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**Test Report:** 91655TRFWL

**Applicant:** Vecima Networks  
150 Cardinal Place  
Saskatoon, SK  
S7L 6H7

**Apparatus:** MA4367 MCS Transmitter/Upconverter System

**FCC ID:** OPPMA4367

**In Accordance With:** FCC Part 27 Miscellaneous Wireless  
Communications Services

**Tested By:** Nemko Canada Inc.  
303 River Road  
Ottawa, Ontario  
K1V 1H2

**Authorized By:**   
Jin Xu, Wireless Specialist

**Date:** September 19, 2007

**Total Number of Pages:** 23

## 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 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:

<b>Apparatus Assessed:</b>	MA4367 MCS Transmitter/Upconverter System
<b>Specification:</b>	FCC Part 27 Miscellaneous Wireless Communications Services
<b>Compliance Status:</b>	Complies
<b>Exclusions:</b>	None
<b>Non-compliances:</b>	None
<b>Report Release History:</b>	Original Release

Author: Jason Nixon, Telecom 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:

MA4367 MCS Transmitter/Upconverter System

### **1.2 Samples Submitted for Assessment**

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

<b>Sample No.</b>	<b>Description</b>	<b>Serial No.</b>
1	Signal Generator	None
2	MA4367 MCS Transmitter/Upconverter	383644
3	Attenuator with termination	None
4	Large cable	None
5	SMA cable	None
6	Power cables	None

The first samples were received on: August 20, 2007

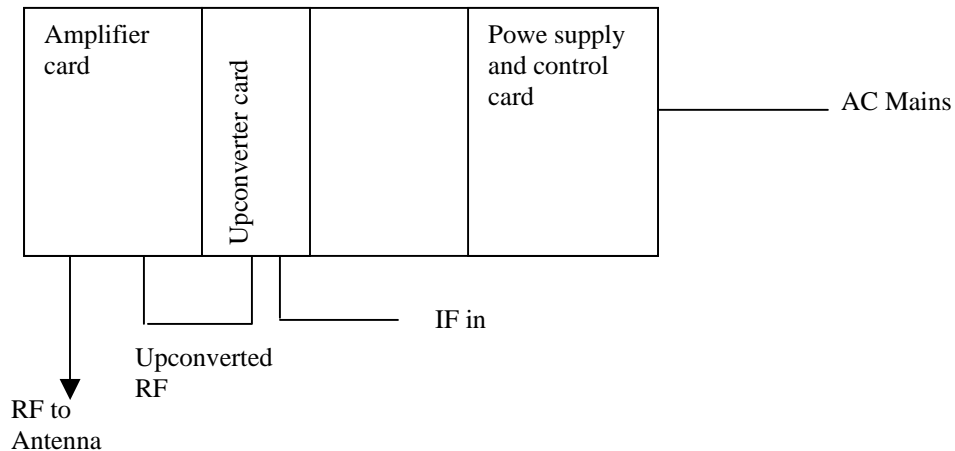
### **1.3 Theory of Operation**

The EUT is an upconverter and amplifier which is used to transmit an IF frequency from the DOCSYS system. The EUT has an internal AGC that compensates for variations in the IF signal power. This keeps the transmit power constant. The EUT is professionally installed at a power level of 36dBm. There are power adjustments to compensate for system losses.

## 1.4 Technical Specifications of the EUT

<b>Operating Frequency:</b>	2505 – 2681MHz
<b>Transmit LO:</b>	1309MHz fixed and 1510 to 1682MHz variable
<b>Emission Designator:</b>	D7W
<b>Rated Power:</b>	36dBm
<b>Measured Power:</b>	36.31dBm
<b>Modulation:</b>	64 QAM
<b>Antenna Data:</b>	18dBi max
<b>Power Source:</b>	120VAC 60Hz

## 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 27 Miscellaneous Wireless Communications Services

### 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.
Signal Generator	Rohde & Schwarz	SMR40	FA001879	Aug 8/08
Spectrum Analyzer	Rohde & Schwarz	FSP40	FA001920	Mar 19/08
Spectrum Analyzer	HP	8565E	FA00981	Oct 06/07
Power Meter	Agilent	N1911A	FA001946	Jan 23/08
Power Sensor	Agilent	N1922A	FA001947	Jan 23/08
Frequency Counter	HP	5352B	FA001915	Nov 22/07
Temperature Chamber	Thermotron	SM-16C	FA001030	NCR
Multimeter	Fluke	16	FA001831	Jan 10/08
Attenuator	Weinschel	47-10-34	FA001740	COU
Biconical (1) Antenna	EMCO	3109	FA000805	May 05/08
Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Sept. 12/07
Horn Antenna #2	EMCO	3115	FA000825	Jan. 30/08
18.0 – 40.0GHz Horn Antenna	EMCO	3116	FA001847	May 9/08
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
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU

COU – Calibrate on Use

NCR – No Calibration Required

## **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 performed during this 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 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 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 27: Test Results**

Clause	Test Method	Test Description	Required	Result
27.50(h)	2.1046	Equivalent isotropically radiated power	Y	PASS
27.53(l)	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	Y	PASS

Notes:

## Appendix A : Test Results

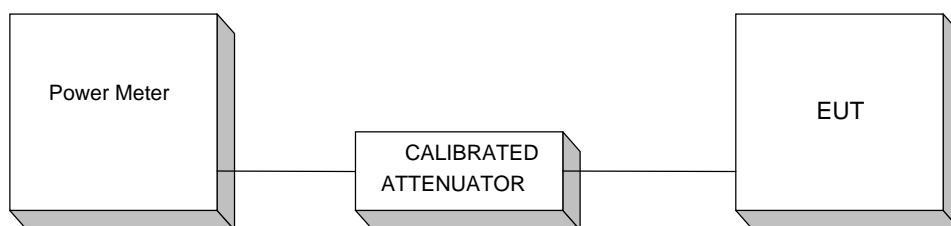
### Clause 27.50(h) Equivalent Isotropically Radiated Power

(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 Setup



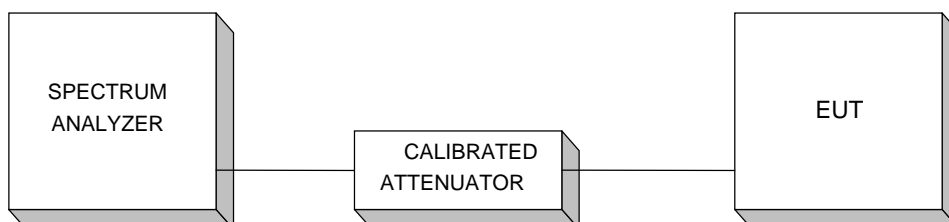
### Output Power

Frequency (MHz)	Measured Avg Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)
2505	36.29	18	54.29
2600	36.10	18	54.10
2681	36.31	18	54.31

$$\text{Limit} = 33\text{dBW} + 10\log(6\text{MHz}/6\text{MHz}) = 33\text{dBW} = 63\text{dBm EIRP}$$

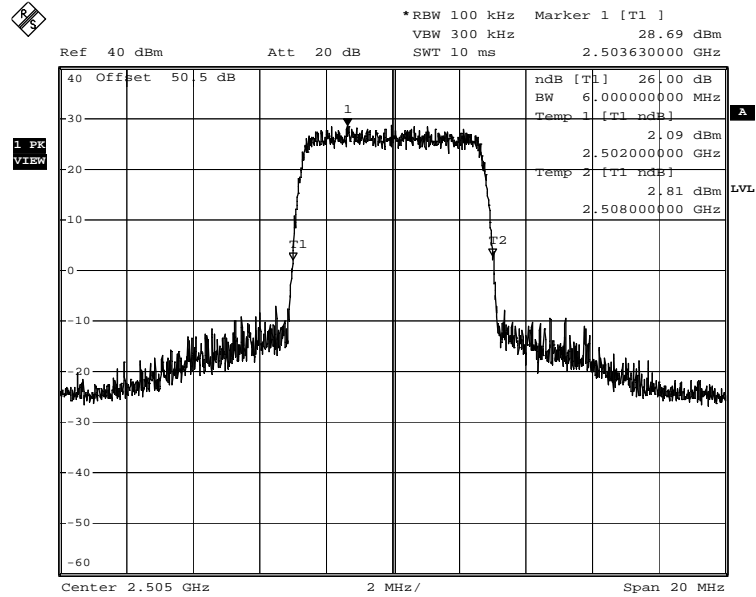
**Clause 27.53(l)(6) Occupied Bandwidth**

(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

**Test Setup**

Frequency (MHz)	Occupied Bandwidth (MHz)
2505	6.00
2600	5.99
2681	6.00

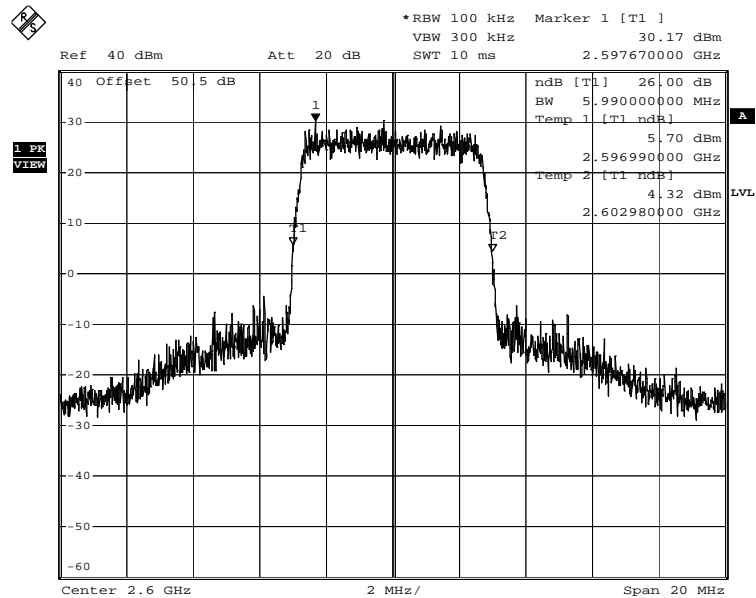
## 26dB Bandwidth – 2505MHz



Low Channel

Date: 28.AUG.2007 11:45:59

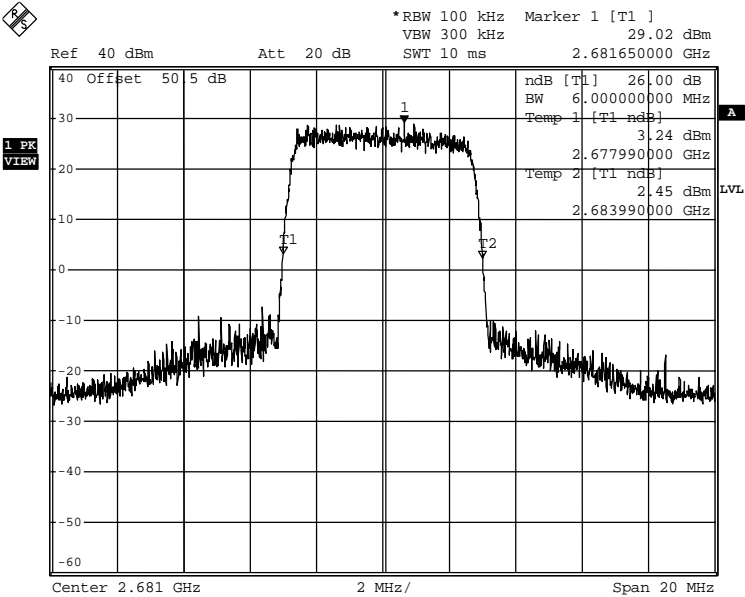
## 26dB Bandwidth – 2600MHz



Mid Channel

Date: 28.AUG.2007 11:43:08

26dB Bandwidth – 2681MHz

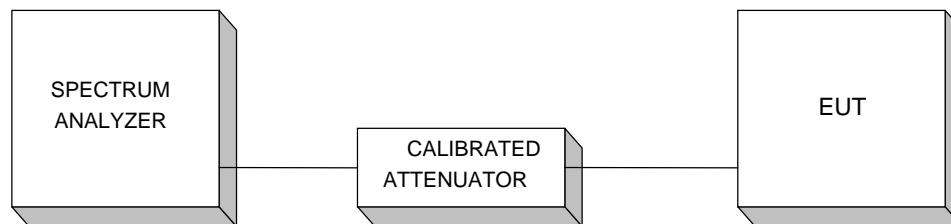


High Channel

Date: 28.AUG.2007 11:44:55

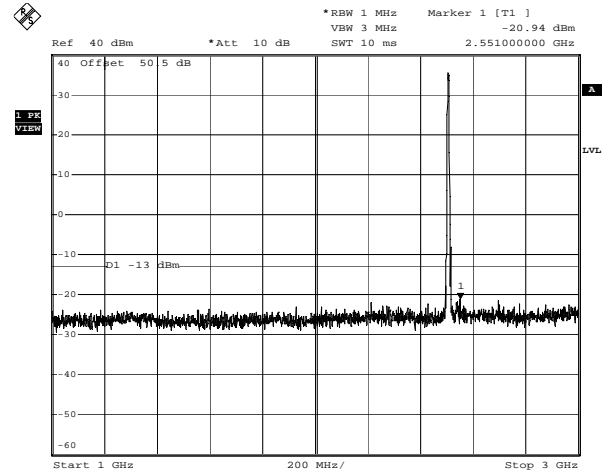
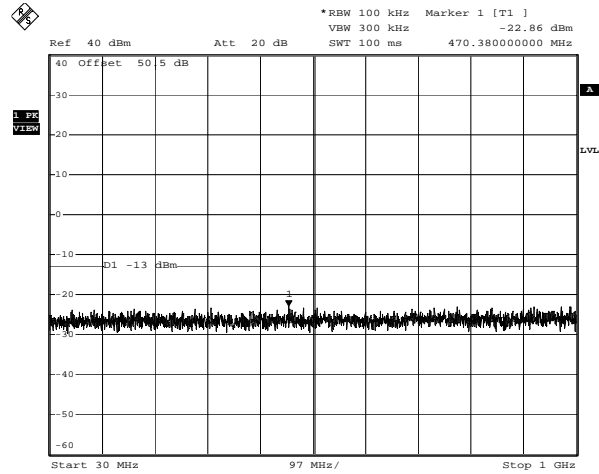
**Clause 27.53(l) spurious emissions at the antenna terminal**

- (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. Provided that the complaint cannot be mutually resolved between the parties, both licensees of existing and new systems shall reduce their out-of-band emissions by at least  $67 + 10 \log (P)$  dB measured at 3 MHz from their channel's edges for distances between stations exceeding 1.5 km.
- (6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

**Test Setup:**

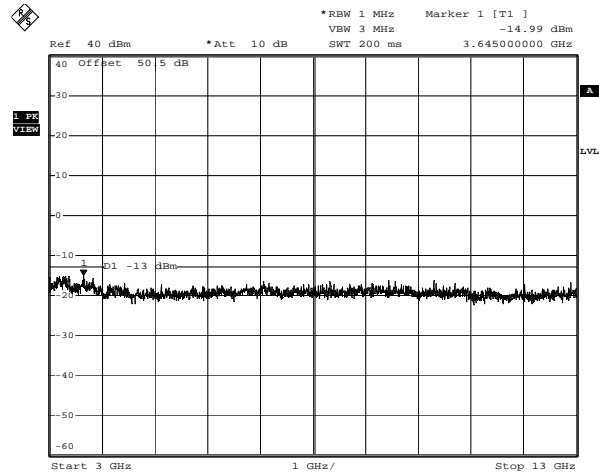
## Conducted Emissions

2505MHz



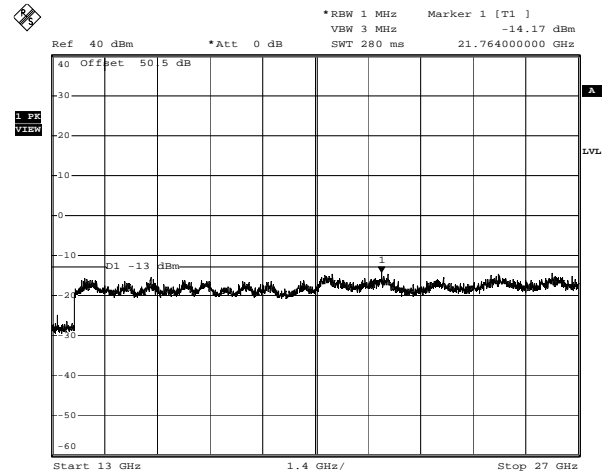
Low channel

Date: 28.AUG.2007 12:18:08



Low channel

Date: 28.AUG.2007 12:22:47



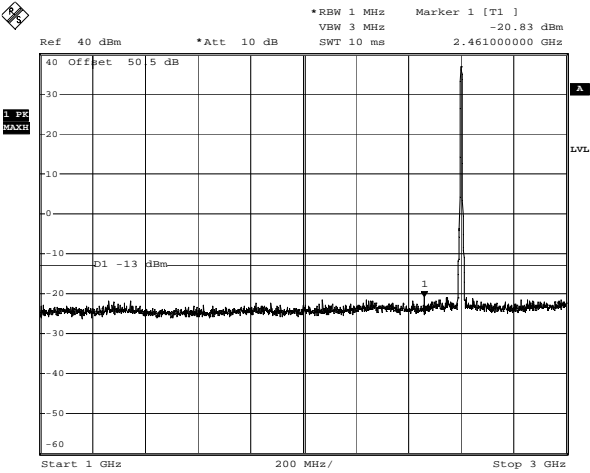
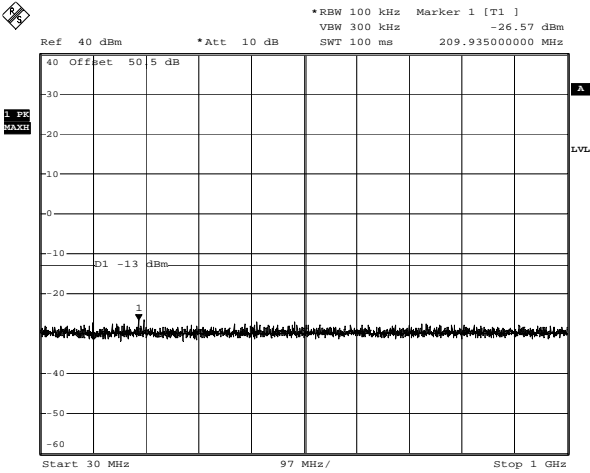
Low channel

Date: 28.AUG.2007 12:24:16

Low channel

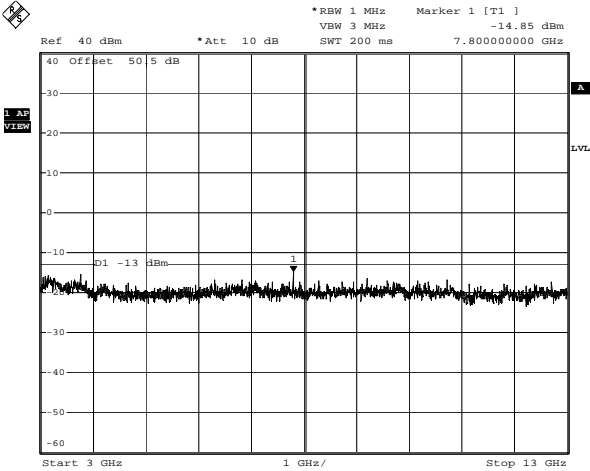
Date: 28.AUG.2007 12:25:58

2600MHz



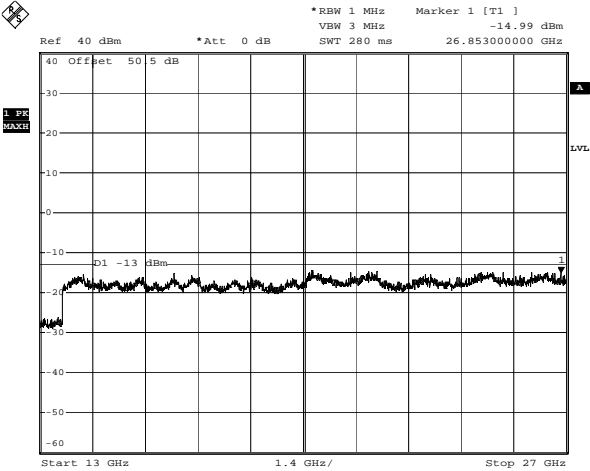
Mid channel

Date: 28.AUG.2007 13:12:14



Mid channel

Date: 28.AUG.2007 13:13:14



Mid channel

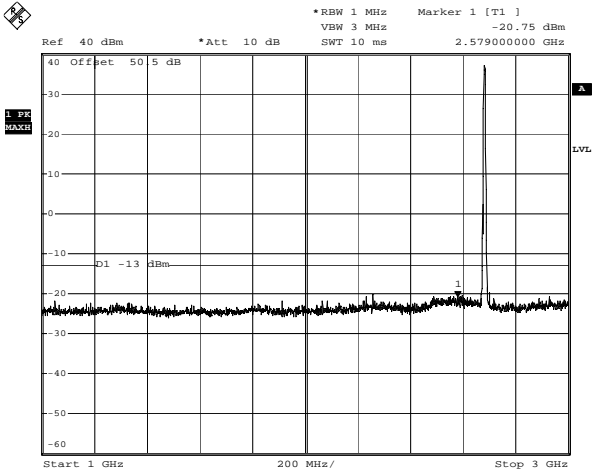
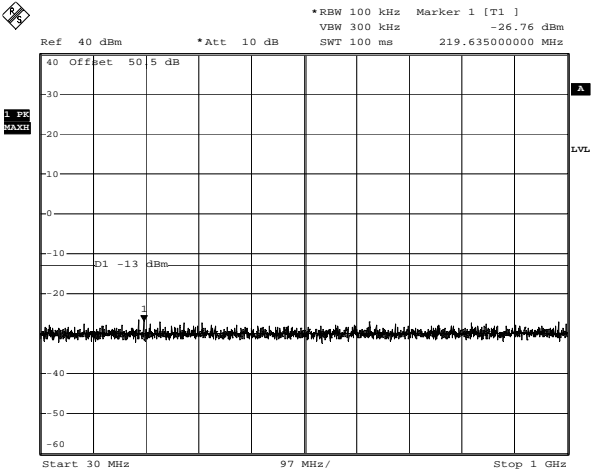
Date: 28.AUG.2007 13:16:21

Mid channel

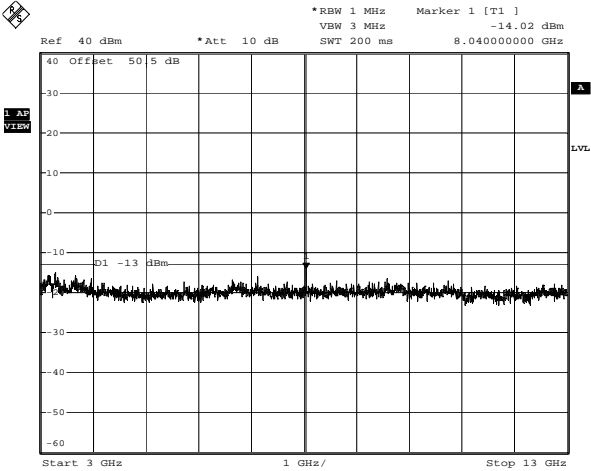
Date: 28.AUG.2007 13:17:12



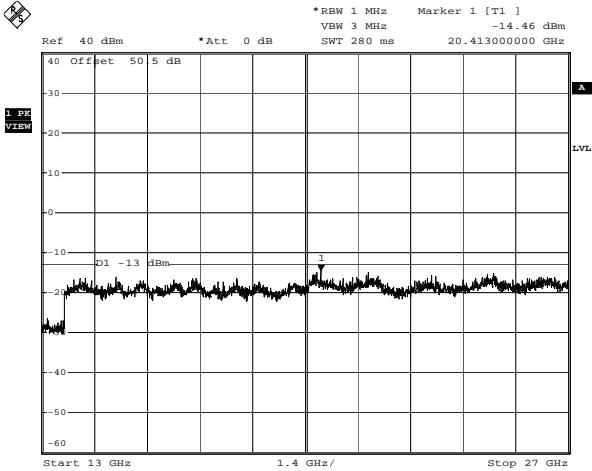
2681MHz



High channel  
Date: 28.AUG.2007 13:08:30



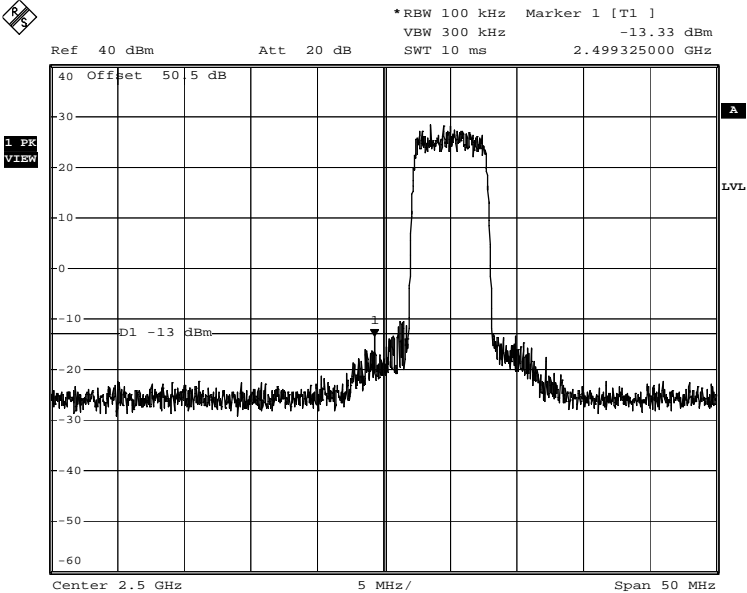
High channel  
Date: 28.AUG.2007 13:07:43



High channel  
Date: 28.AUG.2007 13:09:52

High channel  
Date: 28.AUG.2007 13:10:35

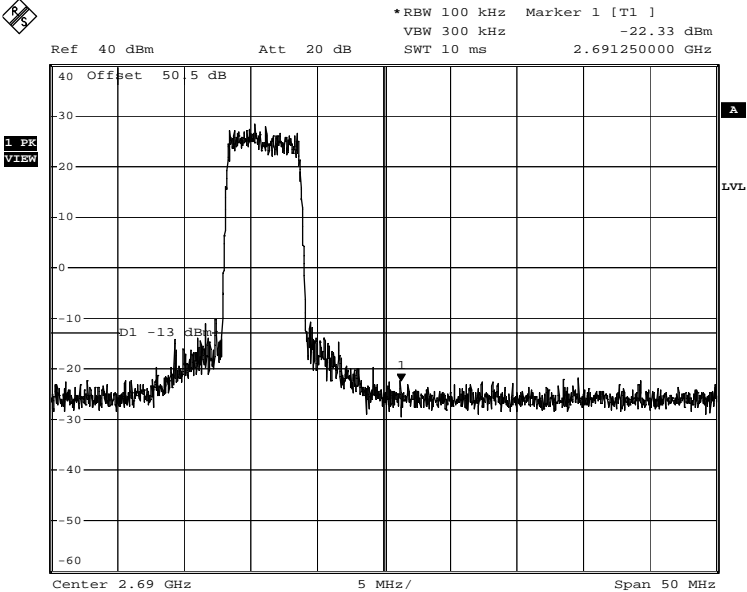
Lower Bandedge



Lower Bandedge

Date: 28.AUG.2007 12:14:55

Upper Bandedge

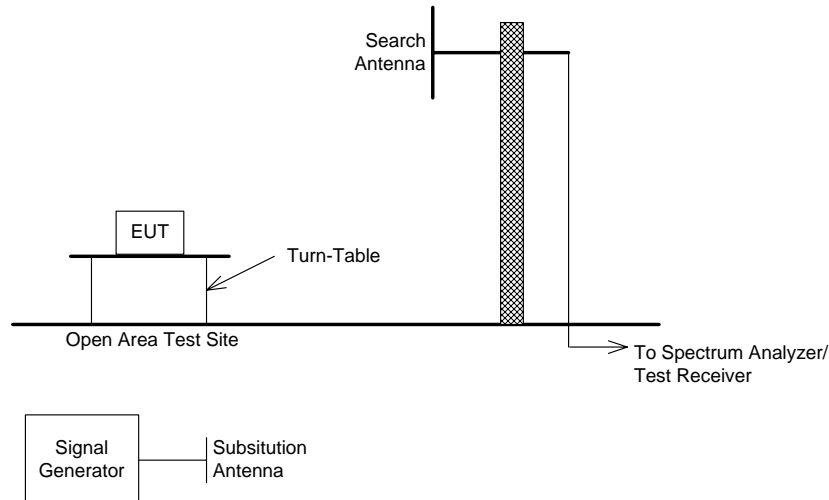


Upper Bandedge

Date: 28.AUG.2007 12:12:51

**Clause 27.53(l) Field Strength of Spurious emissions**

- (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. Provided that the complaint cannot be mutually resolved between the parties, both licensees of existing and new systems shall reduce their out-of-band emissions by at least  $67 + 10 \log (P)$  dB measured at 3 MHz from their channel's edges for distances between stations exceeding 1.5 km.
- (6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

**Test Setup:**

**Radiated emissions**

Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBuV)	Sig. Sub. Factor	Emission Level EIRP (dBm)	Limit (dBm)	Margin (dB)
1 5010.0000	Horn2	V	72.5	-110.9	-38.4	-13.0	25.4
2 5010.0000	Horn2	H	69.3	-111.3	-42.0	-13.0	29.0
3 7515.0000	Horn2	V	90.5	-105.4	-14.9	-13.0	1.9
4 7515.0000	Horn2	H	87.2	-106.7	-19.5	-13.0	6.5
5 5200.0000	Horn2	V	73.0	-109.8	-36.8	-13.0	23.8
6 5200.0000	Horn2	H	74.0	-109.3	-35.3	-13.0	22.3
7 7800.0000	Horn2	V	80.6	-104.3	-23.8	-13.0	10.8
8 7800.0000	Horn2	H	78.6	-106.7	-28.2	-13.0	15.2
9 5362.0000	Horn2	V	67.8	-108.7	-40.9	-13.0	27.9
10 5362.0000	Horn2	H	64.0	-108.3	-44.3	-13.0	31.3
11 8000.0000	Horn2	V	74.0	-103.1	-29.1	-13.0	16.1
12 8000.0000	Horn2	H	67.8	-109.2	-41.4	-13.0	28.4
13 1039.0000	Horn2	H	54.1	-119.1	-65.0	-13.0	52.0
14 1039.0000	Horn2	V	52.2	-119.2	-67.0	-13.0	54.0
15 1685.7530	Horn2	H	59.0	-119.1	-60.1	-13.0	47.1
16 1685.7530	Horn2	V	61.0	-118.4	-57.4	-13.0	44.4

The spectrum was searched from 30MHz to 27GHz. Testing was performed using a Peak detector with 100kHz RBW/VBW below 1GHz and a 1MHz RBW/VBW above 1GHz. Testing was performed at a distance of 3 meters.

The EUT was tuned to low, mid and high channels.

### Clause 27.54 Frequency Stability

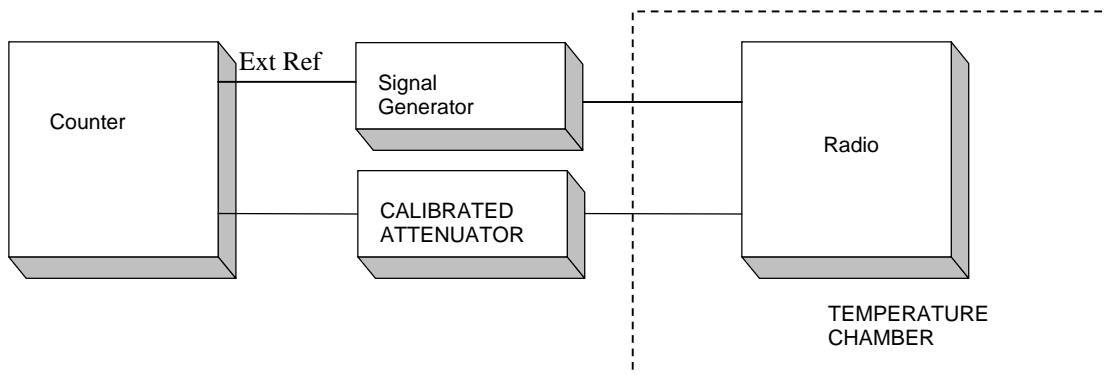
§27.54 Frequency stability. - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

### FCC Clause 2.1055 Frequency Stability

§2.1055 Measurements required: Frequency stability.

- (a) The frequency stability shall be measured with variation of ambient temperature as follows:
  - (1) From  $-30^{\circ}$  to  $+50^{\circ}$  centigrade for all equipment except that specified in paragraphs (a)(2) and (3) of this section
- (b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than  $10^{\circ}$  centigrade through the range.
- (d) The frequency stability shall be measured with variation of primary supply voltage as follows:
  - (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

### Test Setup



### Test Conditions:

Extreme Temperature Condition:  $-30^{\circ}\text{C}$  to  $50^{\circ}\text{C}$

Extreme Voltage Conditions:  $\pm 15\%$  of standard voltage condition.

Condition	Frequency (Hz)	Offset (ppm)
+50°C	EUT did not transmit	
+40°C	2680999273	0.09
+30°C	2680999176	0.06
+20°C, +15% voltage	2680999034	0.00
+20°C	2680999022	——
+20°C, -15% voltage	2680999028	0.00
+10°C	2680999356	0.12
0°C	2680999180	0.06
-10°C	2680997667	-0.51
-20°C	2680992234	-2.53
-30°C	EUT did not transmit	

**Note:** The EUT is only designed to operate in the temperature range of 10°C to 40°C.

## **Appendix B : Setup Photographs**

### **Radiated Spurious Emissions Setup:**

