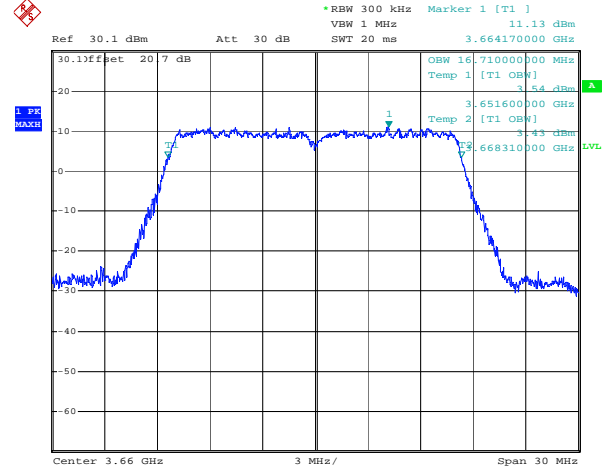
Date: 2.SEP.2008 13:41:34

10MHz Channel



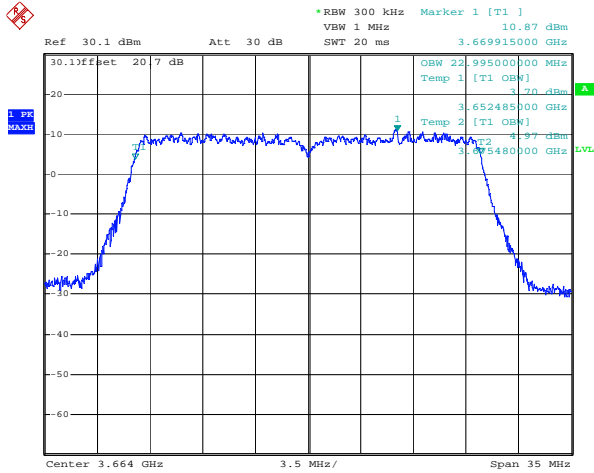
Date: 2.SEP.2008 14:14:14

20MHz Channel



Date: 2.SEP.2008 14:17:37

28MHz Channel



Date: 2.SEP.2008 14:27:12

Clause 90.210(n)/90.1323 Emission Limits Spurious emissions at the antenna terminal

90.210 (n) Other frequency bands. Transmitters designed for operation under this part on frequencies other than listed in this section must meet the emission mask requirements of Emission Mask B. Equipment operating under this part on frequencies allocated to but shared with the Federal Government, must meet the applicable Federal Government technical standards.

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

90.1323 (a) The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

Test Results: Pass

Additional Observations:

All modulations were evaluated, but only worst-case plots are shown.

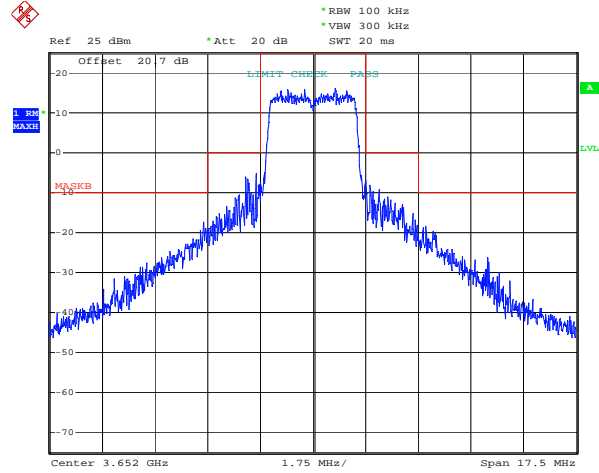


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Emission Mask – 90.210(b)

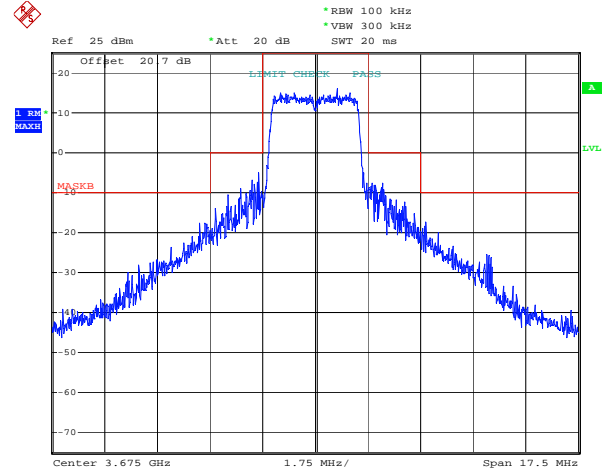
3.5MHz Channel

Low Channel



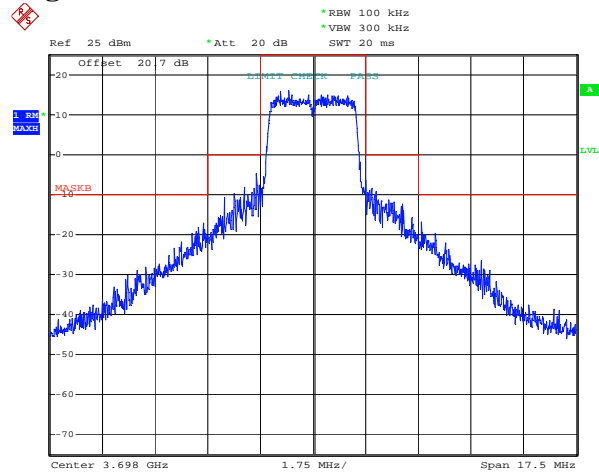
Date: 8.SEP.2008 14:01:44

Mid Channel



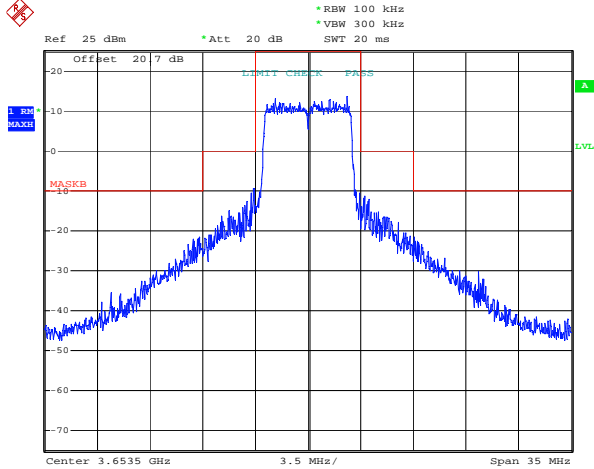
Date: 8.SEP.2008 14:01:07

High Channel



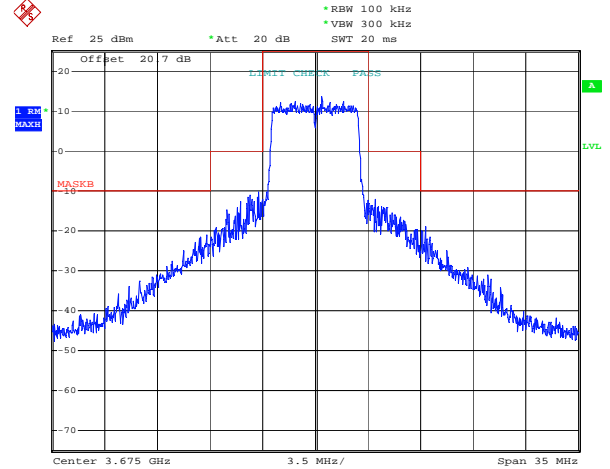
Date: 8.SEP.2008 13:58:32

**7MHz Channel
 Low Channel**



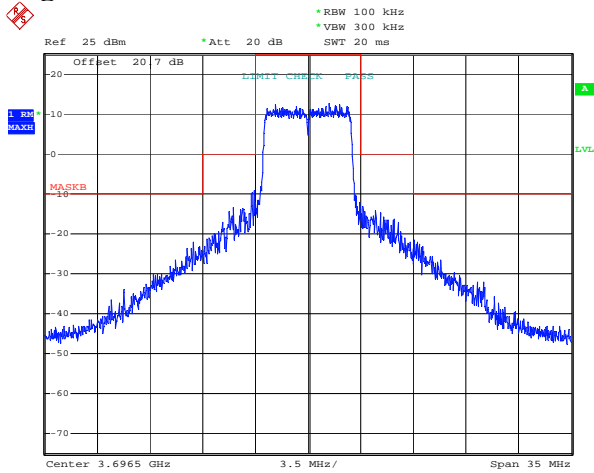
Date: 8.SEP.2008 13:53:07

Mid Channel



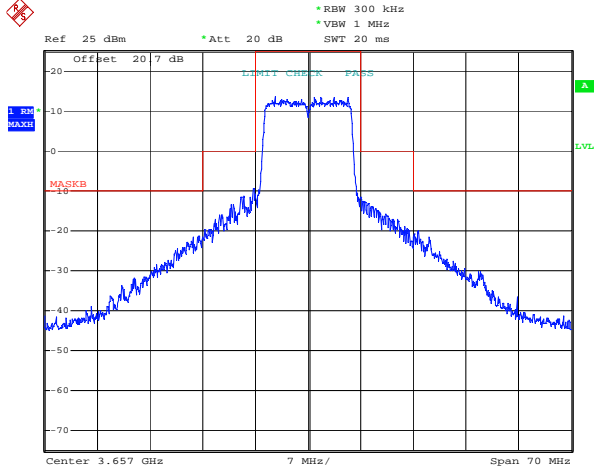
Date: 8.SEP.2008 13:53:35

High Channel



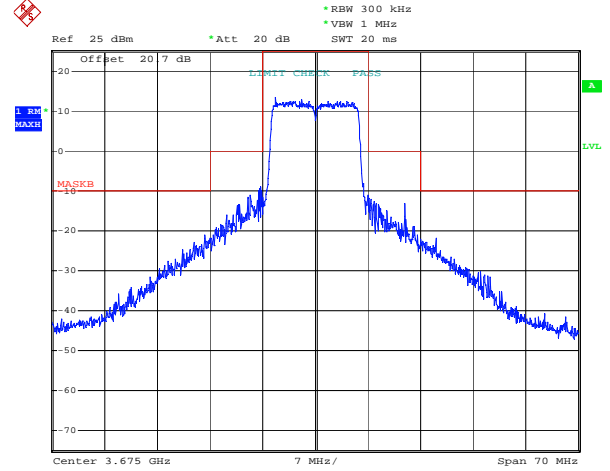
Date: 8.SEP.2008 13:56:14

**14MHz Channel
 Low Channel**



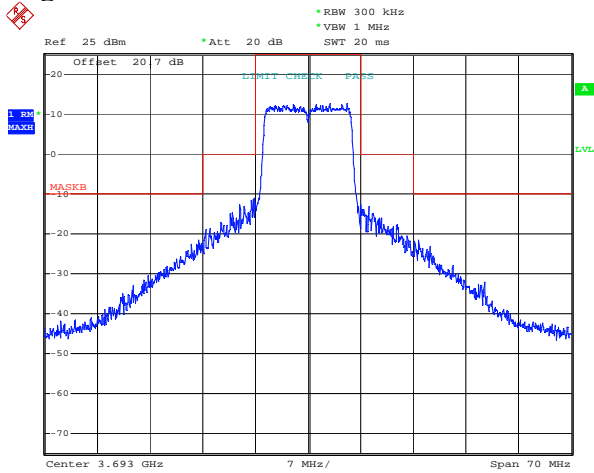
Date: 8.SEP.2008 13:49:08

Mid Channel



Date: 8.SEP.2008 13:48:24

High Channel



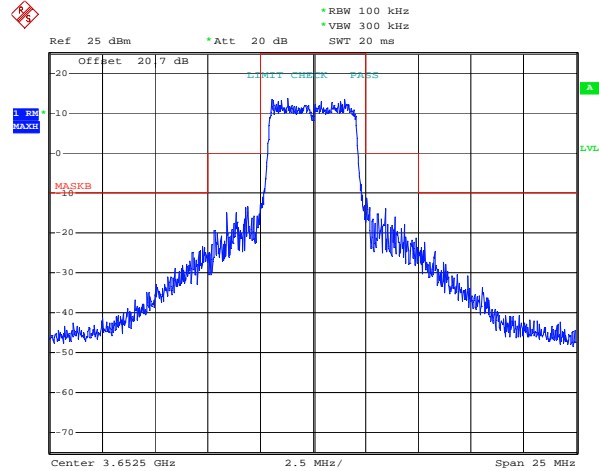
Date: 8.SEP.2008 13:45:45



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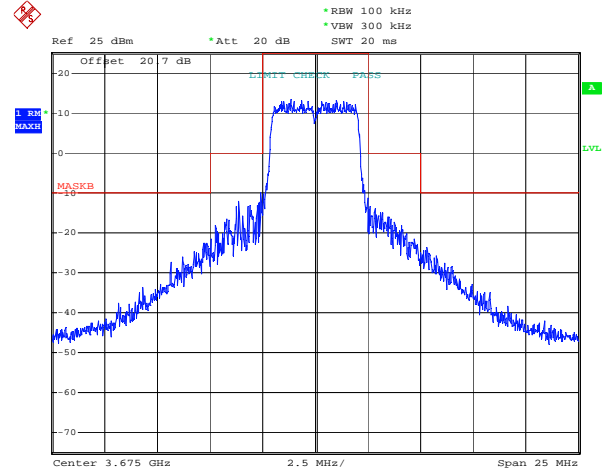
Report Number: 112659R1TRFWL
Specification: FCC Part 90 Subpart Z

5MHz Channel Low Channel



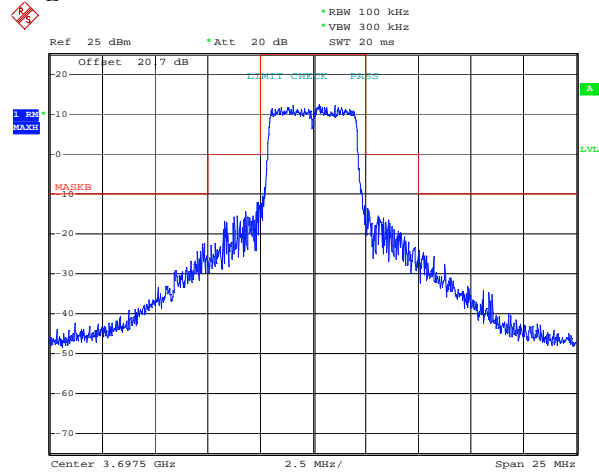
Date: 8.SEP.2008 13:26:20

Mid Channel



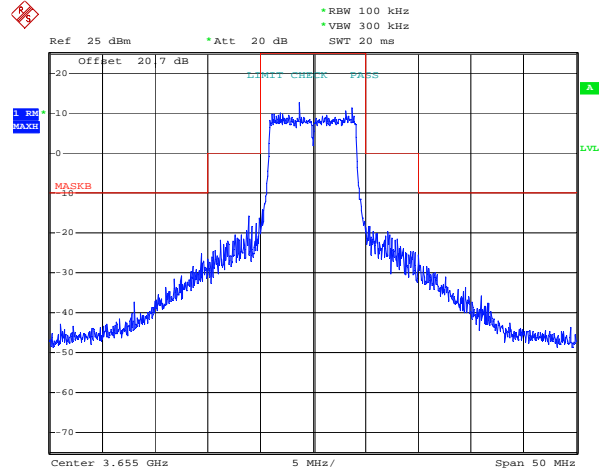
Date: 8.SEP.2008 13:26:45

High Channel



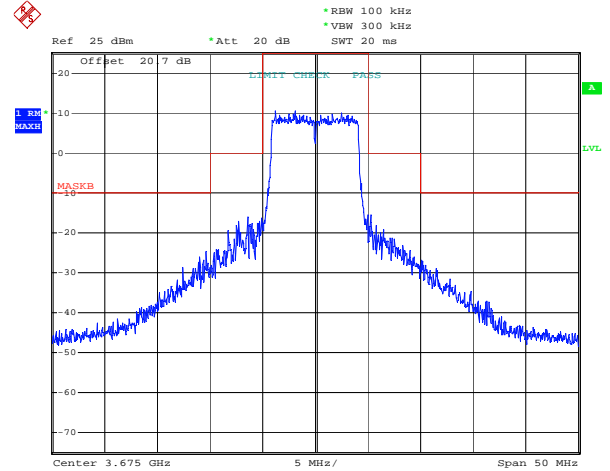
Date: 8.SEP.2008 13:29:09

**10MHz Channel
 Low Channel**



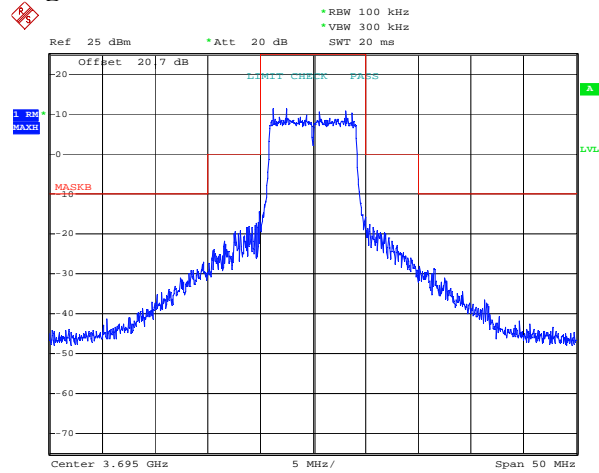
Date: 8.SEP.2008 13:22:25

Mid Channel



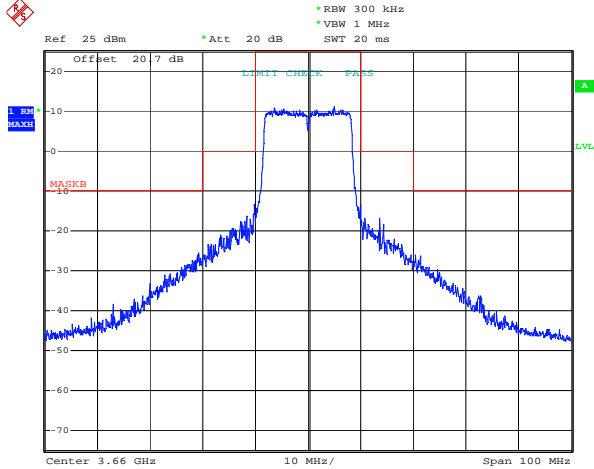
Date: 8.SEP.2008 13:21:59

High Channel



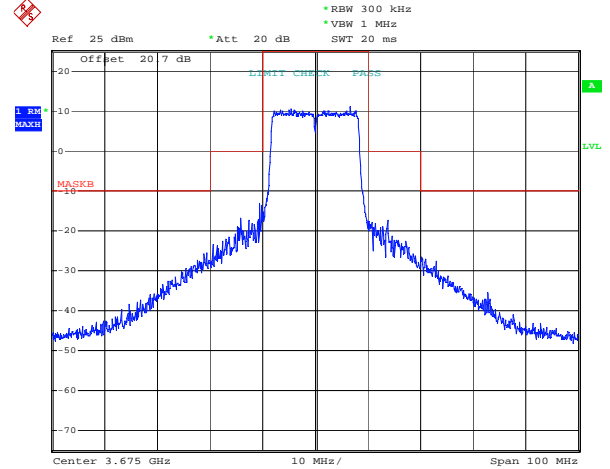
Date: 8.SEP.2008 13:19:17

**20MHz Channel
 Low Channel**



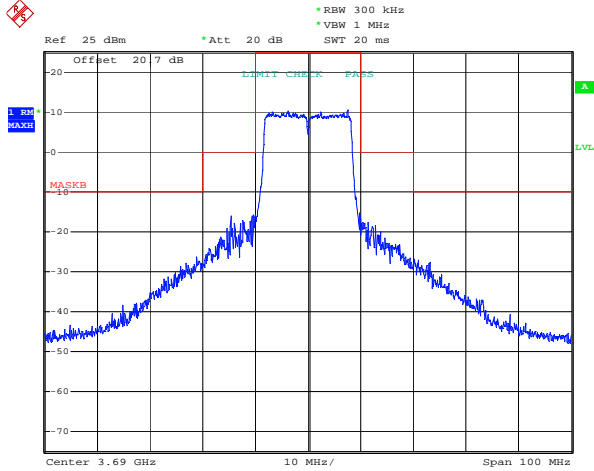
Date: 8.SEP.2008 13:00:18

Mid Channel



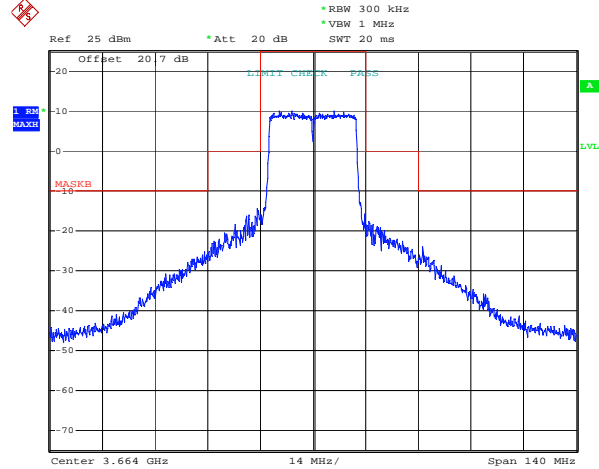
Date: 8.SEP.2008 13:00:43

High Channel



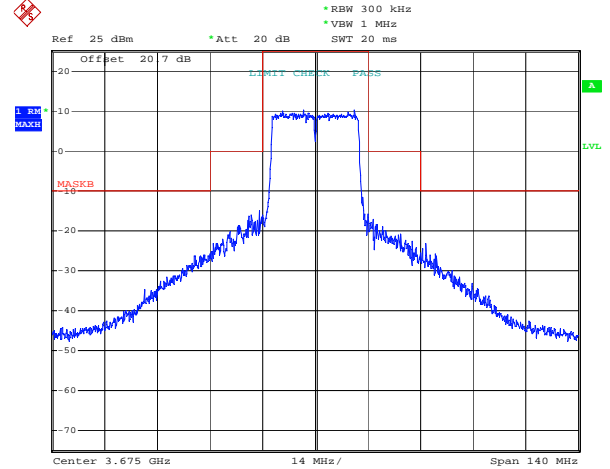
Date: 8.SEP.2008 13:03:25

**28MHz Channel
 Low Channel**



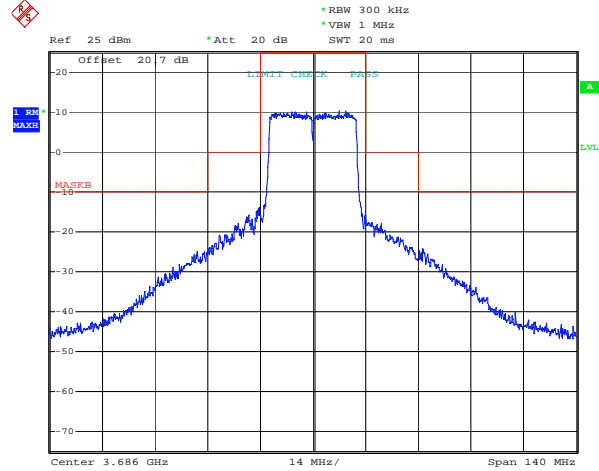
Date: 8.SEP.2008 12:55:24

Mid Channel



Date: 8.SEP.2008 12:54:52

High Channel

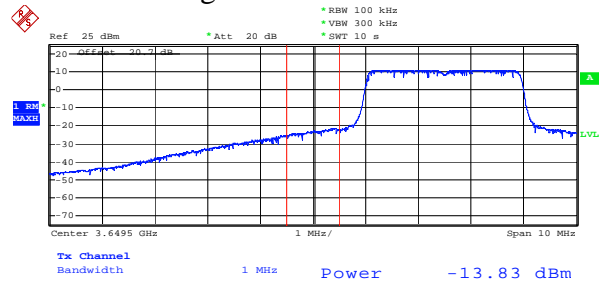


Date: 8.SEP.2008 12:51:37



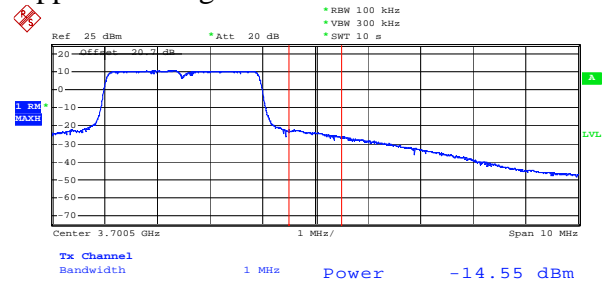
Nemko Canada Inc.

Bandedge 3.5MHz Channel Lower Bandedge



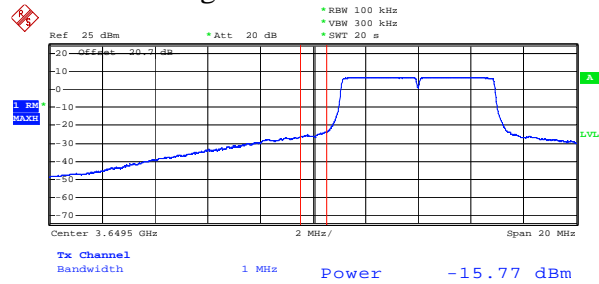
Date: 8.SEP.2008 14:29:15

Upper Bandedge



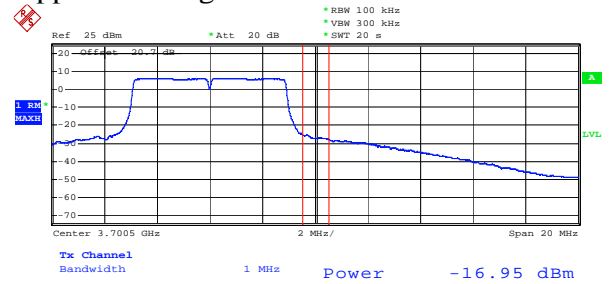
Date: 8.SEP.2008 14:26:02

7MHz Channel Lower Bandedge



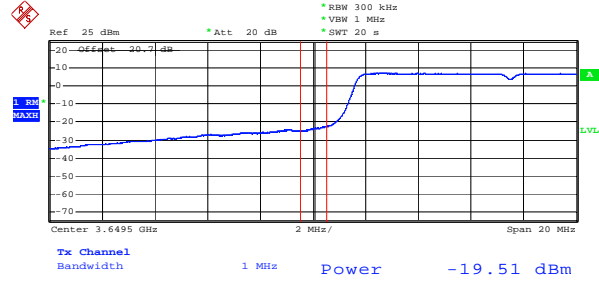
Date: 8.SEP.2008 14:37:34

Upper Bandedge



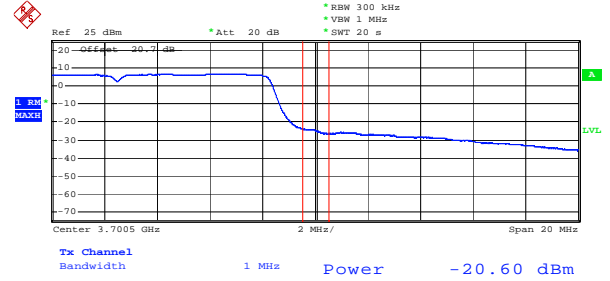
Date: 8.SEP.2008 14:56:32

**14MHz Channel
 Lower Bandedge**



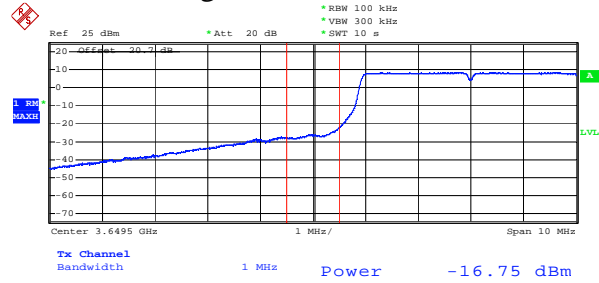
Date: 8.SEP.2008 15:26:08

Upper Bandedge



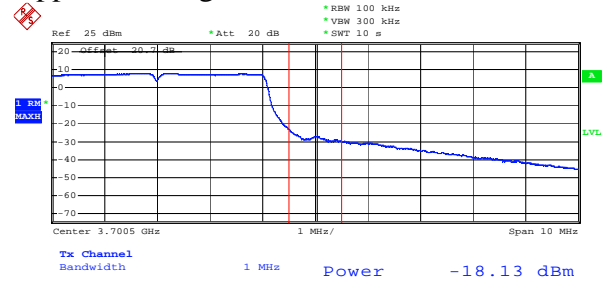
Date: 8.SEP.2008 15:08:27

**5MHz Channel
 Lower Bandedge**



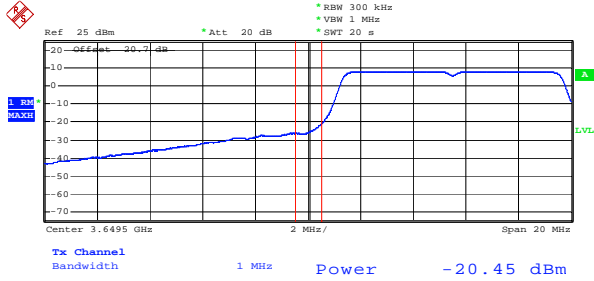
Date: 8.SEP.2008 15:31:36

Upper Bandedge



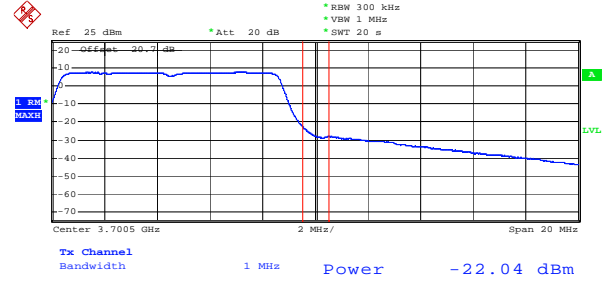
Date: 8.SEP.2008 15:51:41

**10MHz Channel
 Lower Bandedge**



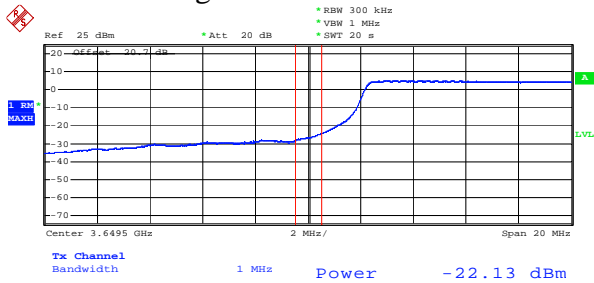
Date: 8.SEP.2008 16:14:31

Upper Bandedge



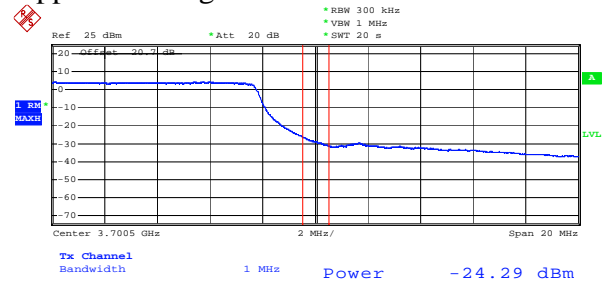
Date: 8.SEP.2008 15:58:50

**20MHz Channel
 Lower Bandedge**



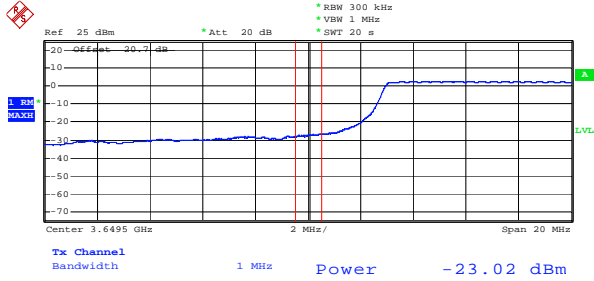
Date: 9.SEP.2008 08:01:39

Upper Bandedge



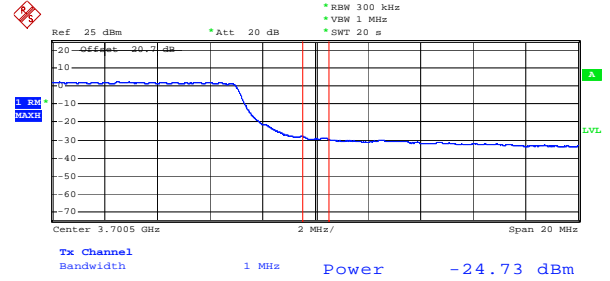
Date: 9.SEP.2008 08:28:05

**28MHz Channel
 Lower Bandedge**



Date: 9.SEP.2008 08:46:26

Upper Bandedge



Date: 9.SEP.2008 08:38:47

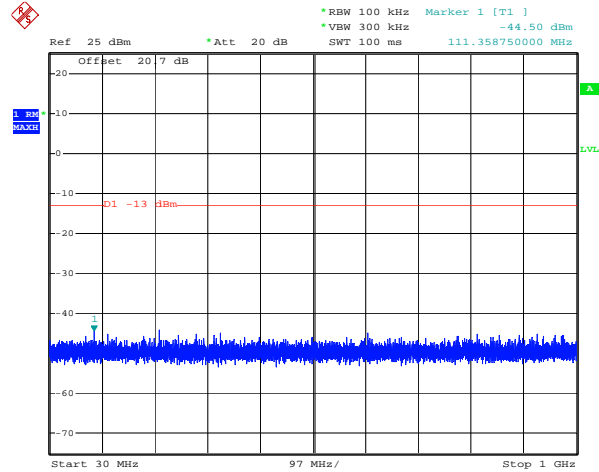


Nemko Canada Inc.

Conducted Emissions

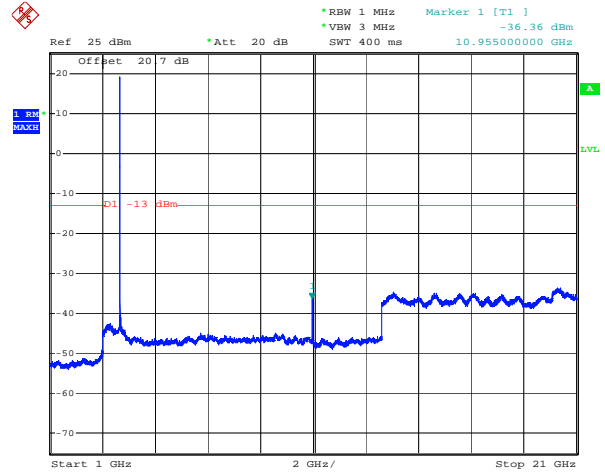
Only worst-case results are included.

Low channel 30MHz-1GHz



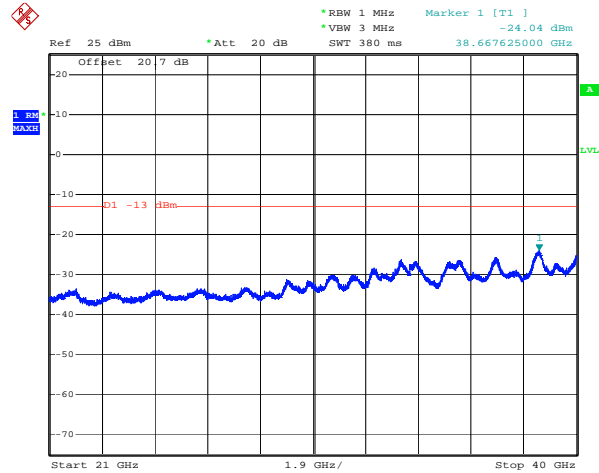
Date: 9.SEP.2008 08:53:32

1GHz-21GHz



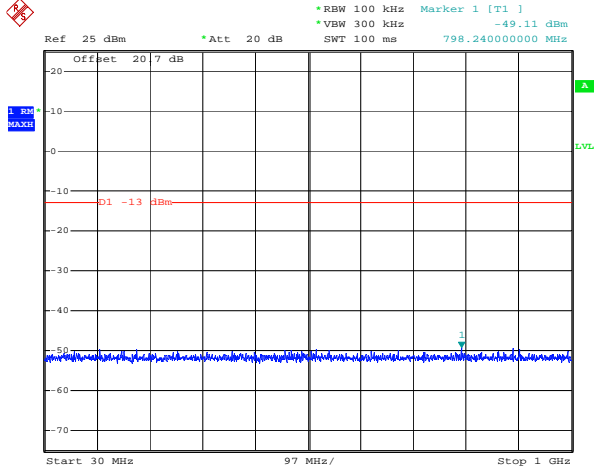
Date: 9.SEP.2008 08:54:03

21GHz-40GHz



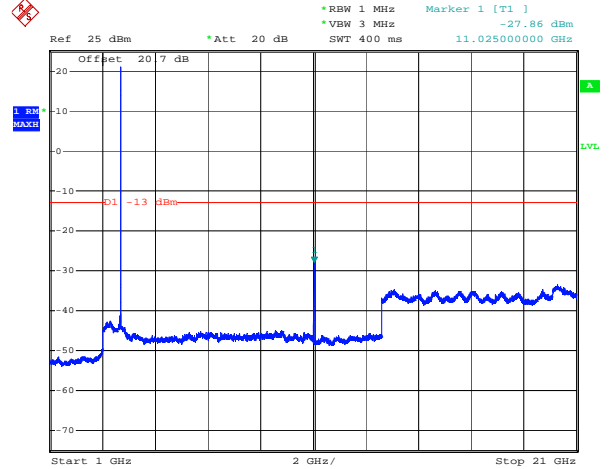
Date: 9.SEP.2008 08:54:20

Mid channel
30MHz-1GHz



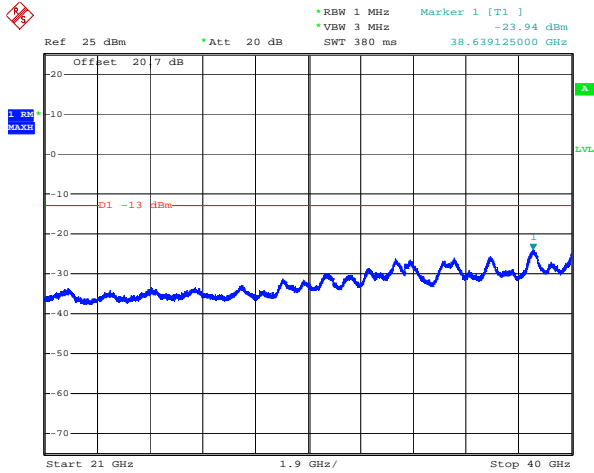
Date: 9.SEP.2008 08:50:12

1GHz-21GHz



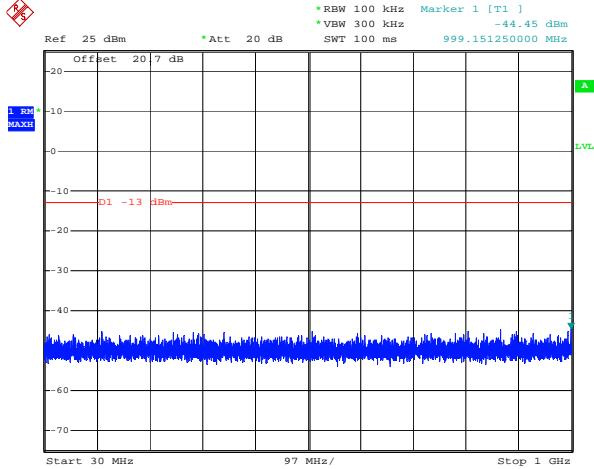
Date: 9.SEP.2008 08:51:36

21GHz-40GHz



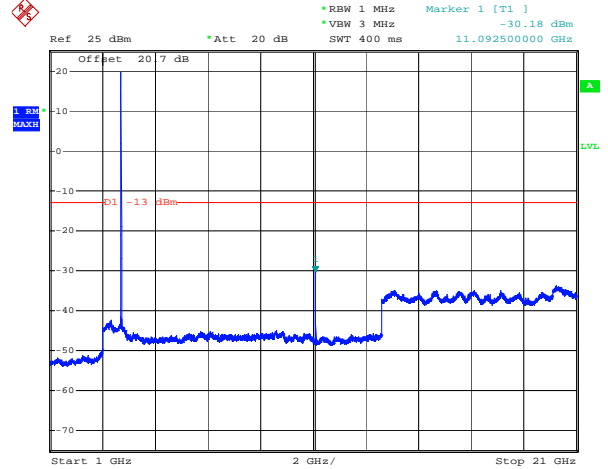
Date: 9.SEP.2008 08:51:54

High channel
30MHz-1GHz



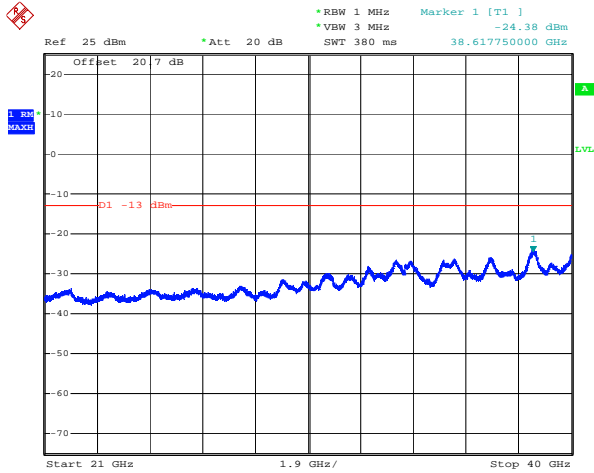
Date: 9.SEP.2008 08:53:07

1GHz-21GHz



Date: 9.SEP.2008 08:52:47

21GHz-40GHz



Date: 9.SEP.2008 08:52:21

Clause 90.210/90.1323 Field Strength of spurious radiation

90.1323 (a) The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

Test Results: Pass

Additional Observations:

The Spectrum was searched from 30MHz to the 37GHz.

All measurements were performed using a Peak Detector with 100kHz RBW below 1GHz and a 1MHz RBW above 1GHz.

Measurements below 10GHz were performed at 3 meters distance and measurements above 10GHz were performed at 1m distance.

Emissions were searched in all modulations and only worst case is included.

Frequency (MHz)	Polarization (V/H)	Reading (dBuV/m)	Correction (dB)	Emissions level (dBm)	Limit (dBm)	Margin (dB)
7348	V	54.64	-97.3	-42.66	-13	29.66
7348	H	58.33	-98.2	-39.87	-13	26.87
7304	V	53.09	-97.2	-44.11	-13	31.11
7304	H	59.21	-98.2	-38.99	-13	25.99
7396	V	53.88	-97.6	-43.72	-13	30.72
7396	H	56.35	-98.6	-45.25	-13	29.25

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	Mobile stations	
		Over 2 watts output power	2 watts or less output power
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 Results: Pass

Conditions	Frequency (Hz)	Offset (Hz)	Offset (ppm)
+50°C, Nominal power	3675000032	4736	1.29
+40°C, Nominal power	3674995118	-178	-0.05
+30°C, Nominal power	3674995074	-222	-0.06
+20°C, +15% power	3674995289	-7	0.00
+20°C, Nominal power	3674995296	0	0.00
+20°C, -15% power	3674995288	-8	0.00
+10°C, Nominal power	3674995331	35	0.01
0°C, Nominal power	3674995606	310	0.08
-10°C, Nominal power	3674996477	1181	0.32
-20°C, Nominal power	3674995152	-144	-0.04

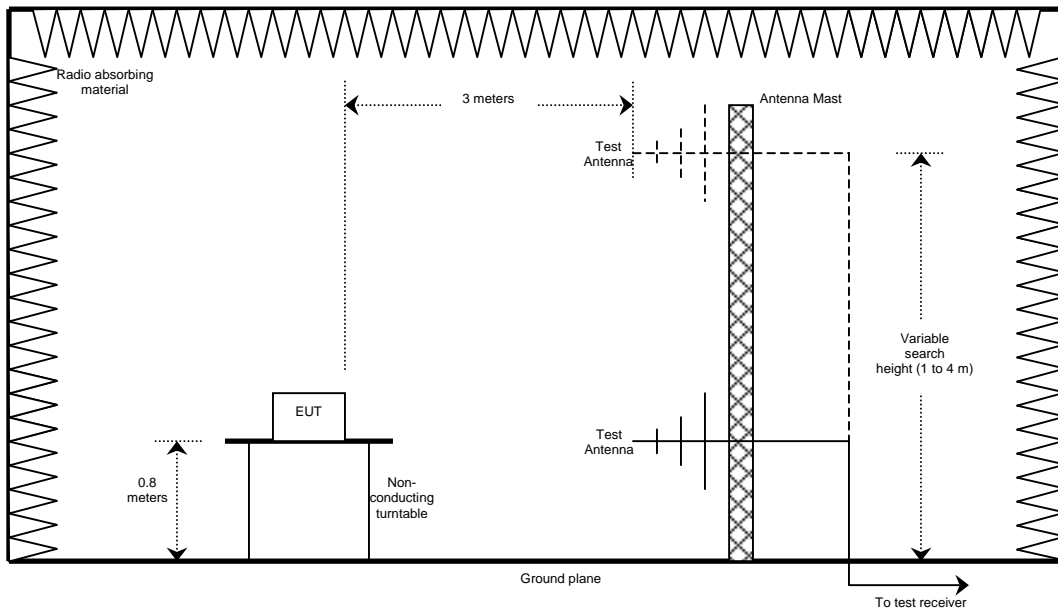
Appendix B : Setup Photographs

Radiated Spurious Emissions Setup:

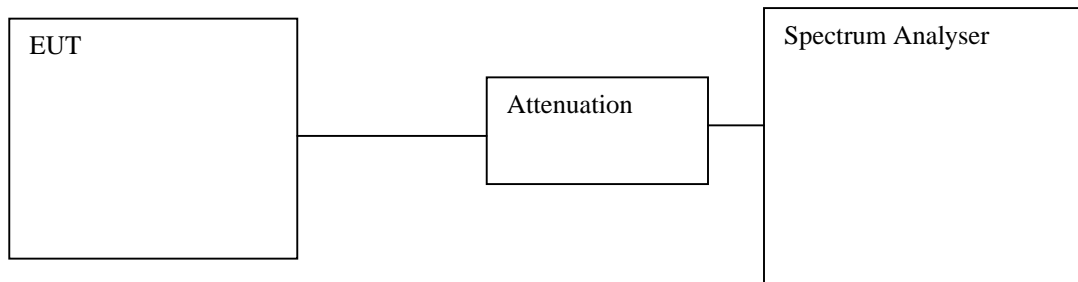


Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions, Output power, Occupied Bandwidth



Frequency Stability

