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# Report On

FCC Testing of the  
Ericsson RRU22 21V40 (KRC 161 134/4)  
In accordance with FCC CFR 47 Part 27 and Industry Canada RSS 139

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8AKRC161134-4  
IC: 287AB-AW1611344

Document 75905338 Report 03 Issue 1

December 2008



TUV Product Service Ltd, Octagon House, Concorde Way, Segensworth North, Fareham, Hampshire, United Kingdom, PO15 5RL  
Tel: +44 (0) 1489 558100. Website: [www.tuvps.co.uk](http://www.tuvps.co.uk)

COMMERCIAL-IN-CONFIDENCE

**REPORT ON**

FCC Testing of the  
Ericsson RRU22 21V40 (KRC 161 134/4)  
In accordance with FCC CFR 47 Part 27 and Industry Canada RSS 139

Document 75905338 Report 03 Issue 1

December 08

**PREPARED FOR**

Ericsson (China) Communications Company Ltd  
Ericsson Tower  
No.5 Lize East Street  
Chaoyang District  
Beijing 100102  
China

**PREPARED BY**

**N Bennett**  
Senior Administrator

**APPROVED BY**

**S Bennett**  
Authorised Signatory

**DATED**

23 December 2008

---

**ENGINEERING STATEMENT**

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 27 and Industry Canada RSS 139. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

C Zhang

X Zhang

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**SECTION 1**

**REPORT SUMMARY**

FCC Testing of the Ericsson RRU22 21V40 (KRC 161 134/4)  
In accordance with FCC CFR 47 Part 27 and Industry Canada RSS 139



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRU22 211V40 (KRC 161 134/4) to the requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008.

Testing was carried out in support of an application for Grant of Equipment Authorisation of RRU22 211V40 (KRC 161 134/4).

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Ericsson (China) Communications Company Ltd
Model Number(s)	RRU22 211V40 (KRC 161 134/4)
Serial Number(s)	CB 45077917
Software Version	--
Hardware Version	R1C
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 27: 2007 Industry Canada RSS 139: 2008
Incoming Release Date	Declaration of Build Status 08 December 2008
Start of Test	08 December 2008
Finish of Test	19 December 2008
Name of Engineer(s)	C Zhang X Zhang
Related Document(s)	FCC CFR 47 Part 2:2007 RSS-Gen Issue 2:2007 ANSI C63.4:2003



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008, is shown below.

Configuration - Base Station							
Section	FCC Clause	IC Clause	Test Description	Mode	Mod State	Result	Comments
-	27.50 (d)(1)	6.4	Effective Isotropically Radiated Power			N/A	No integral antenna.
2.1	27.50 (d)(1)	6.4	Maximum Peak Output Power - Conducted	2112.4 MHz	0	Pass	-
				2132.5 MHz	0	Pass	
				2152.6 MHz	0	Pass	
				2112.4 + 2122.4 MHz	0	Pass	
				2127.5 + 2137.5 MHz	0	Pass	
				2142.6 + 2152.6 MHz	0	Pass	
2.2	27.50 (i)	-	Peak – Average Ratio	2112.4 MHz	0	Pass	-
				2112.4 + 2122.4 MHz	0	Pass	
2.3	2.1047 (d)		Modulation Characteristics	2112.4 MHz	0	Pass	-
2.4	2.1049, 27.53 (g)	RSS-Gen 4.6.1	Occupied Bandwidth	2112.4 MHz	0	Pass	-
				2132.5 MHz	0	Pass	
				2152.6 MHz	0	Pass	
2.5	2.1051, 27.53 (g)	6.5	Spurious Emissions at Antenna Terminals (±1MHz)	2112.4 MHz	0	Pass	-
				2152.6 MHz	0	Pass	
				2112.4 + 2122.4 MHz	0	Pass	
				2142.6 + 2152.6 MHz	0	Pass	
2.6	2.1053, 27.53 (g)	6.5	Radiated Spurious Emissions	2112.4 MHz	0	Pass	-
				2132.5 MHz	0	Pass	
				2152.6 MHz	0	Pass	
				2112.4 + 2122.4 MHz	0	Pass	
				2127.5 + 2137.5 MHz	0	Pass	
				2142.6 + 2152.6 MHz	0	Pass	
2.7	2.1051, 27.53 (g)	6.5	Conducted Spurious Emissions	2112.4 MHz	0	Pass	-
				2132.5 MHz	0	Pass	
				2152.6 MHz	0	Pass	
				2112.4 + 2122.4 MHz	0	Pass	
				2127.5 + 2137.5 MHz	0	Pass	
				2142.6 + 2152.6 MHz	0	Pass	
2.8	-	6.6	Receiver Spurious Emissions	2112.4 MHz	0	Pass	-
				2132.5 MHz	0	Pass	
				2152.6 MHz	0	Pass	
2.9	2.1055, 27.54	6.3	Frequency Stability Under Temperature Variations	2132.5 MHz	0	Pass	-
2.10	2.1055, 27.54	6.3	Frequency Stability Under Voltage Variations	2132.5 MHz	0	Pass	-

N/A – Not Applicable

## 1.3 DECLARATION OF BUILD STATUS

<b>MAIN EUT</b>	
<b>MANUFACTURING DESCRIPTION</b>	Radio Equipment
<b>MANUFACTURER</b>	Ericsson
<b>TYPE</b>	RRU22 21V40
<b>PART NUMBER</b>	KRC 161 134/4
<b>SERIAL NUMBER</b>	CB 45077917
<b>HARDWARE VERSION</b>	R1C
<b>SOFTWARE VERSION</b>	--
<b>TRANSMITTER OPERATING RANGE</b>	2110-2155MHz
<b>RECEIVER OPERATING RANGE</b>	1710-1755MHz
<b>COUNTRY OF ORIGIN</b>	P.R. CHINA
<b>INTERMEDIATE FREQUENCIES</b>	--
<b>ITU DESIGNATION OF EMISSION</b>	4M17F9W
<b>HIGHEST INTERNALLY GENERATED FREQUENCY</b>	2152.6MHz
<b>OUTPUT POWER (W or dBm)</b>	46dBm/40W
<b>FCC ID</b>	TA8AKRC161134-4
<b>IC ID</b>	287AB-AW1611344
<b>TECHNICAL DESCRIPTION (a brief description of the intended use and operation)</b>	RRU22 21V40 is the radio part of a WCDMA Radio Base Station

<b>Signature</b>	<u>Xiaoying Jiang</u>
<b>Date</b>	<u>16 December 2008</u>
<b>D of B S Serial No</b>	<u>75905338/03</u>

No responsibility will be accepted by TÜV Product Service as to the accuracy of the information declared in this document by the manufacturer.

## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) RRU22 21V40 (KRC 161 134/4) is an Ericsson Radio Equipment intended to operate with a compatible Radio Equipment Controller to form a WCDMA 2100MHz band base station.

The Equipment Under Test is shown in the photograph below. A full technical description can be found in the Manufacturers documentation.



Equipment Under Test



### 1.4.2 Test Configuration

The EUT was configured in accordance with FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008.

The EUT supports QPSK, 16QAM and 64QAM modulations at 2100MHz. All TX measurements were performed at the combined TX/RX output connector ANT1 of the EUT. RX measurements were performed at RX connector ANT2 of the EUT.

The complete testing was performed at maximum output power with QPSK, using Test model 1, with a combination of QPSK and 16QAM modulation, using Test model 5, and with a combination of QPSK and 64QAM modulation, using Test model 6.

The EUT was powered by a -48V DC Power supply.

### 1.4.3 Modes of Operation

#### Test Models

Test model 1, 5 and 6 are defined in 3GPP TS 25.141 as follows:

Single carrier:

Test model 1 (TM1): 64 DPCHs at 30 ksps (SF=128)

Test model 5 (TM5): 30 DPCHs at 30 ksps (SF=128) and 8 HS-PDSCHs at 240 ksps (SF=16)

Test model 6 (TM6): 30 DPCHs at 30 ksps (SF=128) and 8 HS-PDSCHs at 240 ksps (SF=16)

Multi carrier:

Test model 1 (TM1): 32 DPCHs at 30 ksps (SF=128)

Test model 5 (TM5): 30 DPCHs at 30 ksps (SF=128) and 8 HS-PDSCHs at 240 ksps (SF=16)

Test model 6 (TM6): 30 DPCHs at 30 ksps (SF=128) and 8 HS-PDSCHs at 240 ksps (SF=16)

#### Operation Modes

Mode 1 – 2112.4 MHz (Bottom Channel)

Mode 2 – 2132.5 MHz (Middle Channel)

Mode 3 – 2152.6 MHz (Top Channel)

Mode 4 – 2112.4 MHz+2122.4 MHz (Bottom Channel)

Mode 5 – 2127.5 MHz+2137.5 MHz (Middle Channel)

Mode 6 – 2142.6 MHz+2152.6 MHz (Top Channel)

Information on the specific test modes utilised are detailed in the test procedure for each individual test.



## 1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

## 1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

## 1.7 MODIFICATION RECORD

Modification State	Description of Modification fitted to EUT	Sample S/N
0	Initial sample supplied by customer	CB45077917

No modifications were made to the EUT during testing.

## 1.8 ALTERNATIVE TEST SITE

Testing was carried out at the following locations:

Ericsson Tower, No.5 Lize East Street Chaoyang District, Beijing 100102 China

Except the testing for section 2.6 Radiated Spurious Emission was conducted at following site registrations:

FCC Accreditation

612767 The State Radio Monitoring Center, No.80 Beilishi Road Xicheng District Beijing, China.

Industry Canada Accreditation

7308A The State Radio Monitoring Center, No.80 Beilishi Road Xicheng District Beijing, China.



## **SECTION 2**

### **TEST DETAILS**

FCC Testing of the Ericsson RRU22 21V40 (KRC 161 134/4)  
In accordance with FCC CFR 47 Part 27 and Industry Canada RSS 139



## 2.1 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

### 2.1.1 Specification Reference

FCC CFR 47 Part 27: 2007, Clause 27.50(d)(1)  
Industry Canada RSS 139:2008 Clause 6.4

### 2.1.2 Equipment Under Test

RRU22 21V40 (KRC 161 134/4)

### 2.1.3 Date of Test and Modification State

09,16 and 17 December 2008 – Modification State 0

### 2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008.

Using a Spectrum Analyzer with attenuator(s), the output was connected to a spectrum analyzer with RMS detector activated, the output power of the EUT was measured at the antenna terminals.

The test was performed with the EUT in the following configurations and modes of operation:

- Mode 1
- Mode 2
- Mode 3
- Mode 4
- Mode 5
- Mode 6

### 2.1.6 Environmental Conditions

	09 December 2008	16 December 2008	17 December 2008
Ambient Temperature	23.2°C	23.3°C	22.9°C
Relative Humidity	24.1%	24.4%	24.2%

### 2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008 for Maximum Peak Output Power - Conducted.

The test results are shown below.

#### - Mode 1

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	2112.4	41.5	46.31	42.756
TM5	2112.4	41.5	46.58	45.499
TM6	2112.4	41.5	46.13	41.020

#### - Mode 2

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	2132.5	41.5	46.32	42.855
TM5	2132.5	41.5	46.58	45.499
TM6	2132.5	41.5	46.45	44.157

#### - Mode 3

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	2152.6	41.5	46.15	41.210
TM5	2152.6	41.5	46.56	45.290
TM6	2152.6	41.5	46.40	43.652

#### - Mode 4

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	2112.4+2122.4	41.5	46.12	40.926
TM5	2112.4+2122.4	41.5	46.32	42.855
TM6	2112.4+2122.4	41.5	46.45	44.157

#### - Mode 5

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	2127.5+2137.5	41.5	46.19	41.591
TM5	2127.5+2137.5	41.5	46.25	42.170
TM6	2127.5+2137.5	41.5	46.62	45.920

- Mode 6

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	2142.6+2152.6	41.5	46.10	40.738
TM5	2142.6+2152.6	41.5	46.17	41.400
TM6	2142.6+2152.6	41.5	46.69	46.666

Limit	$\leq 3280W$ or $\leq 65.2dBm$ for FCC $46dBm \pm 1dB$ for IC
-------	--

Remarks

The EUT does not exceed 3280W or 65.2dBm for FCC, 46dBm $\pm$ 1dB for IC at the measured frequencies.



**2.2 PEAK – AVERAGE RATIO**

**2.2.1 Specification Reference**

FCC CFR 47 Part 27: 2007, Clause 27.50(i)

**2.2.2 Equipment Under Test**

RRU22 21IV40 (KRC 161 134/4)

**2.2.3 Date of Test and Modification State**

17 and 18 December 2008 – Modification State 0

**2.2.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.2.5 Test Method and Operating Modes**

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 27: 2007.

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

The spectrum analyzer Measurement bandwidth was set to 10MHz for single carrier and 20MHz for multi carrier and the path loss measured and entered as a reference level offset.

The test was performed with the EUT operating on all modes in section 1.4.3 and record the result of following configurations and modes of operation for worst case:

- Mode 1
- Mode 4

**2.2.6 Environmental Conditions**

	17 December 2008	18 December 2008
Ambient Temperature	22.9°C	22.3°C
Relative Humidity	24.2%	24.6%



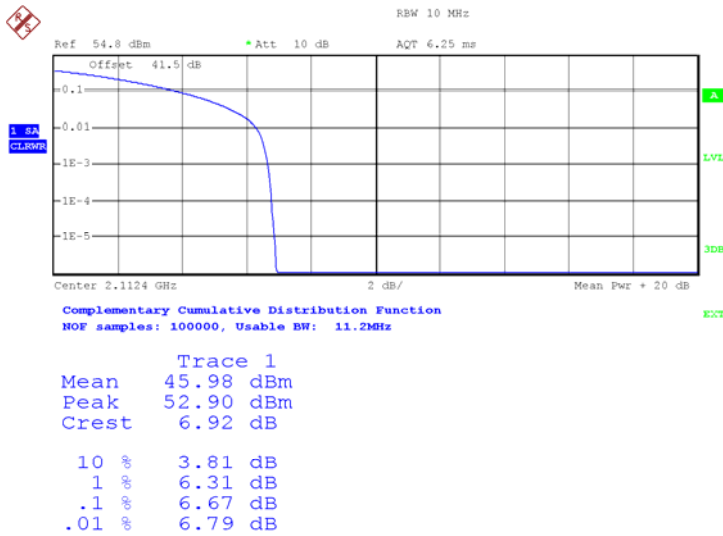
2.2.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 27: 2007 Peak – Average Ratio.

The test results are shown below.

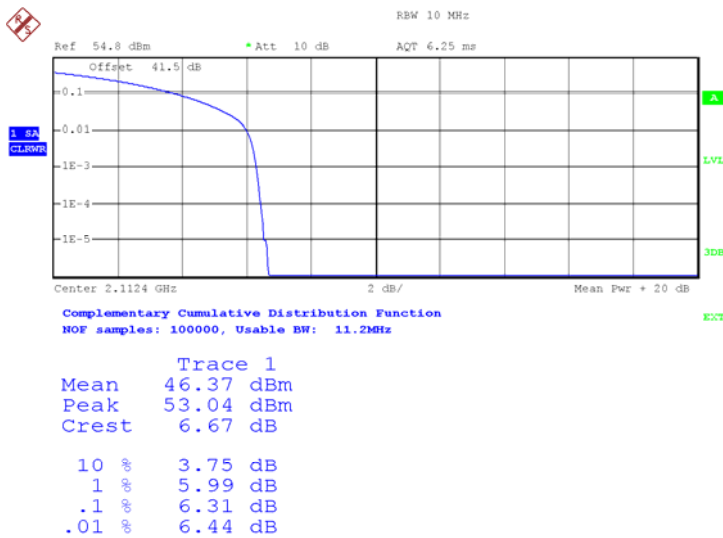
- Mode 1

TM1



Date: 17.DEC.2008 03:36:43

TM5

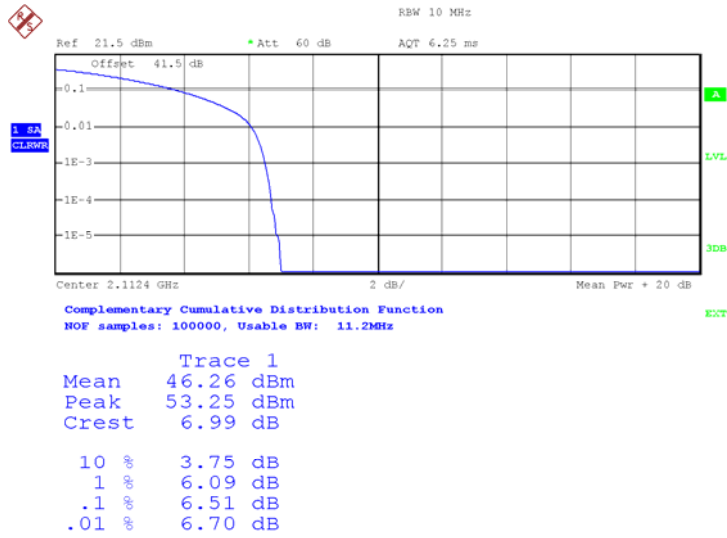


Date: 17.DEC.2008 03:58:00





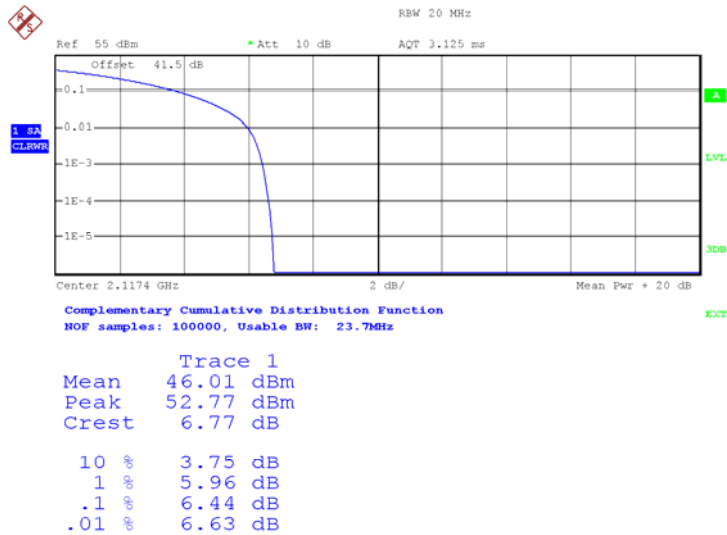
TM6



Date: 17.DEC.2008 07:38:14

- Mode 4

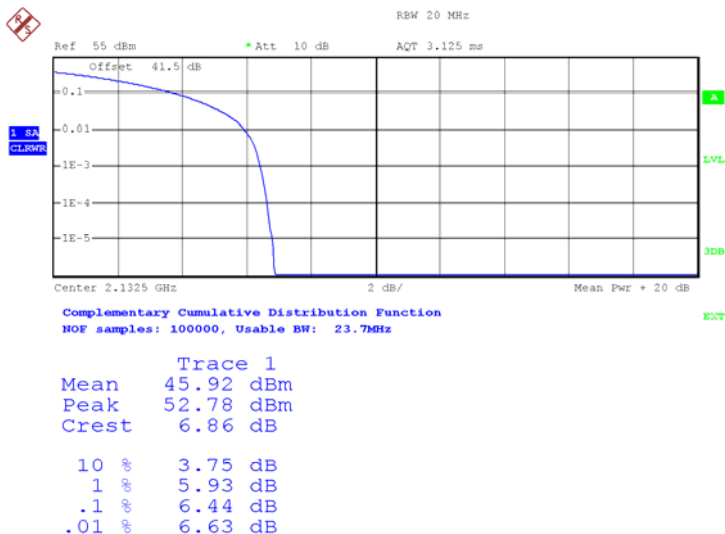
TM1



Date: 18.DEC.2008 04:30:33

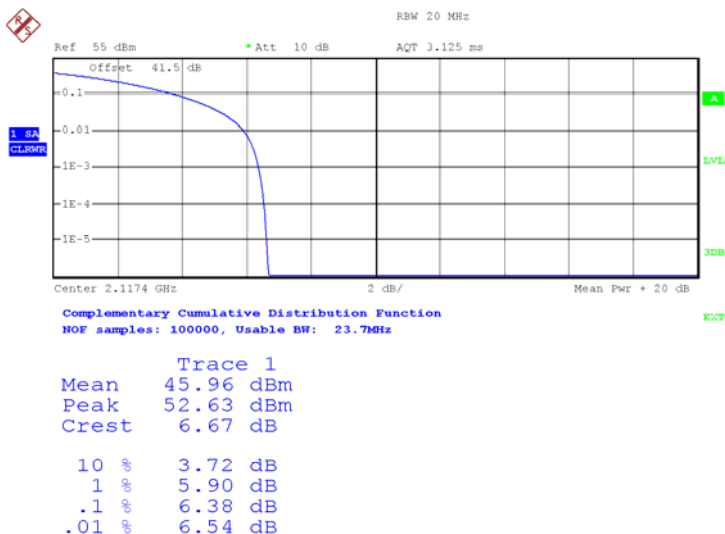


TM5



Date: 18.DEC.2008 09:22:08

TM6



Date: 18.DEC.2008 08:26:56

Limit	13dB
-------	------

Remarks

The Peak – Average ratio does not exceed 13dB at the measured frequencies.



## 2.3 MODULATION CHARACTERISTICS

### 2.3.1 Specification Reference

FCC CFR 47 Part 2: 2007, Clause 2.1047(d)

### 2.3.2 Equipment Under Test

RRU22 21IV40 (KRC 161 134/4)

### 2.3.3 Date of Test and Modification State

16 and 17 December 2008 – Modification State 0

### 2.3.4 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2: 2007.

Connect the RF output connector ANT1 to a spectrum analyzer with a 40dB attenuator. Other connectors were connected to match load. The band class is set as US PCS 2100MHz. RRU was controlled to transmit maximum power. Measure and record the Code Domin Power and the constellation of the RRU by the spectrum analyzer.

The test was performed with the EUT in the following configurations and modes of operation:

- Mode 1

### 2.3.5 Environmental Conditions

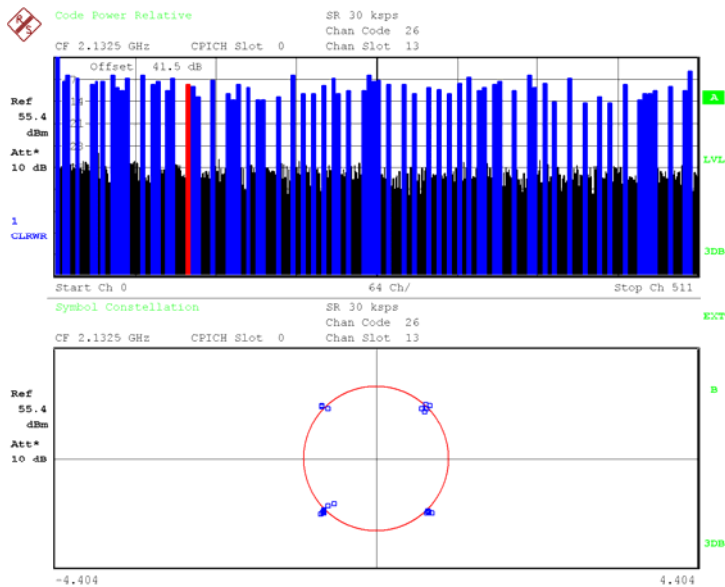
	16 December 2008	17 December 2008
Ambient Temperature	23.3°C	22.9°C
Relative Humidity	24.4%	24.2%



### 2.3.6 Test Result

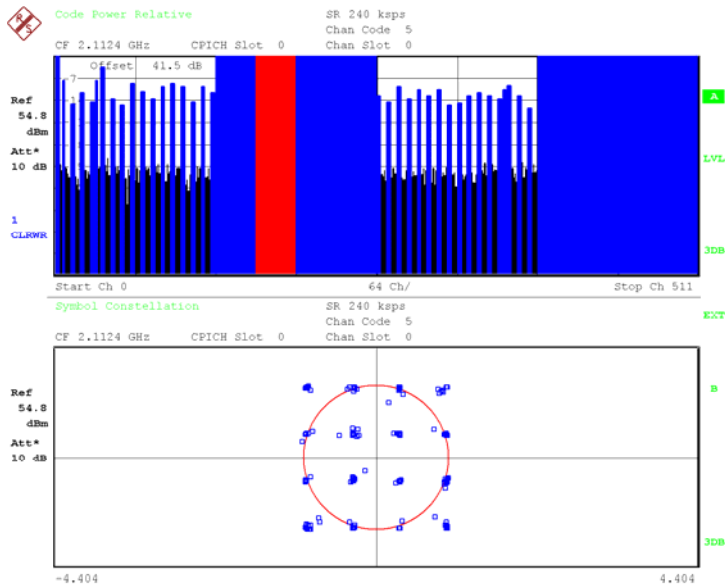
Plots are shown on the following page showing the EUT transmitting with all of the modulations:

EUT transmitting with QPSK modulation:



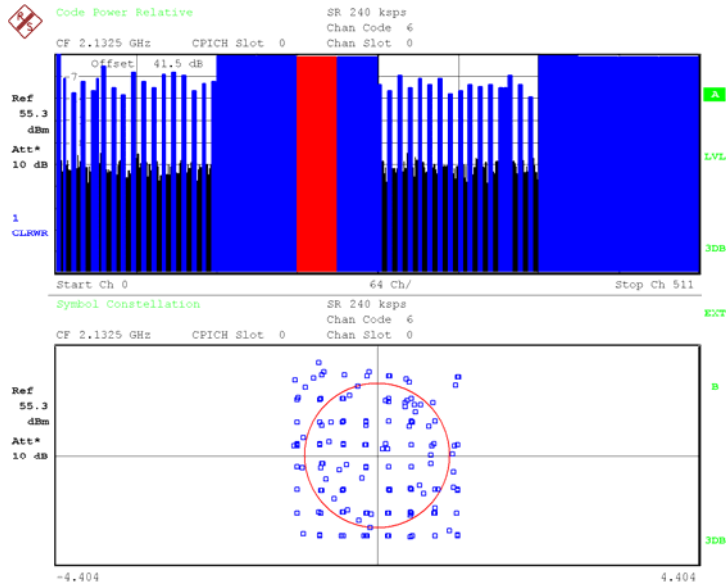
Date: 16.DEC.2008 09:59:32

EUT transmitting with 16QAM modulation:



Date: 17.DEC.2008 03:57:28

EUT transmitting with 64QAM modulation:



Date: 16.DEC.2008 08:35:17



## 2.4 OCCUPIED BANDWIDTH

### 2.4.1 Specification Reference

FCC CFR 47 Part 27: 2007, Clause 2.1049(h), 27.53(g)  
Industry Canada RSS 139:2008 Clause 2.3

### 2.4.2 Equipment Under Test

RRU22 21V40 (KRC 161 134/4)

### 2.4.3 Date of Test and Modification State

09,16 and 17 December 2008 – Modification State 0

### 2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.4.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008.

The EUT was transmitting at maximum power with TM1, TM5 and TM6. Using a resolution bandwidth of 50 kHz and a video bandwidth of 500 kHz. The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission. The  $-26\text{dBc}$  points were also established and the emission bandwidth determined.

The test was performed with the EUT in the following configurations and modes of operation:

- Mode 1
- Mode 2
- Mode 3

### 2.4.6 Environmental Conditions

	09 December 2008	16 December 2008	17 December 2008
Ambient Temperature	23.2°C	23.3°C	22.9°C
Relative Humidity	24.1%	24.4%	24.2%

### 2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008 for Occupied Bandwidth.

#### - Mode 1

	Frequency (MHz)	99% Power bandwidth (MHz)
TM1	2112.4	4.1731
TM5	2112.4	4.1731
TM6	2112.4	4.1731

#### - Mode 2

	Frequency (MHz)	99% Power bandwidth (MHz)
TM1	2132.5	4.1731
TM5	2132.5	4.1731
TM6	2132.5	4.1731

#### - Mode 3

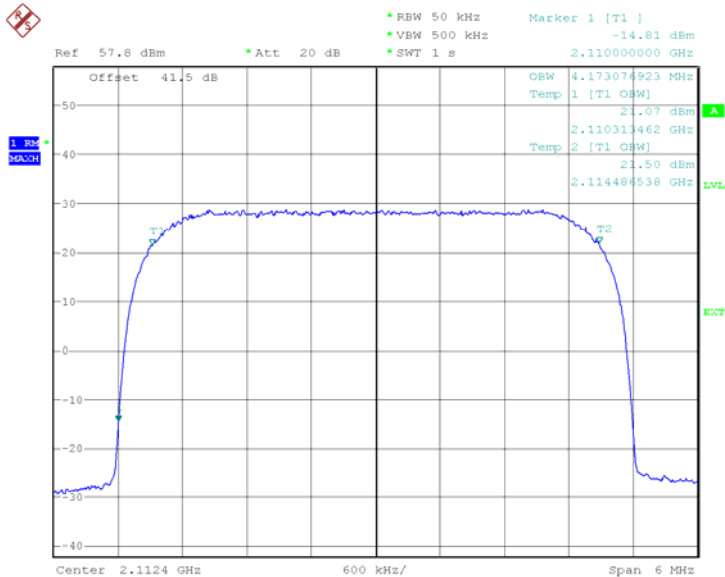
	Frequency (MHz)	99% Power bandwidth (MHz)
TM1	2152.6	4.1731
TM5	2152.6	4.1731
TM6	2152.6	4.1731



The plots of test results are shown below.

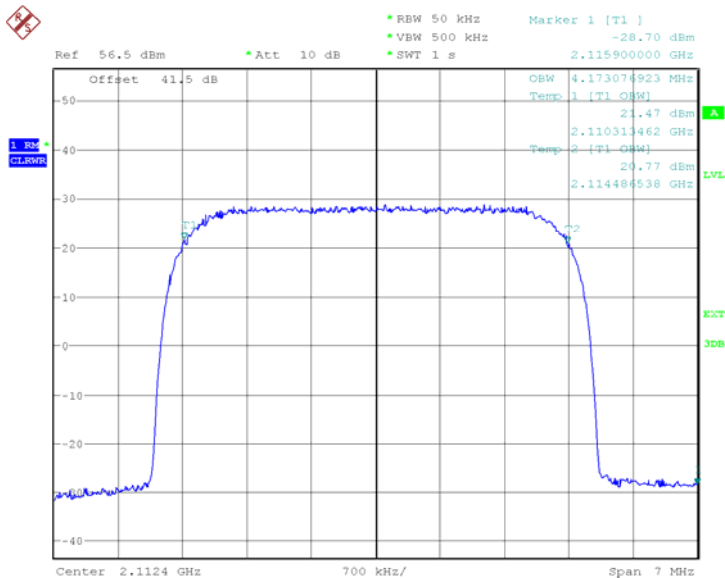
- Mode 1

TM1



Date: 9.DEC.2008 05:45:22

TM5

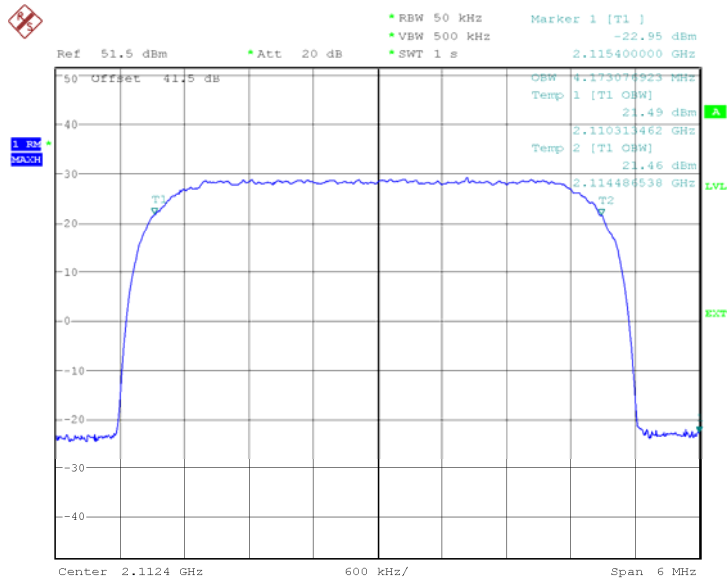


Date: 17.DEC.2008 04:02:02





TM6

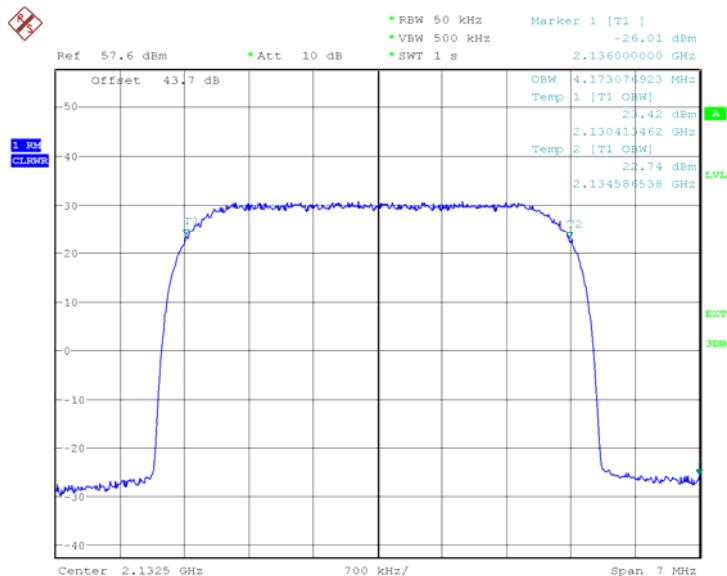


Date: 9.DEC.2008 03:53:03



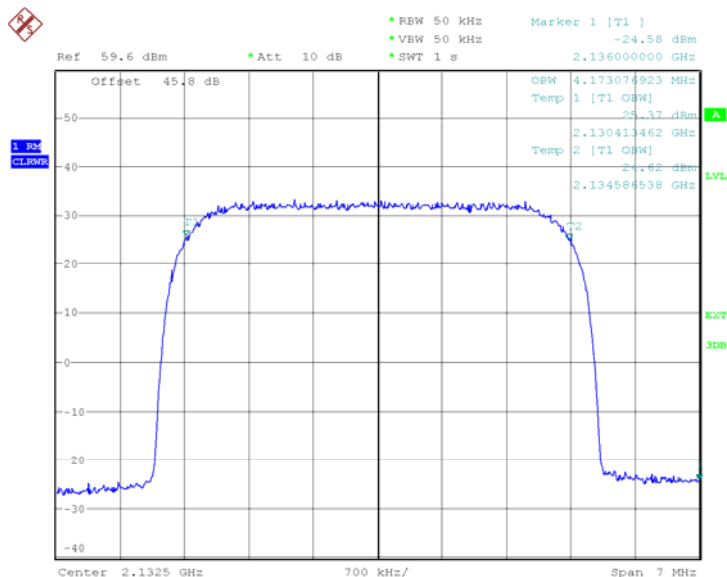
- Mode 2

TM1



Date: 16.DEC.2008 09:54:53

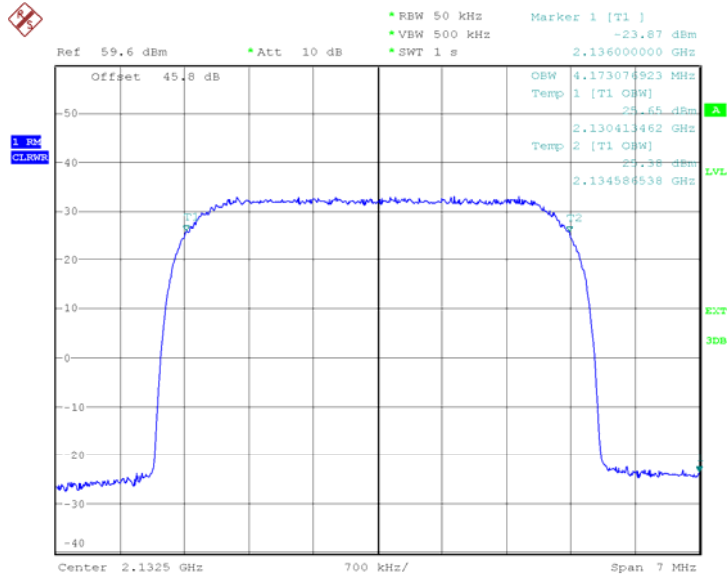
TM5



Date: 16.DEC.2008 05:52:06



TM6

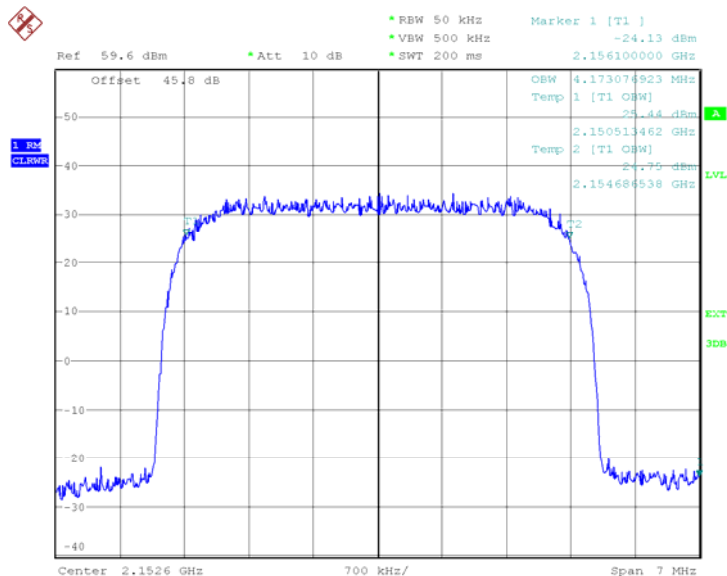


Date: 16.DEC.2008 08:24:40



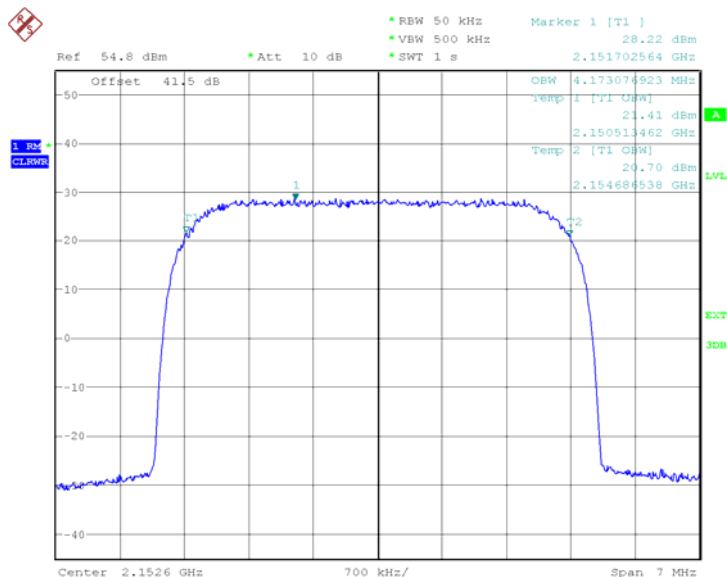
- Mode 3

TM1



Date: 17.DEC.2008 03:13:15

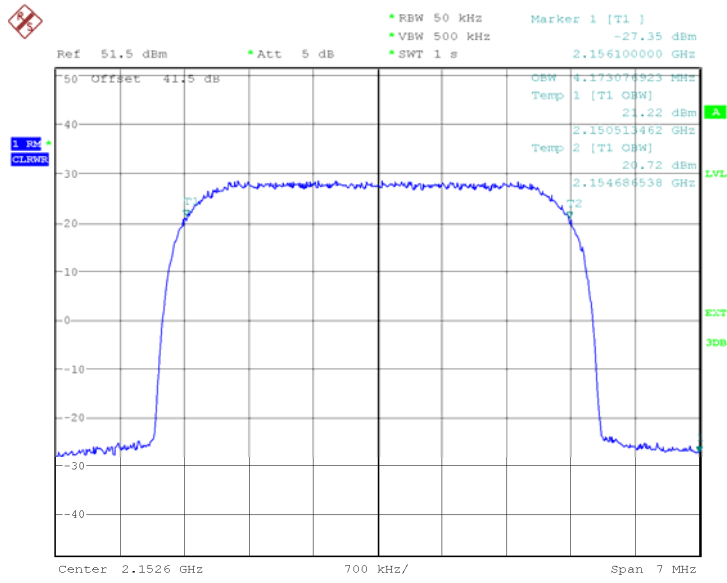
TM5



Date: 17.DEC.2008 04:19:56



TM6



Date: 17.DEC.2008 06:24:09



## 2.5 SPURIOUS EMISSIONS AT TERMINALS ( $\pm 1$ MHz)

### 2.5.1 Specification Reference

FCC CFR 47 Part 27: 2007, Clause 2.1051, 27.53(g)  
Industry Canada RSS 139:2008 Clause 6.5

### 2.5.2 Equipment Under Test

RRU22 21V40 (KRC 161 134/4)

### 2.5.3 Date of Test and Modification State

17 and 18 December 2008 – Modification State 0

### 2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.5.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008.

The measurements were made per definition in 27.53. Measurements were performed on the combined TX/RX connector ANT1. The output was connected to a spectrum analyzer with RMS detector activated. A resolution bandwidth of 50kHz (4.68 MHz between the 26dB points) was used up to 1MHz away from the band edges. The limit was displayed, showing the  $-13$ dBm.

The EUT was tested at its maximum power level with TM1, TM5 and TM6.

The test was performed with the EUT in the following configurations and modes of operation:

- Mode 1
- Mode 3
- Mode 4
- Mode 6

### 2.5.6 Environmental Conditions

	17 December 2008	18 December 2008
Ambient Temperature	22.9°C	22.3°C
Relative Humidity	24.2%	24.6%



**2.5.7 Test Results**

For the period of test the EUT met the requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008 for Spurious Emissions Antenna Terminals ( $\pm 1$ MHz)

The test results are shown below.

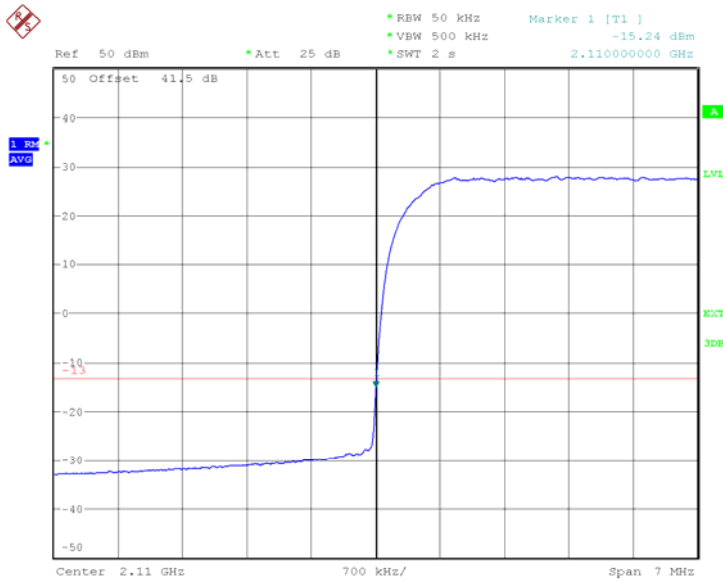
Below are the Frequencies the EUT was tested against along with the tested channels.

Channel (MHz)	Edge Test with QPSK modulation Channel No./Frequencies	Edge Test with 16QAM modulation Channel No./Frequencies	Edge Test with 64QAM modulation Channel No./Frequencies
Bottom 2112.4	Channel: 1537 Frequency: 2110MHz	Channel: 1537 Frequency: 2110MHz	Channel: 1537 Frequency: 2110MHz
Top 2152.6	Channel: 1738 Frequency : 2155MHz	Channel: 1738 Frequency : 2155MHz	Channel: 1738 Frequency : 2155MHz

The channels shown in the table above are the minimum and maximum channels that can be used in the authorised frequency ranges to maintain compliance.

- Mode 1

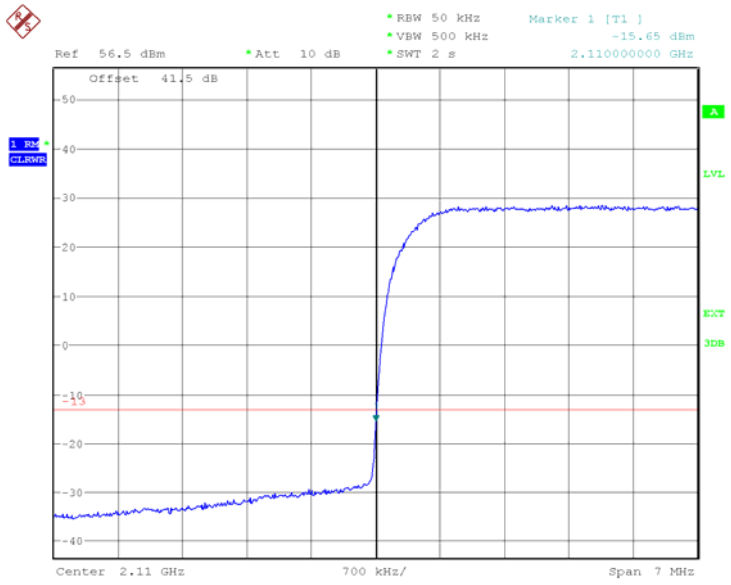
TM1



Date: 17.DEC.2008 03:38:29

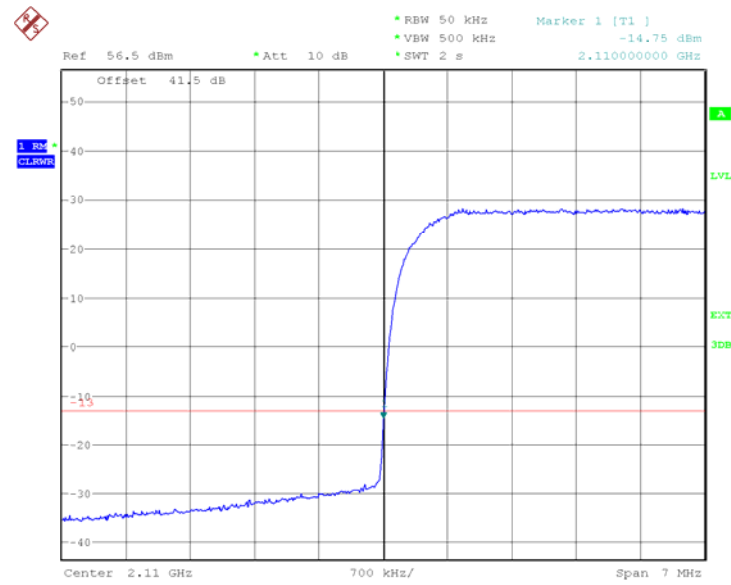


TM5



Date: 17.DEC.2008 04:03:58

TM6

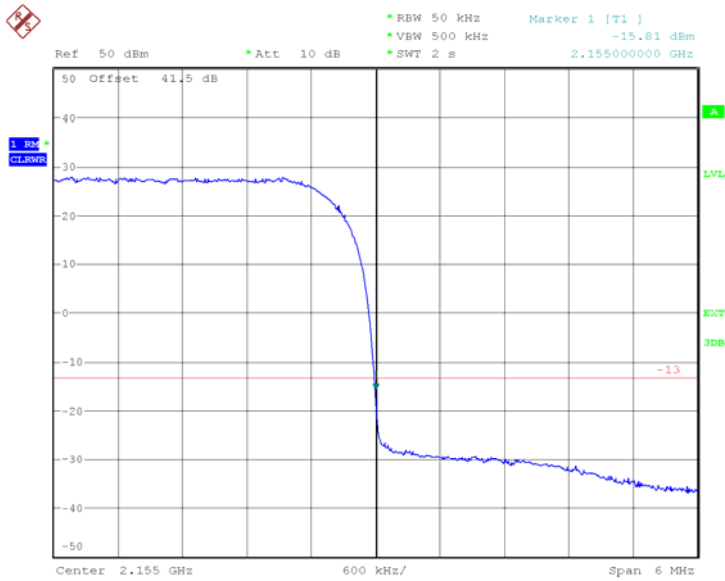


Date: 17.DEC.2008 07:40:03



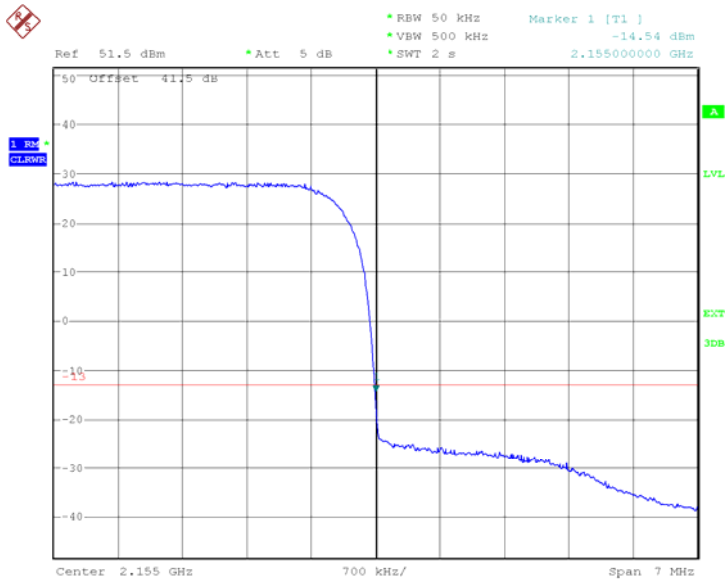
- Mode 3

TM1



Date: 18.DEC.2008 09:47:27

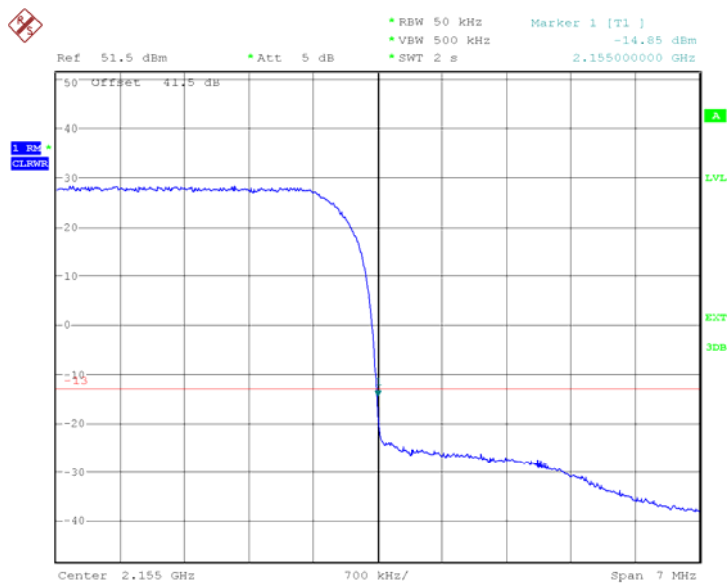
TM5



Date: 17.DEC.2008 04:22:16



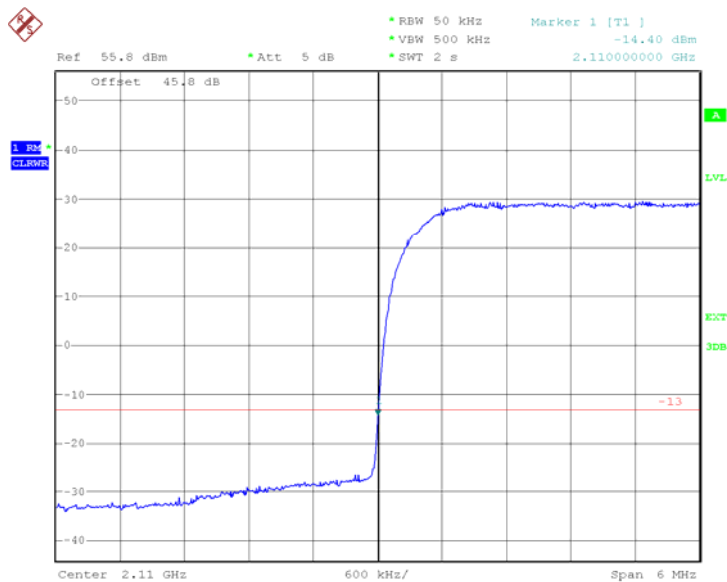
TM6



Date: 17.DEC.2008 06:25:52

- Mode 4

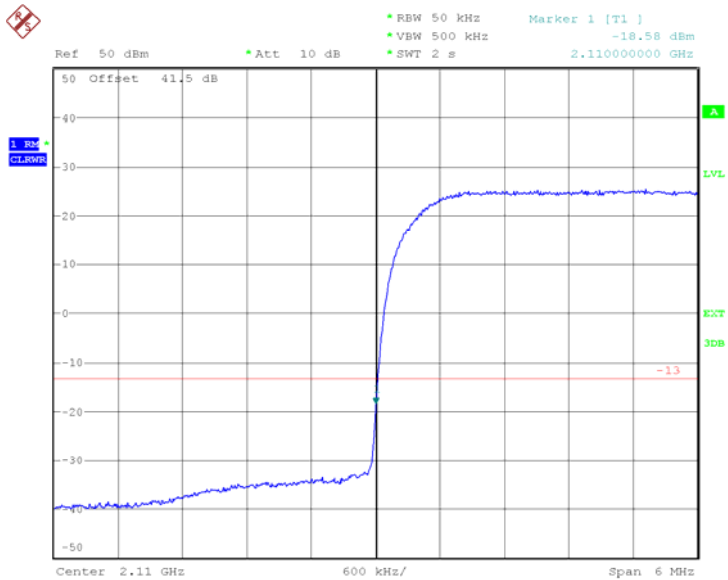
TM1



Date: 18.DEC.2008 04:26:24

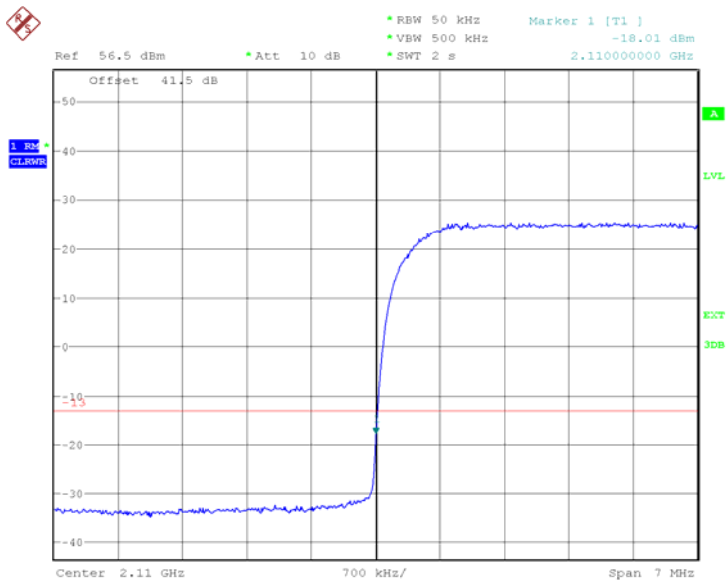


TM5



Date: 18.DEC.2008 08:31:13

TM6

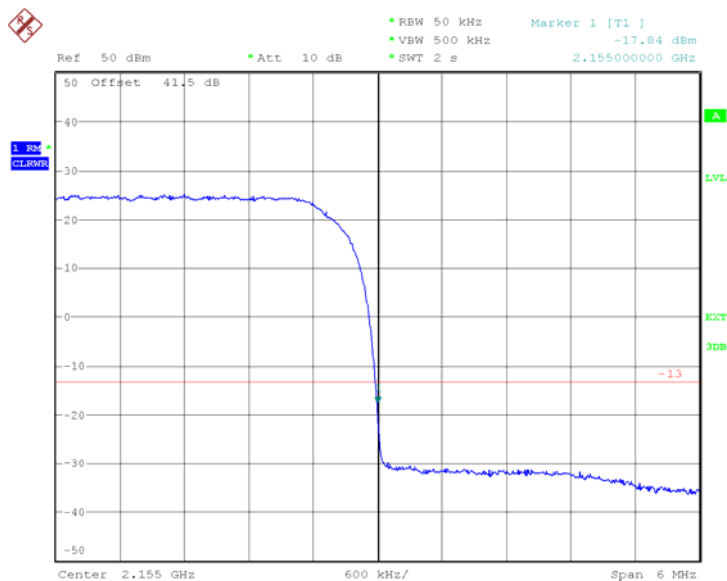


Date: 17.DEC.2008 08:49:15



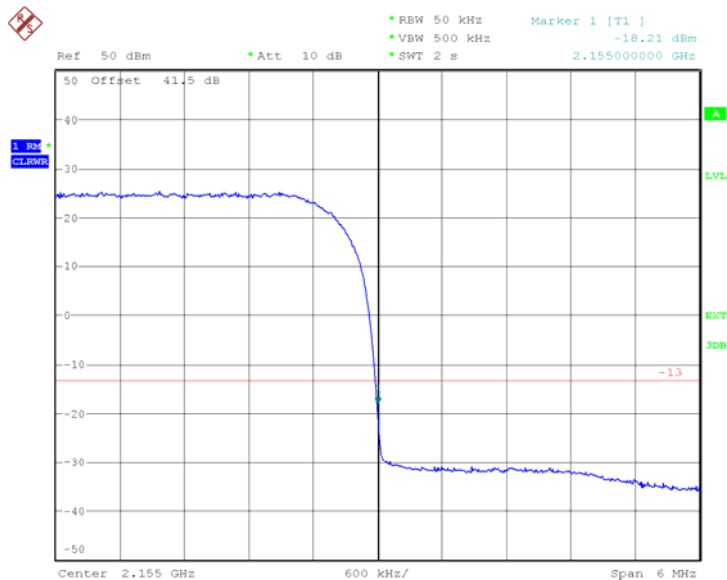
- Mode 6

TM1



Date: 18.DEC.2008 09:37:36

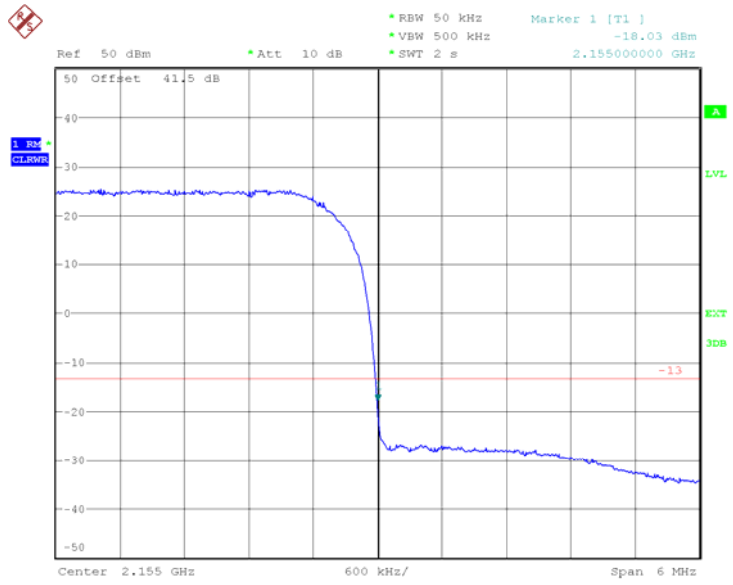
TM5



Date: 18.DEC.2008 08:41:50



TM6



Date: 17.DEC.2008 09:17:05



## **2.6 RADIATED SPURIOUS EMISSIONS**

### **2.6.1 Specification Reference**

FCC CFR 47 Part 27: 2007, Clause 2.1053, 27.53(g)  
Industry Canada RSS 139:2008 Clause 6.5

### **2.6.2 Equipment Under Test**

RRU22 21V40 (KRC 161 134/4)

### **2.6.3 Date of Test and Modification State**

11, 18 and 19 December 2008 – Modification State 0

### **2.6.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.6.5 Test Method and Operating Modes**

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisation with Peak Detector in the frequency range of 30MHz – 22GHz. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Emissions closer than 20 dB to the limit were measured with Average Detector. Emissions closer than 10 dB to the limit with the Average Detector were measured with the substitution method according to the standard.

The measurements were performed at a 3m distance unless otherwise stated.



The limits for Spurious Emissions have been calculated, as shown below using the following formula:

Field Strength of Carrier - (43 + 10Log (P)) dB

Where:

Field Strength is measured in dBμV/m

P is measured Transmitter Power in Watts

**Determination of Spurious Emission Limit**

As the EUT does not have an integral antenna, the field strength of the carrier has been calculated assuming that the power is to be fed to a half-wave tuned dipoles as per 2.1053(a).

$$E_{(v/m)} = (30 \times G_i \times P_o)^{0.5} / d$$

Where  $G_i$  is the antenna gain of ideal half-wave dipoles,  
 $P_o$  is the power out of the transceiver in W,  
 d is the measurement distance in meter.

Therefore at 3m measurement distance the field strength using the lowest transceiver output power would be:

$$E_{(v/m)} = (30 \times 1.64 \times 45.92)^{0.5} / 3 = 15.844V/m = 144.0dB\mu V/m$$

As per 22.917(a) the spurious emission must be attenuated by 43 + 10log ( $P_o$ ) dB this gives:

$$43 + 10\log(45.92) = 59.62dB$$

Therefore the limit at 3m measurement distance is:

$$144.0 - 59.62 = 84.4 \text{ dB}\mu V/m$$

This limit has been used to determine Pass or Fail for the harmonics measured and detailed in the following results.

The test was performed with the EUT operating on all modes in section 1.4.3 and record the result of the following configurations and modes of operation for worst case:

- Mode 1
- Mode 2
- Mode 3
- Mode 4
- Mode 5
- Mode 6

**2.6.6 Environmental Conditions**

	11 December 2008	18 December 2008	19 December 2008
Ambient Temperature	19.2°C	19.3°C	18.9°C
Relative Humidity	23.3%	25.4%	24.1%

**2.6.7 Test Results**

For the period of test the EUT met the requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008 Clause 6.5 for Radiated Spurious Emissions.

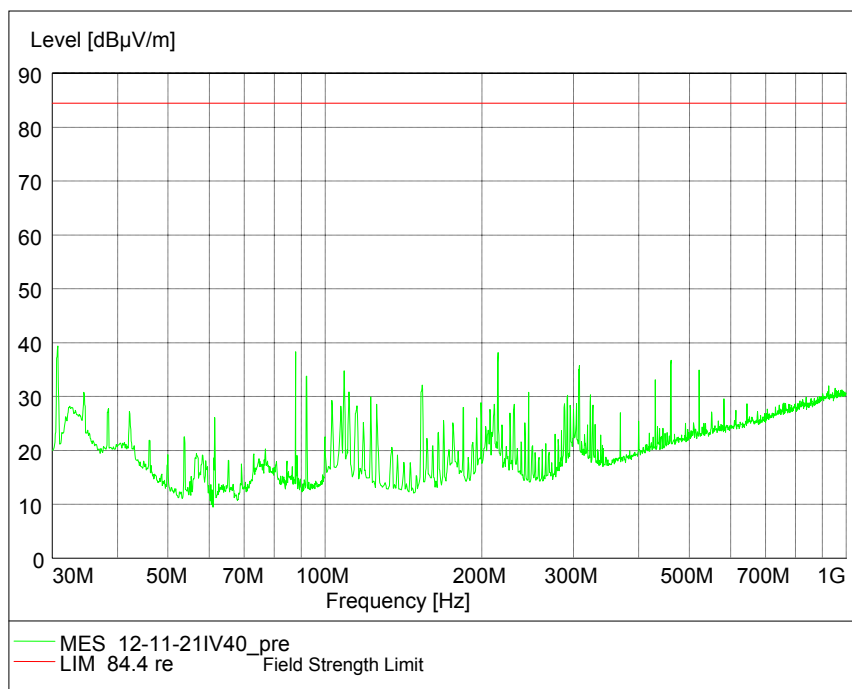
The test results are shown below.

- Mode 1

No emissions were detected within 20dB of the limit.

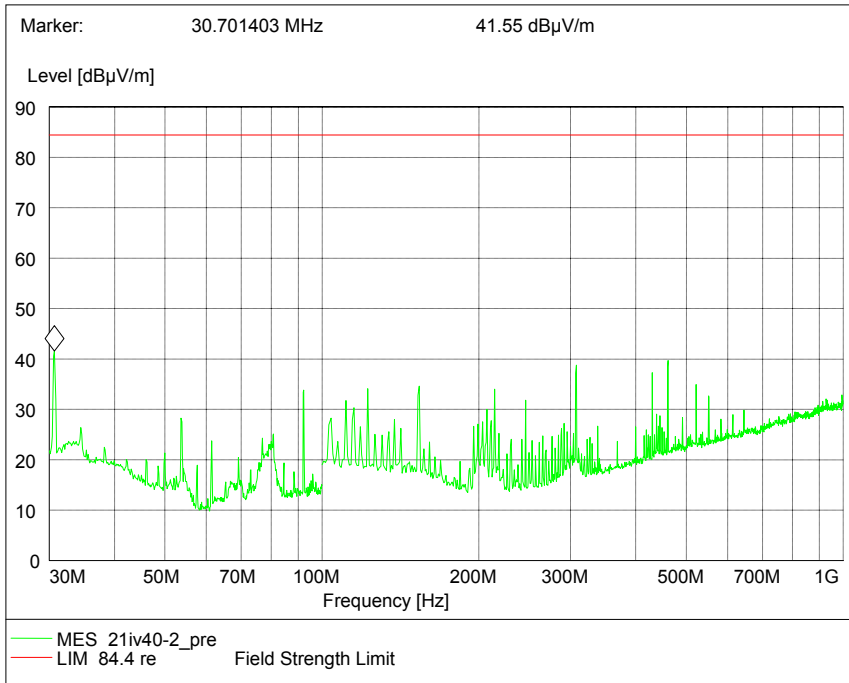
30MHz to 1GHz

TM1

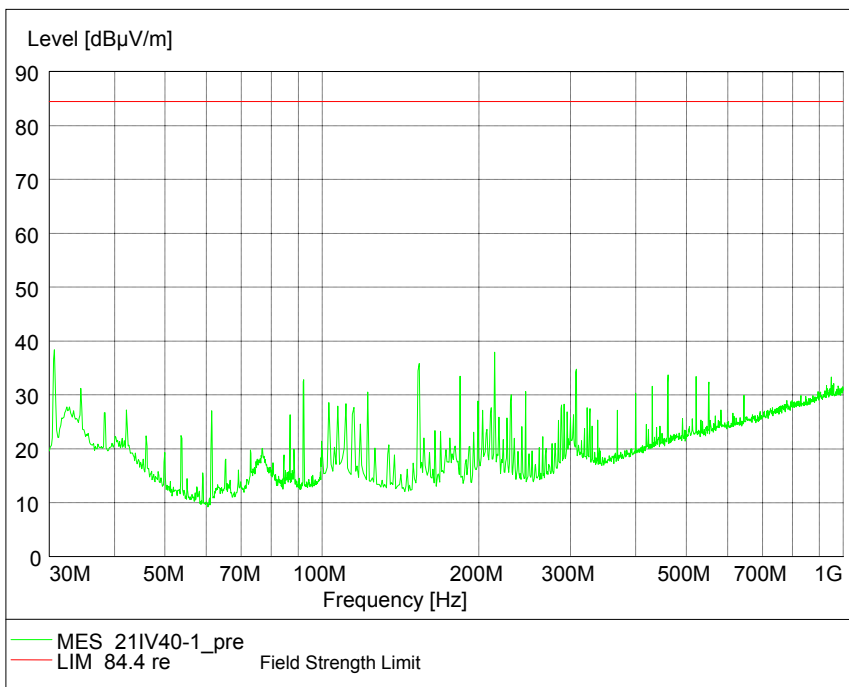




TM5

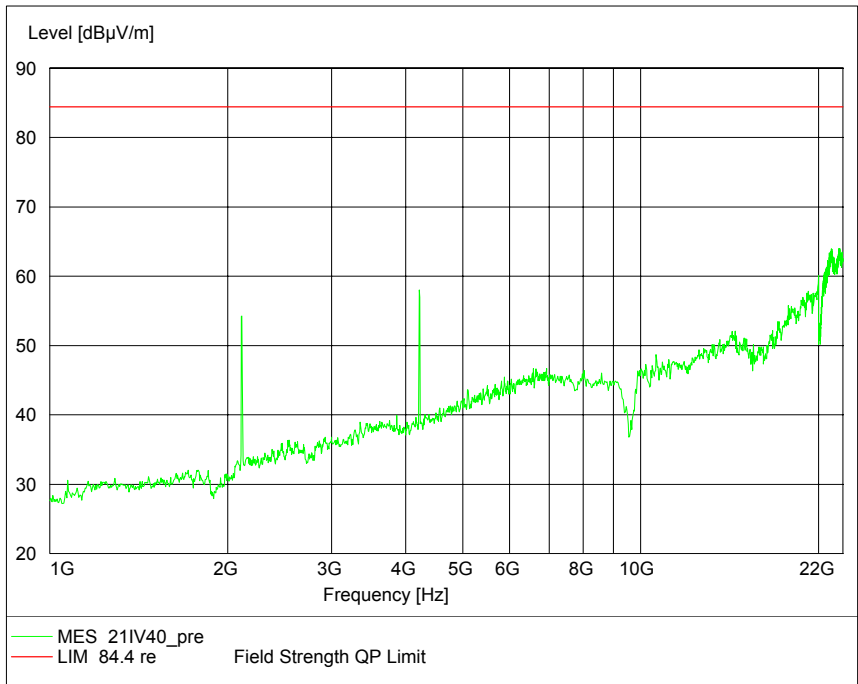


TM6

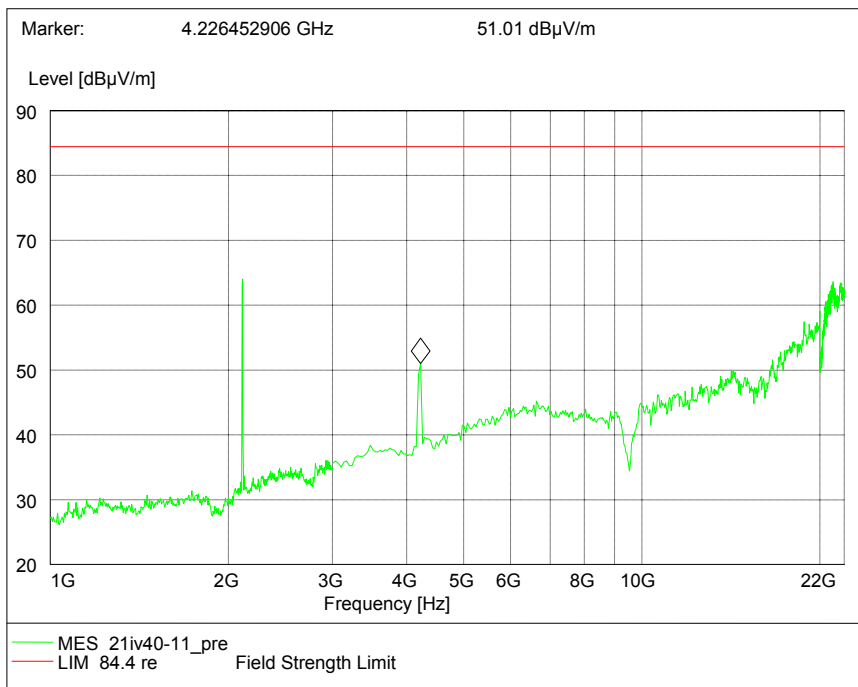


1GHz to 22GHz

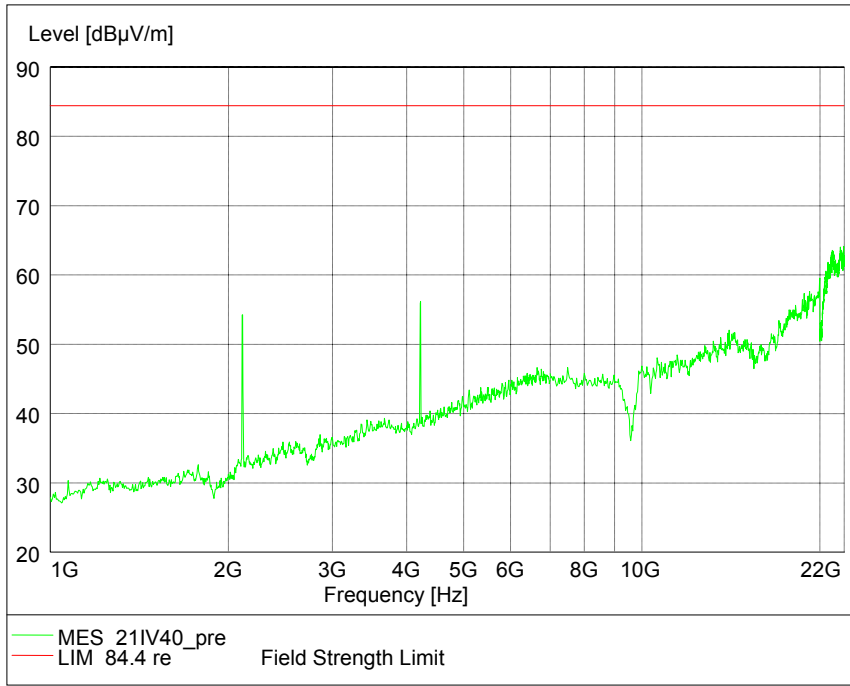
TM1



TM5



TM6

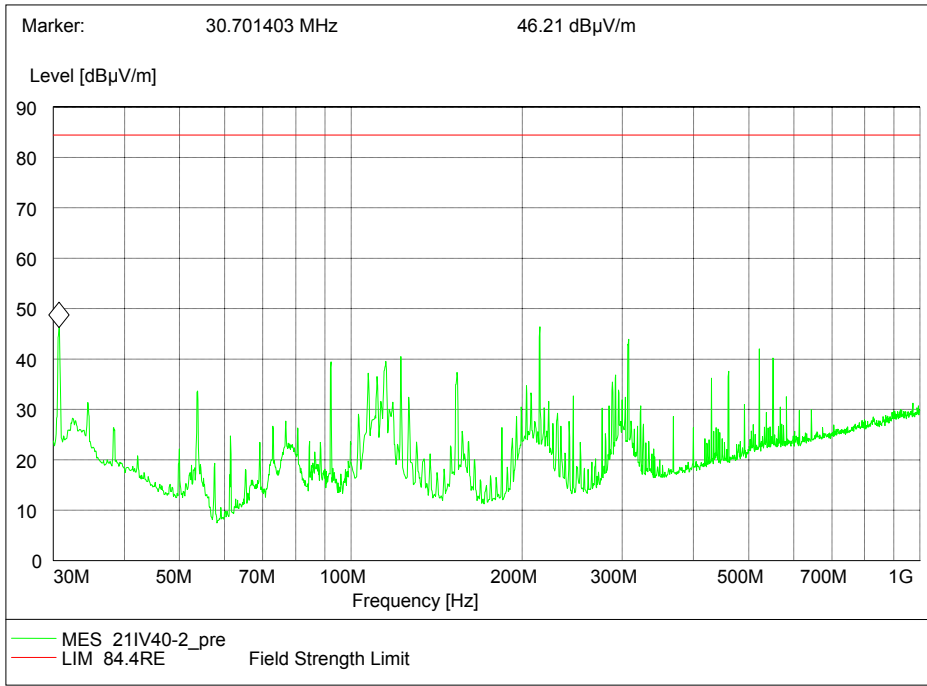


- Mode 2

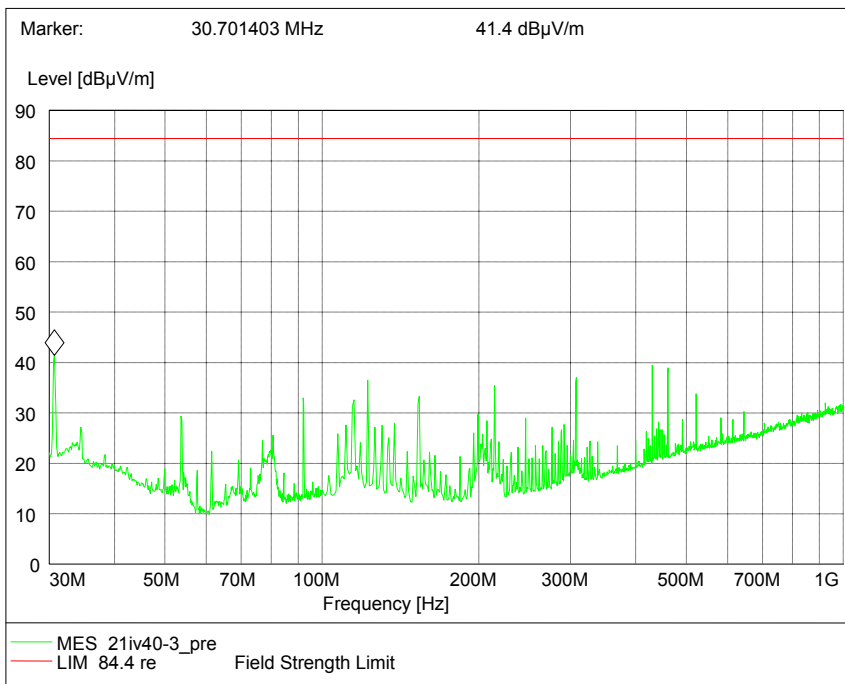
No emissions were detected within 20dB of the limit.

30MHz to 1GHz

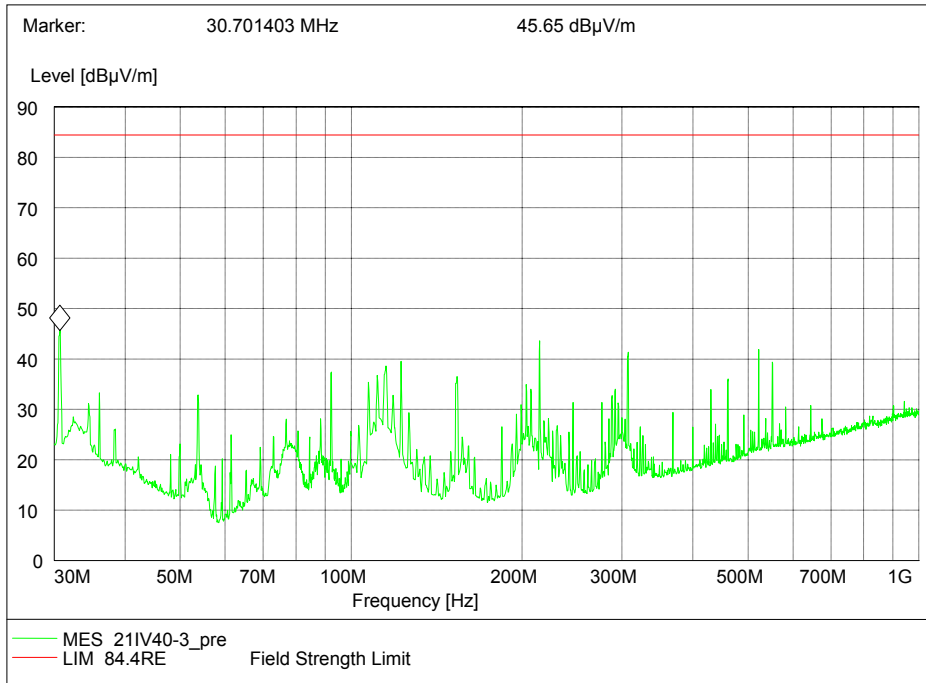
TM1



TM5

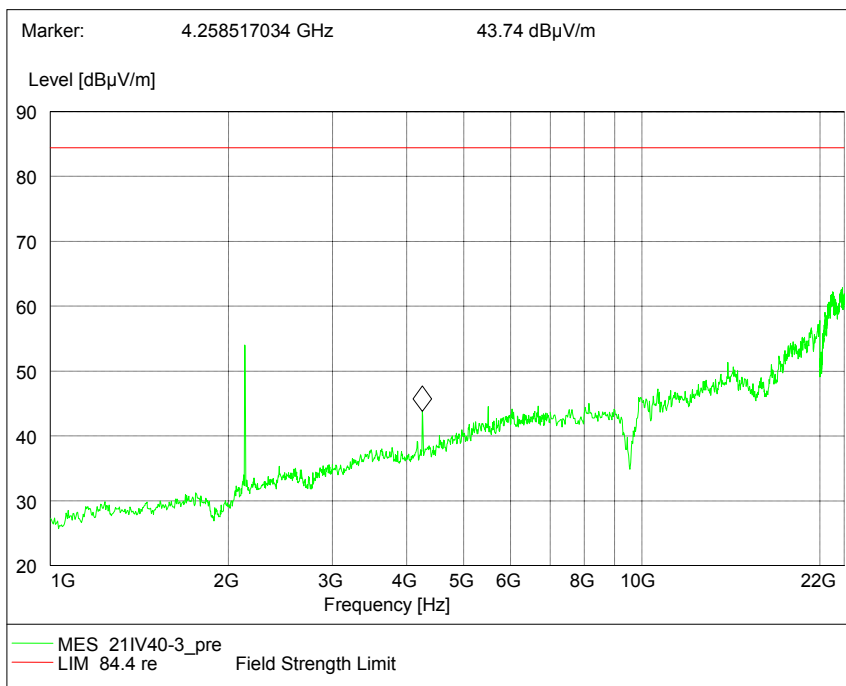


TM6

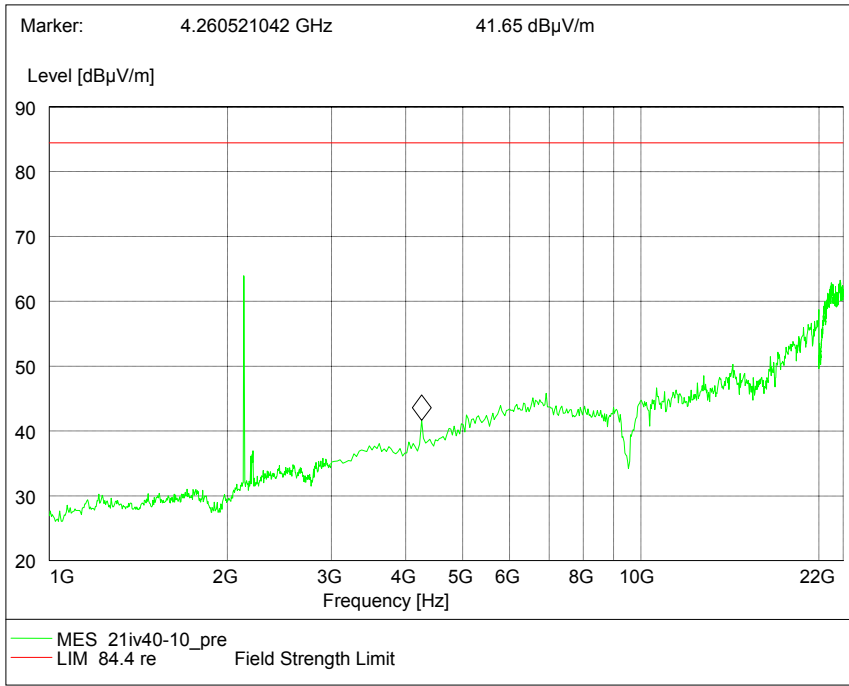


1GHz to 22GHz

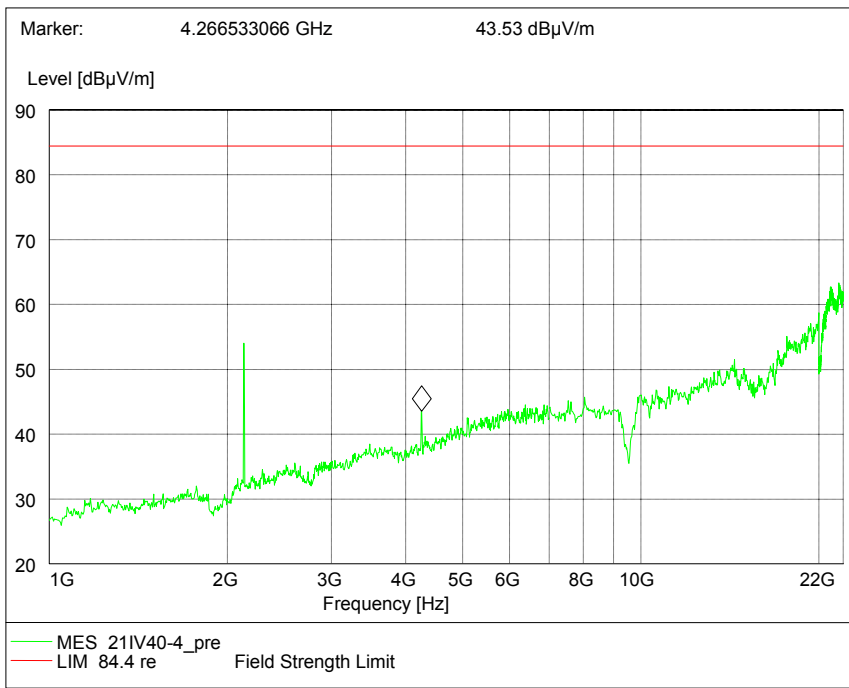
TM1



TM5



TM6

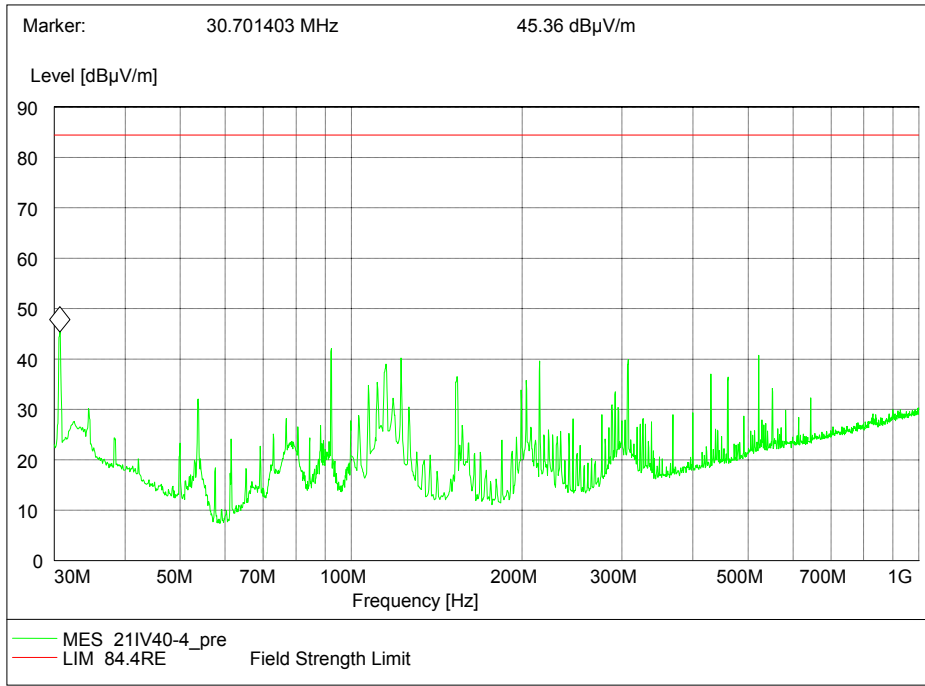


- Mode 3

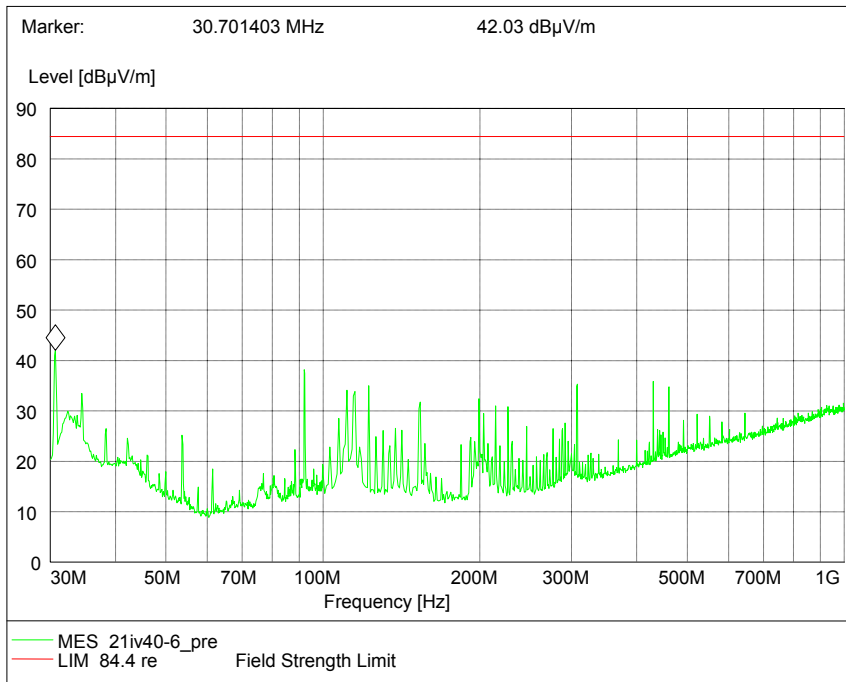
No emissions were detected within 20dB of the limit.

30MHz to 1GHz

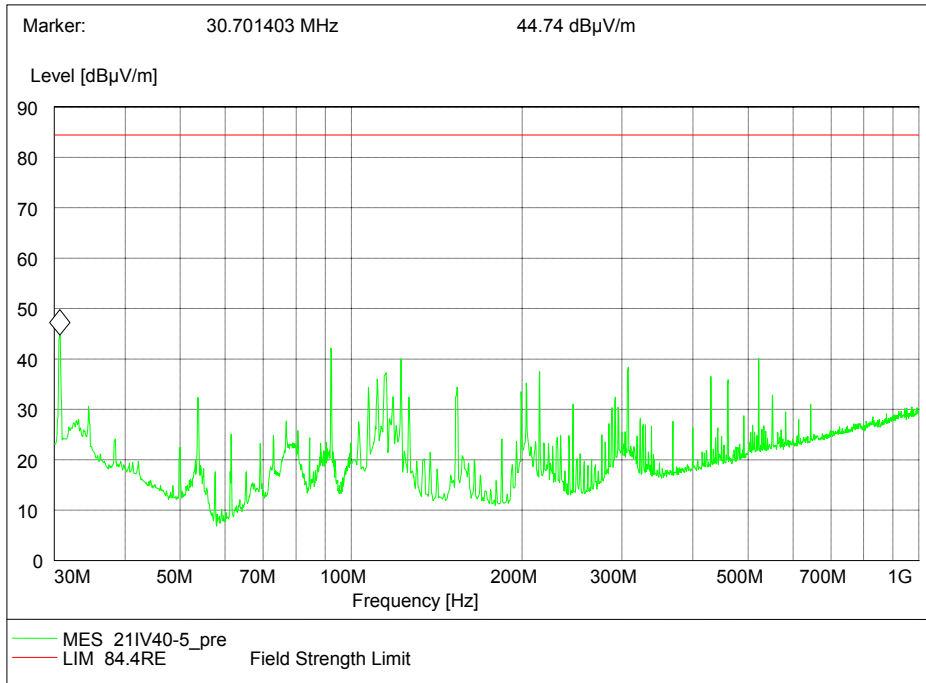
TM1



TM5

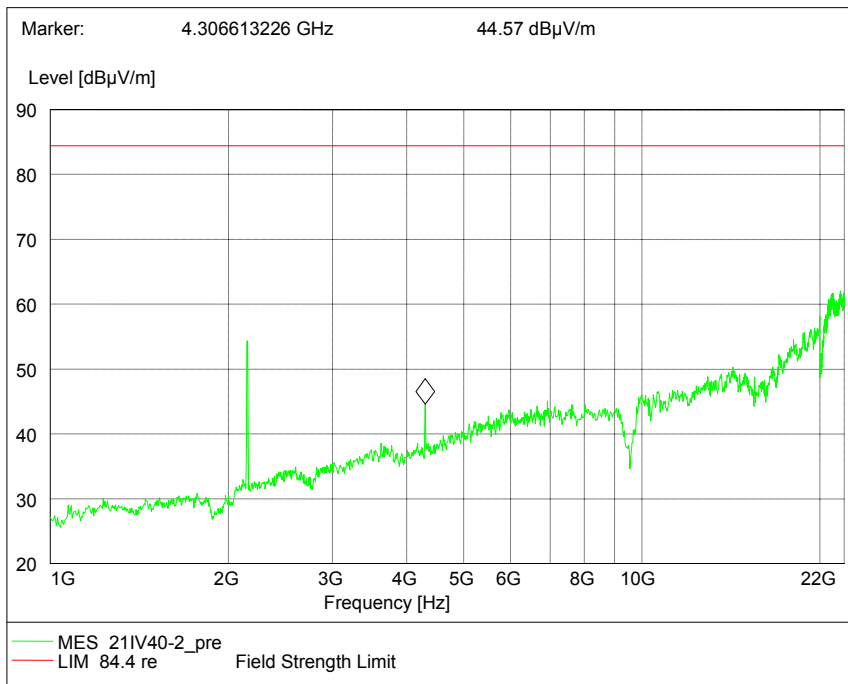


TM6



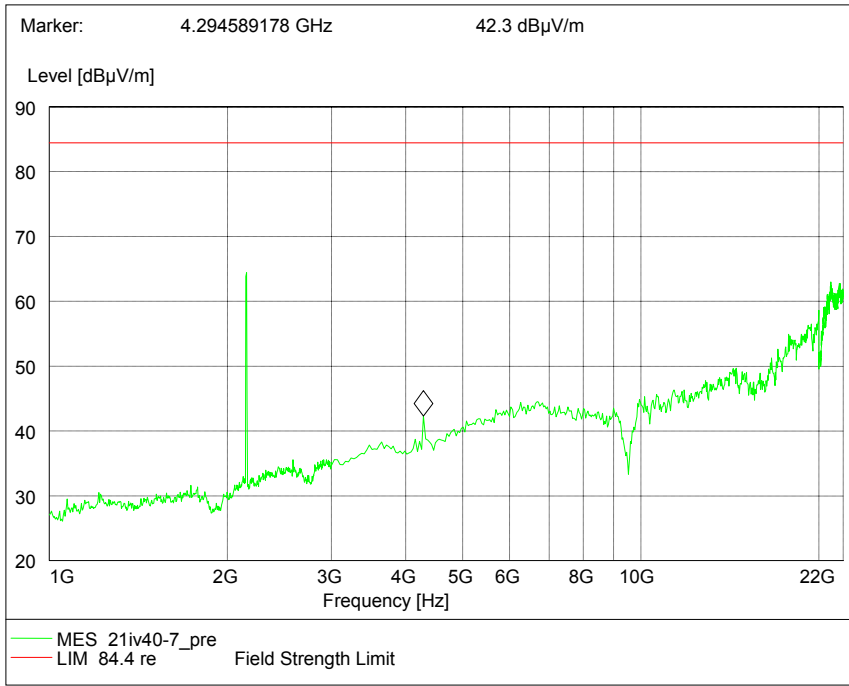
1GHz to 22GHz

TM1

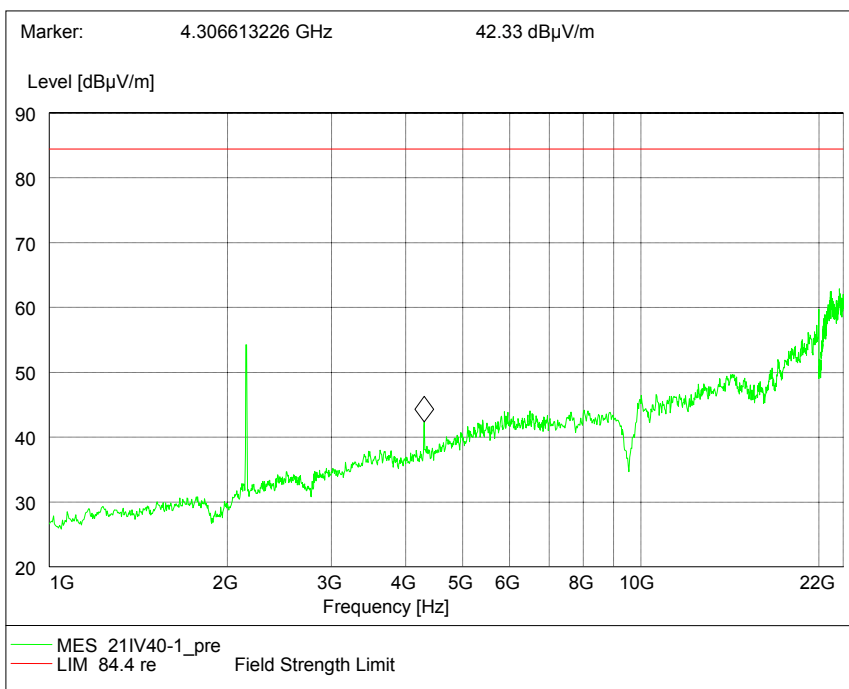




TM5



TM6



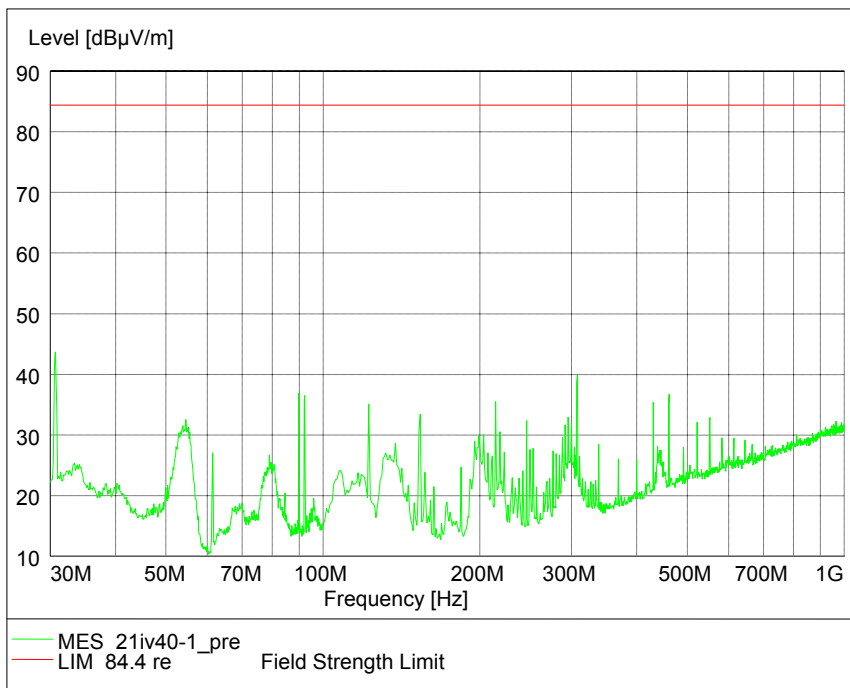


- Mode 4

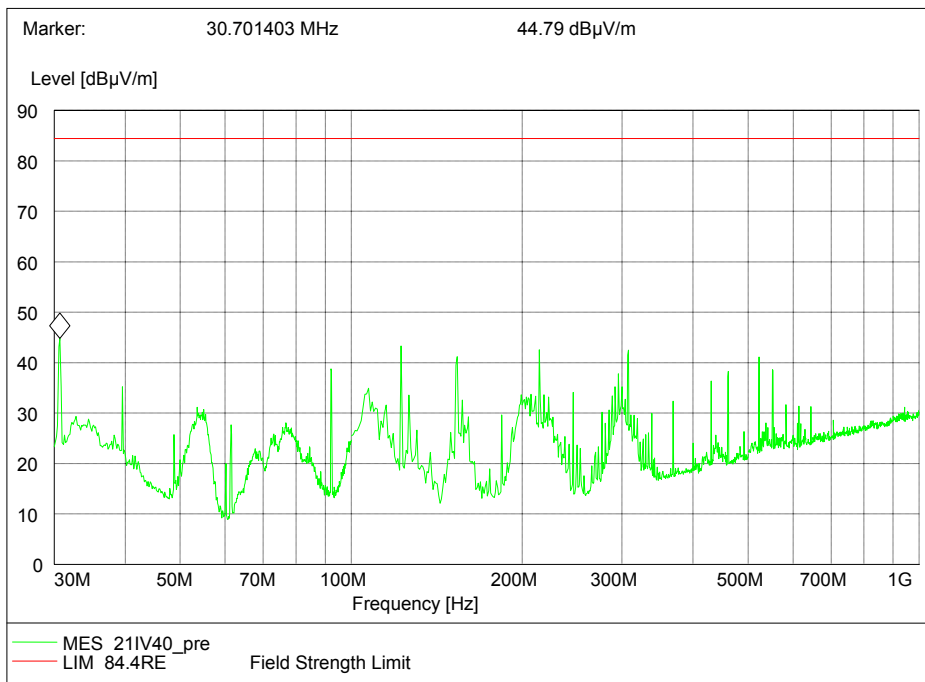
No emissions were detected within 20dB of the limit.

30MHz to 1GHz

TM1&TM5 – Maximum power

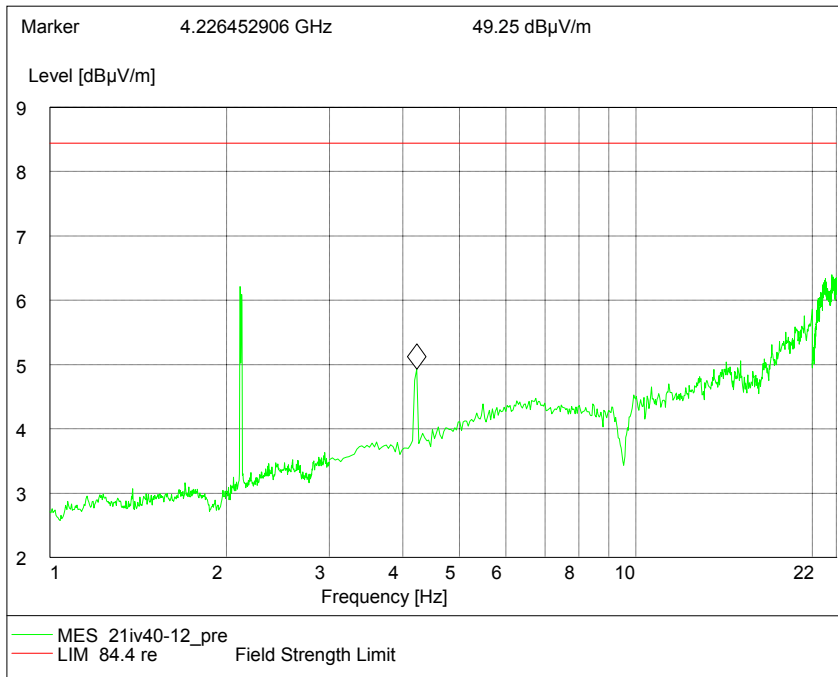


TM6&TM6 - Maximum power

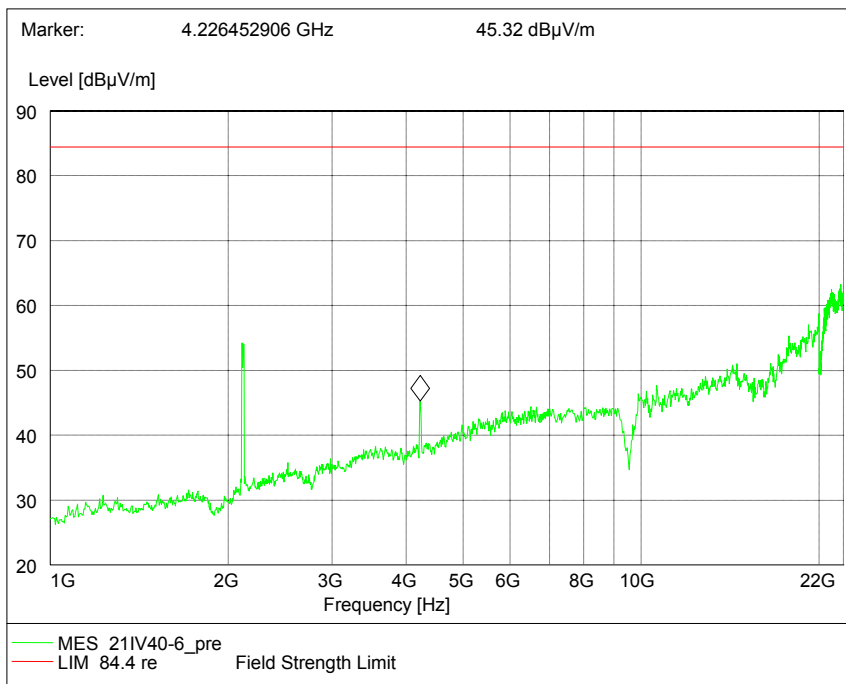


1GHz to 22GHz

TM1&TM5 – Maximum power



TM6&TM6 - Maximum power



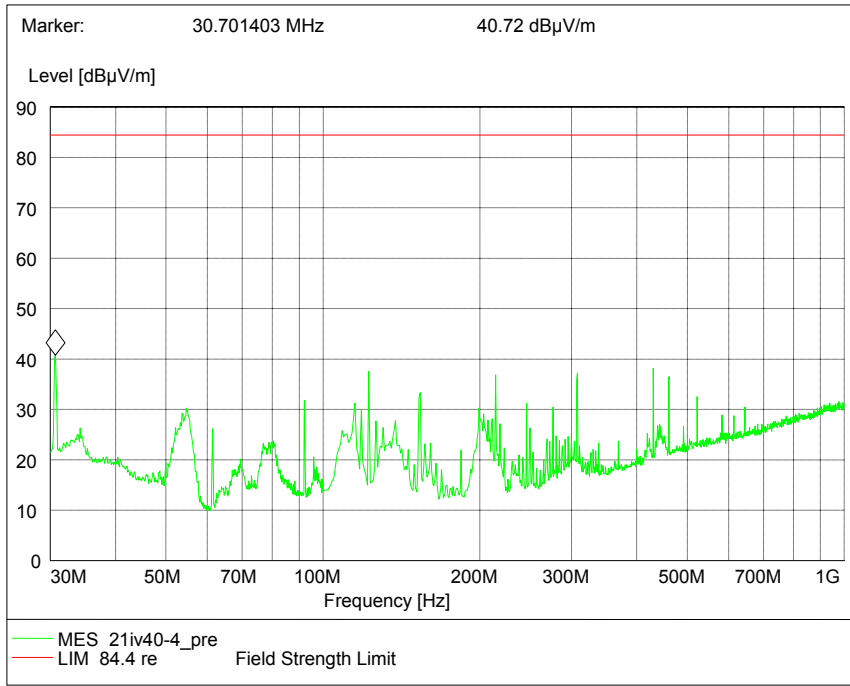


- Mode 5

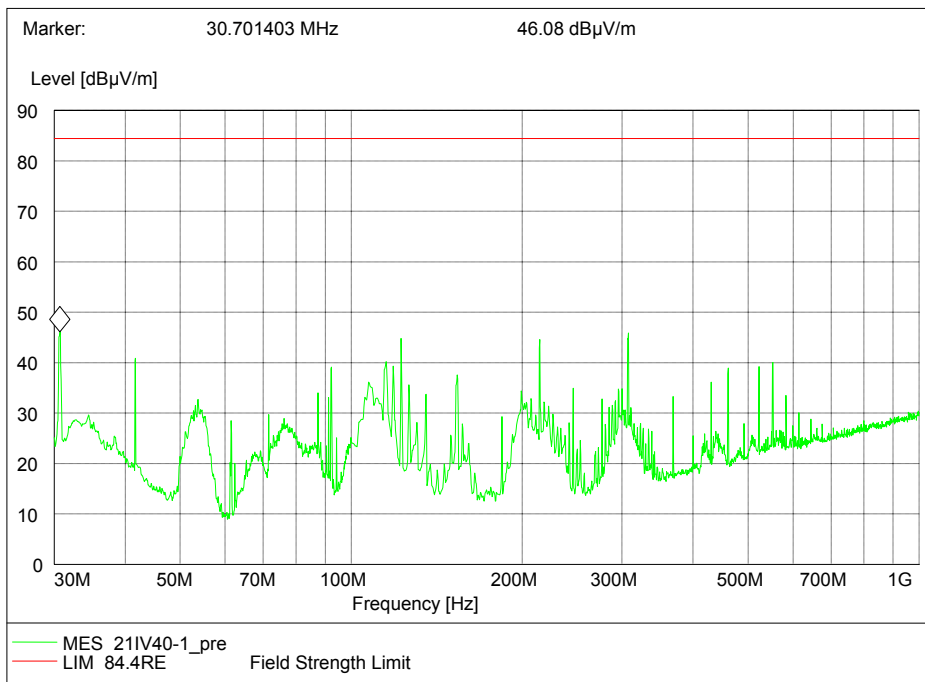
No emissions were detected within 20dB of the limit.

30MHz to 1GHz

TM1&TM5 – Maximum power



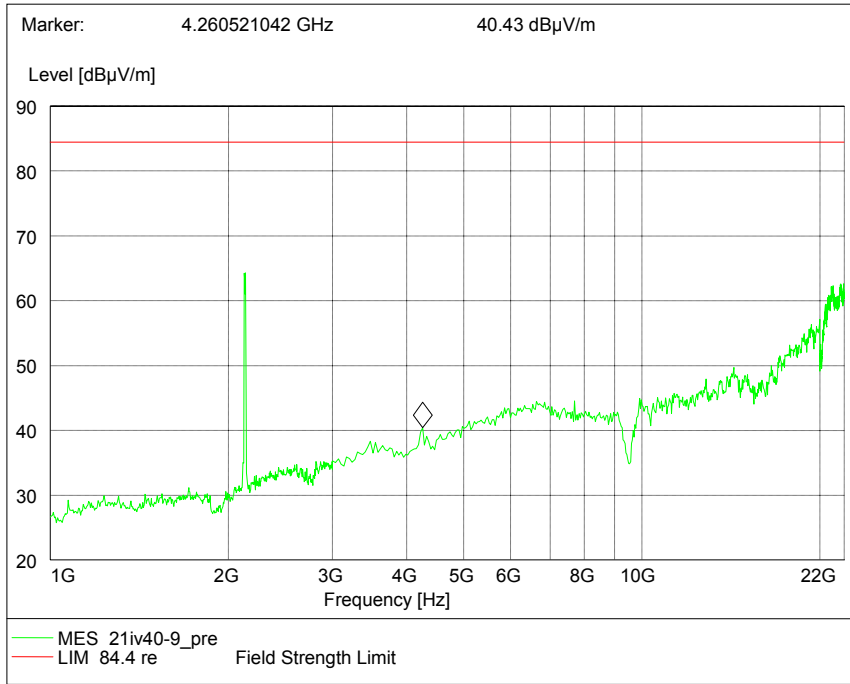
TM6&TM6 - Maximum power



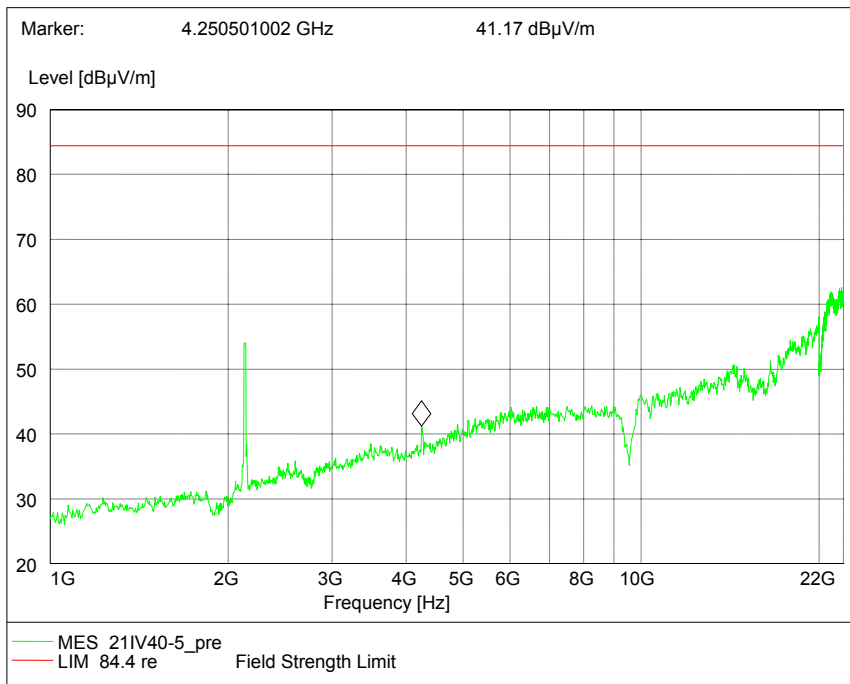


1GHz to 22GHz

TM1&TM5 – Maximum power



TM6&TM6 - Maximum power

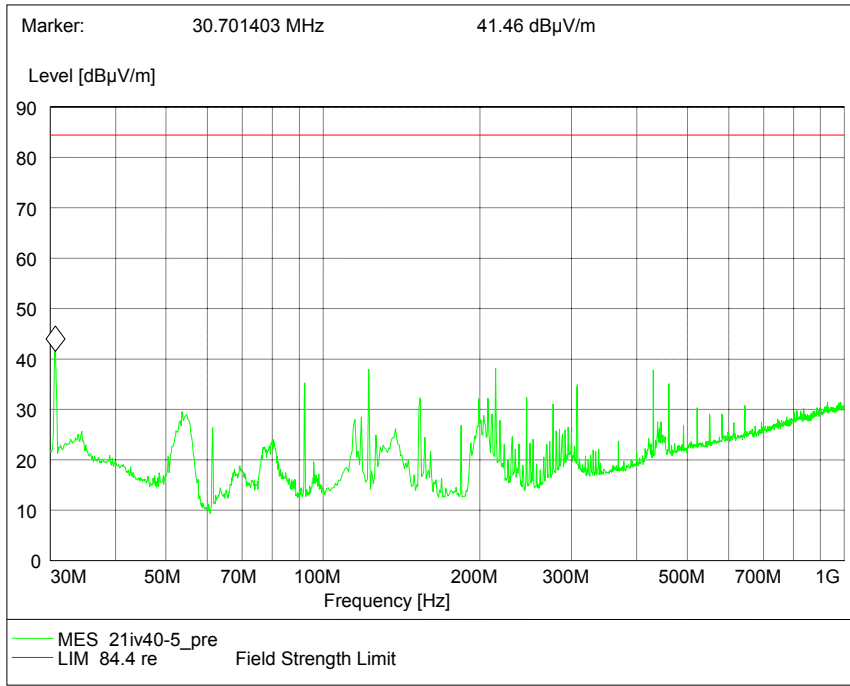


- Mode 6

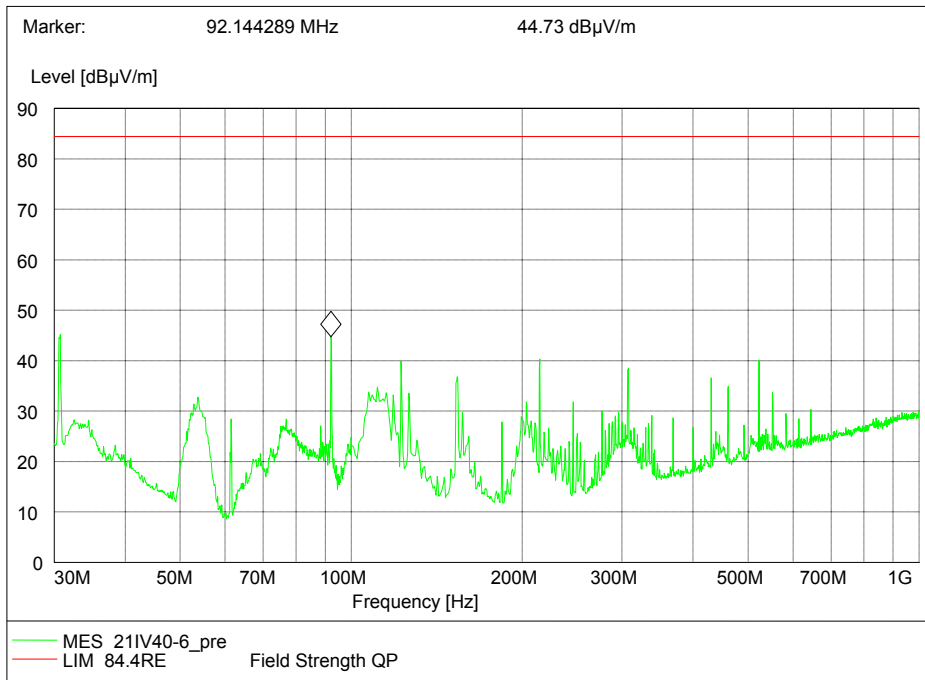
No emissions were detected within 20dB of the limit.

30MHz to 1GHz

TM1&TM5 – Maximum power



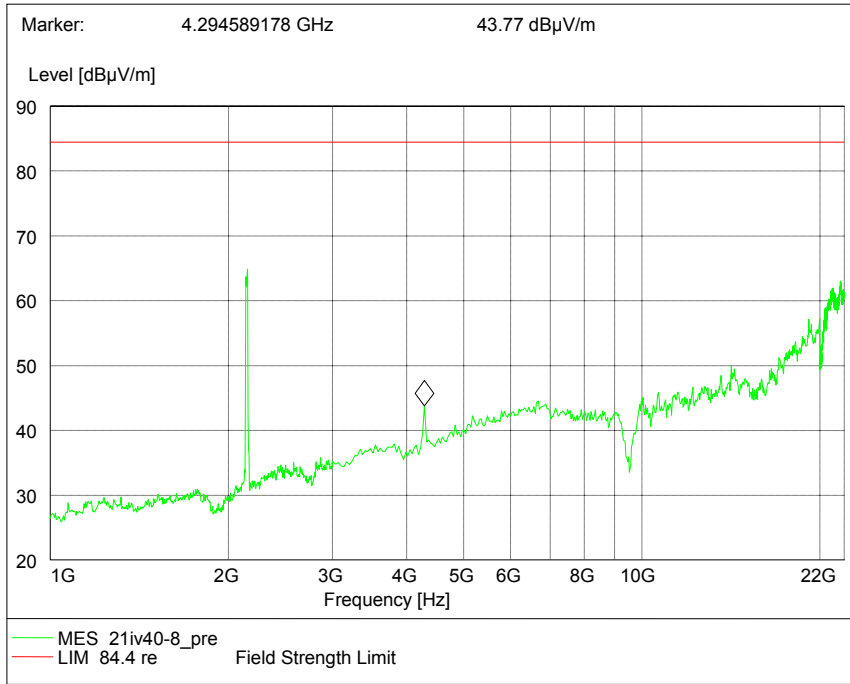
TM6&TM6 - Maximum power



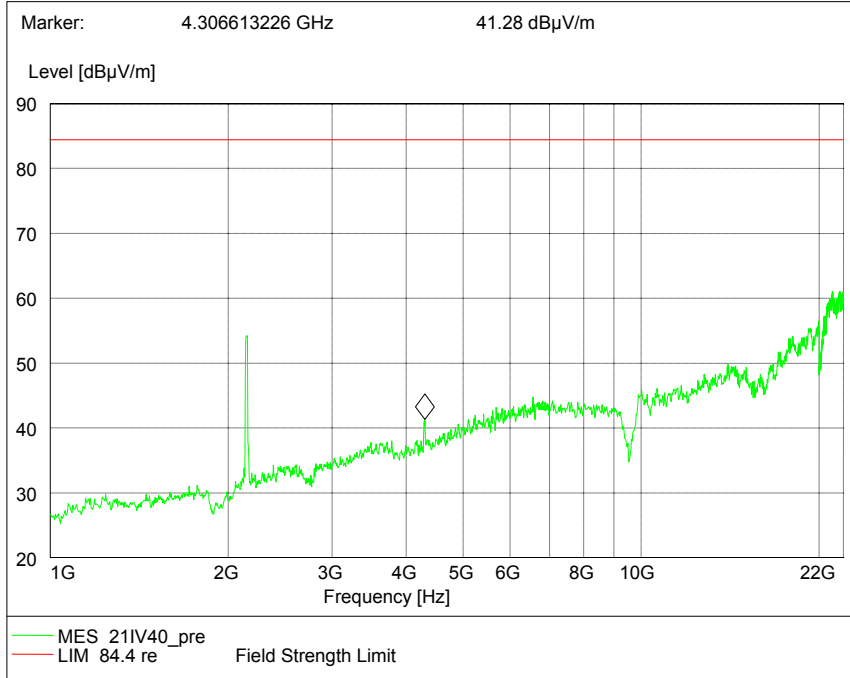


1GHz to 22GHz

TM1&TM5 – Maximum power



TM6&TM6 - Maximum power



Limit	84.4dB $\mu$ V/m.
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## 2.7 CONDUCTED SPURIOUS EMISSIONS

### 2.7.1 Specification Reference

FCC CFR 47 Part 27: 2007, Clause 2.1051, 27.53(g)  
Industry Canada RSS 139:2008 Clause 6.5

### 2.7.2 Equipment Under Test

RRU22 21V40 (KRC 161 134/4)

### 2.7.3 Date of Test and Modification State

09,16 to 18 December 2008 – Modification State 0

### 2.7.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.7.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008.

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using a attenuator and the frequency spectrum investigated from 9kHz to 22GHz. The EUT was set to transmit on maximum power. The EUT was tested on Bottom, Middle and Top channels for all TM1, TM5 and TM6. The resolution bandwidth was set to 1MHz and video bandwidths were set to 1MHz thus meeting the requirements of Part 27.53(g). The spectrum analyser detector was set to peak and trace was kept on Max Hold. The limit line was displayed, showing the –13dBm.

The maximum path loss across the measurement band was used as the reference level offset to ensure worst case.

In addition, measurements were made up to the 10<sup>th</sup> harmonic of the fundamental.

The test was performed with the EUT in the following configurations and modes of operation:

- Mode 1
- Mode 2
- Mode 3
- Mode 4
- Mode 5
- Mode 6

### 2.7.6 Environmental Conditions

	09 Dec. 2008	16 Dec. 2008	17 Dec. 2008	18 Dec. 2008
Ambient Temperature	23.2°C	23.3°C	22.9°C	22.3°C
Relative Humidity	24.1%	24.4%	24.2%	24.6%





**2.7.7 Test Results**

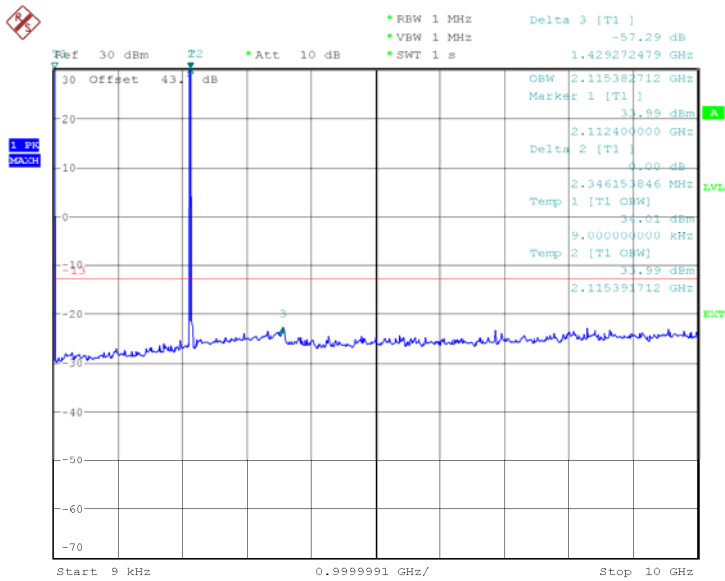
For the period of test the EUT met the requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008 for Spurious Emissions.

The test results are shown below.

- Mode 1

9kHz to 10GHz

TM1

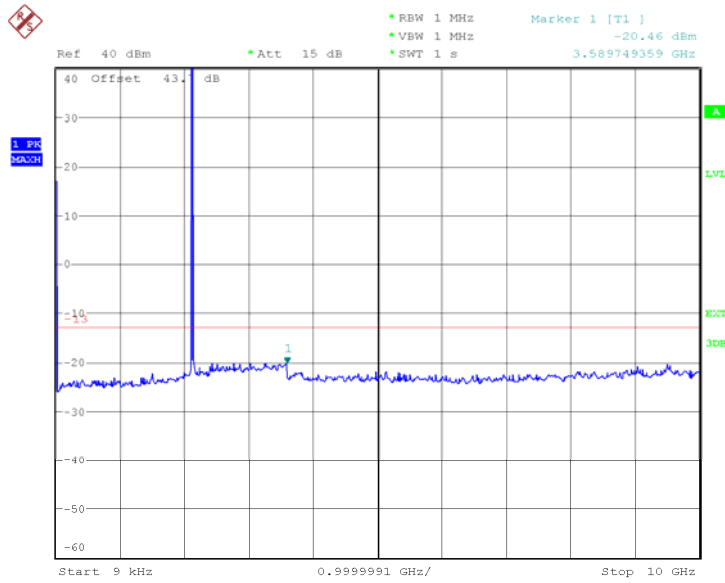


Date: 9.DEC.2008 05:48:02

Note: The emission beyond the limit is the operating frequency.



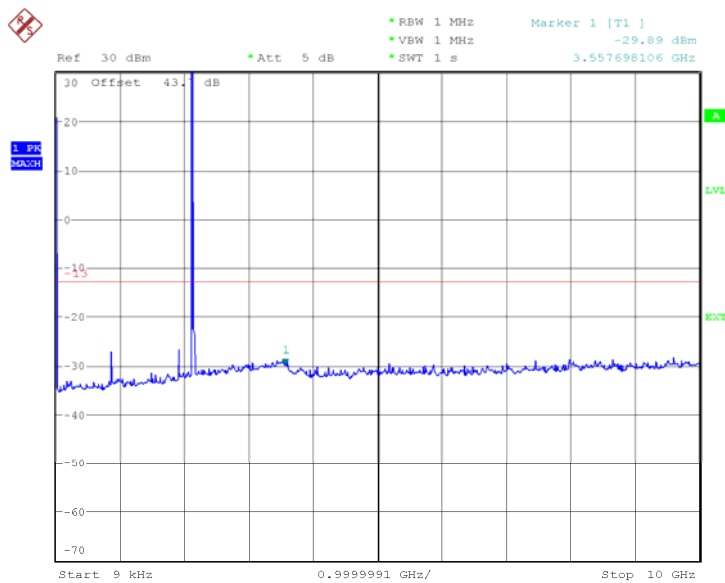
TM5



Date: 17.DEC.2008 03:59:17

Note: The emission beyond the limit is the operating frequency.

TM6



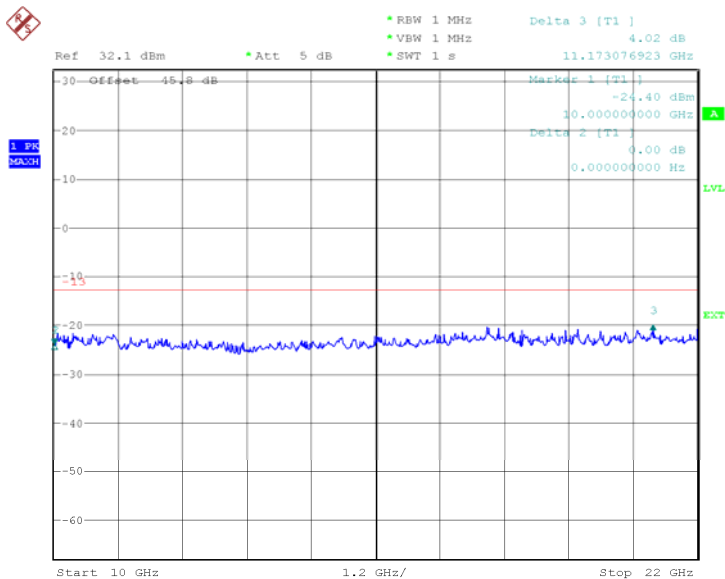
Date: 9.DEC.2008 03:49:20

Note: The emission beyond the limit is the operating frequency.



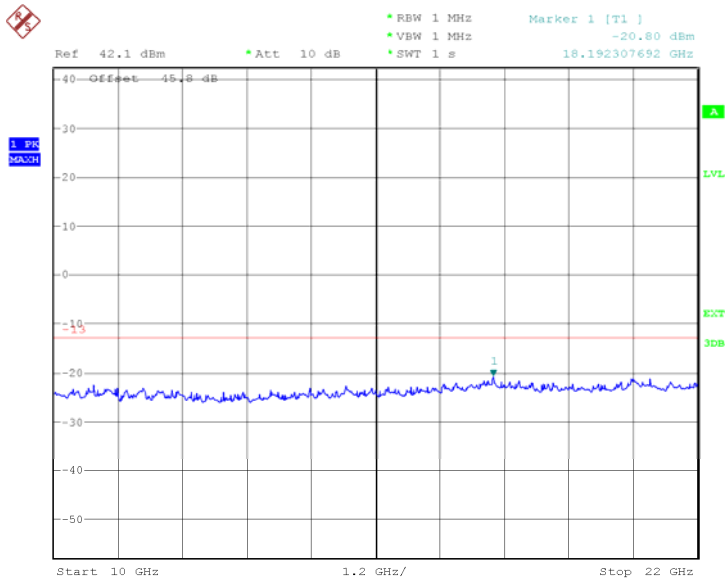
10GHz to 22GHz

TM1



Date: 9.DEC.2008 05:48:48

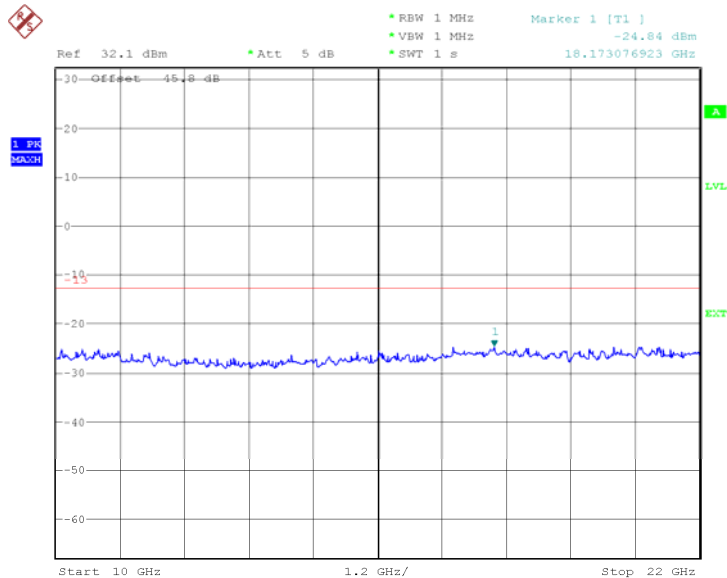
TM5



Date: 17.DEC.2008 04:00:17



TM6

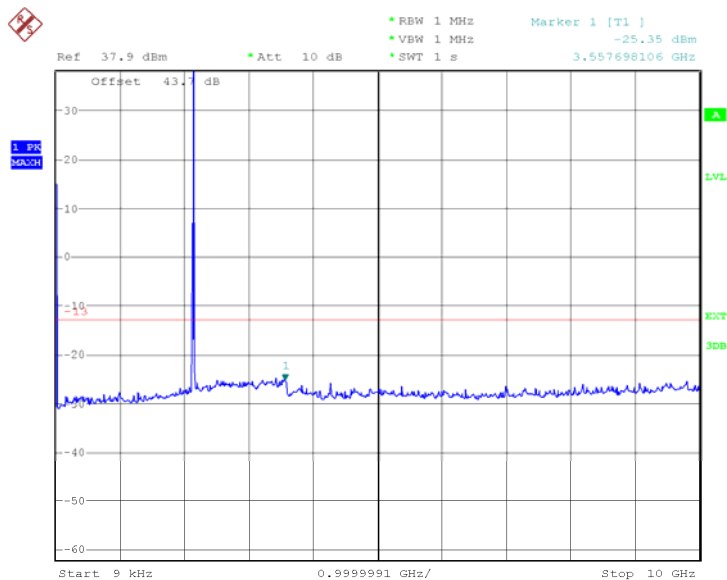


Date: 9.DEC.2008 03:50:22

- Mode 2

9kHz to 10GHz

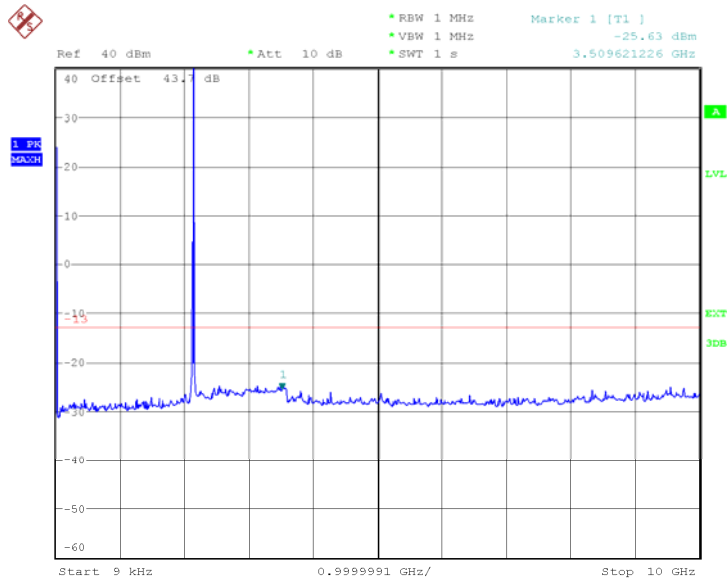
TM1



Date: 16.DEC.2008 09:53:19

Note: The emission beyond the limit is the operating frequency.

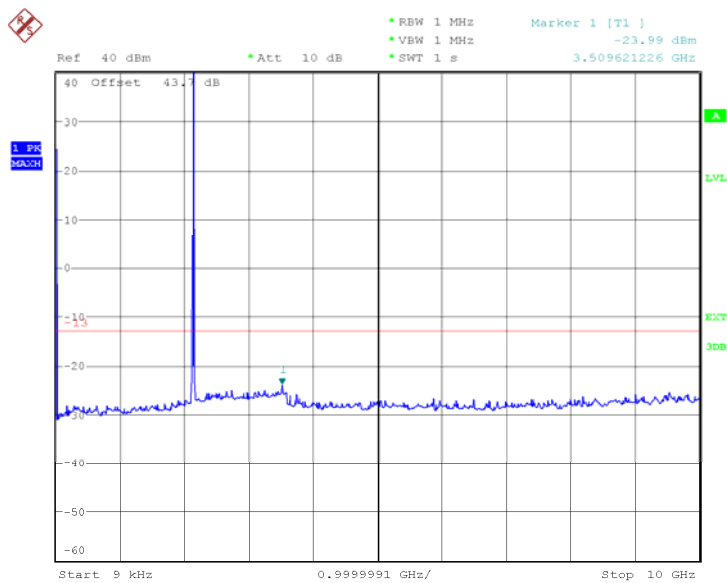
TM5



Date: 16.DEC.2008 05:49:20

Note: The emission beyond the limit is the operating frequency.

TM6



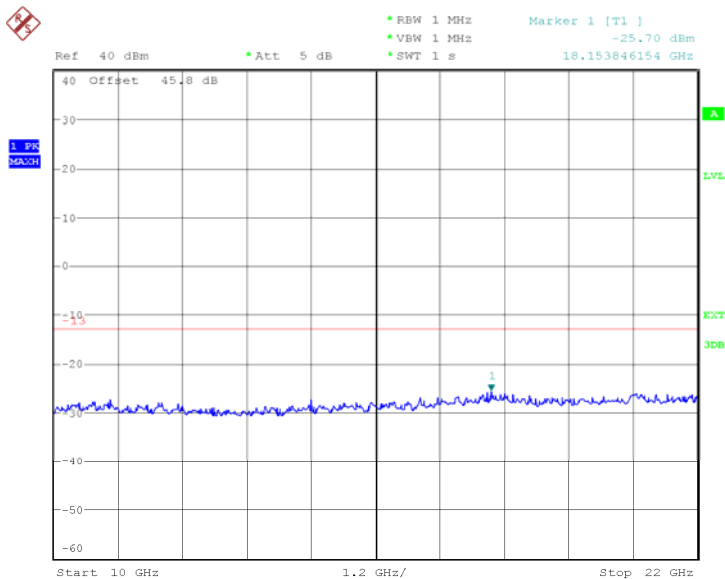
Date: 16.DEC.2008 08:23:09

Note: The emission beyond the limit is the operating frequency.



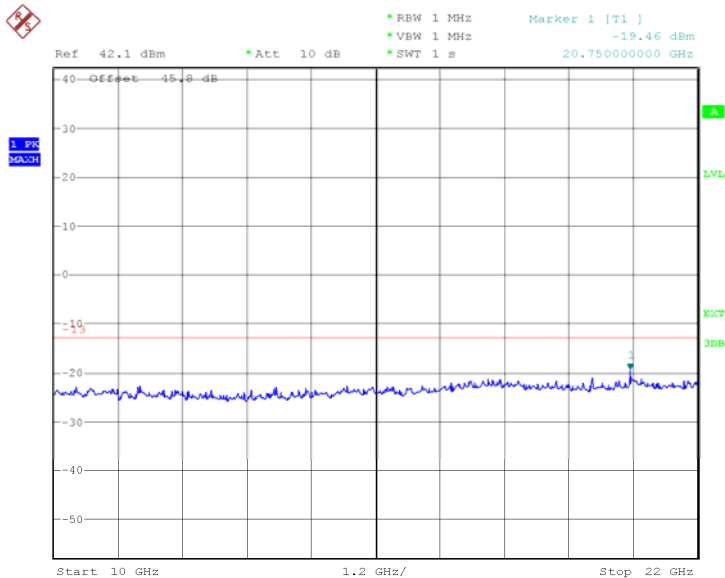
10GHz to 22GHz

TM1



Date: 16.DEC.2008 09:52:31

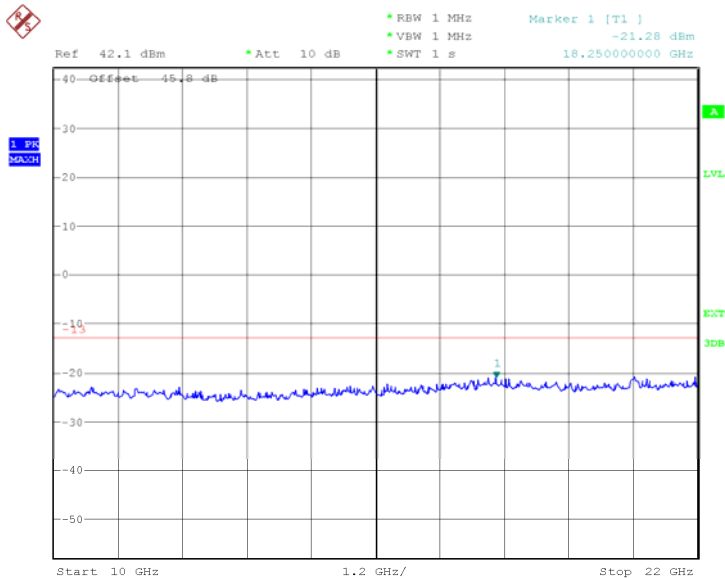
TM5



Date: 16.DEC.2008 05:50:34



TM6

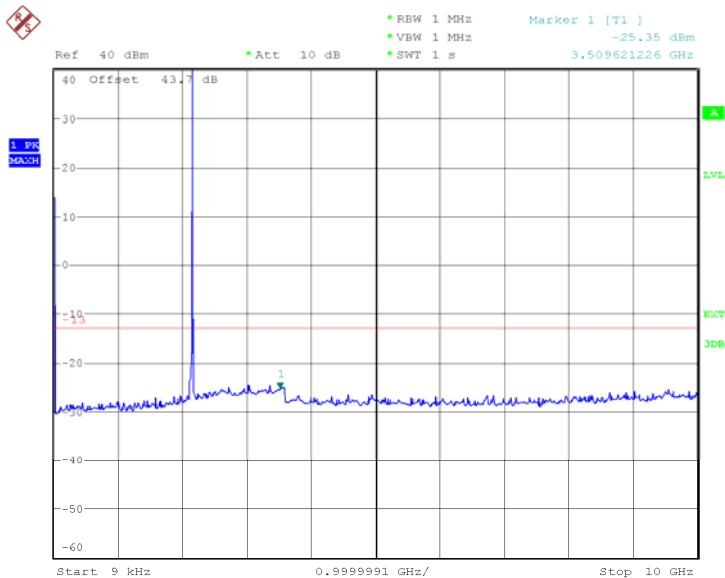


Date: 16.DEC.2008 08:23:54

- Mode 3

9kHz to 10GHz

TM1

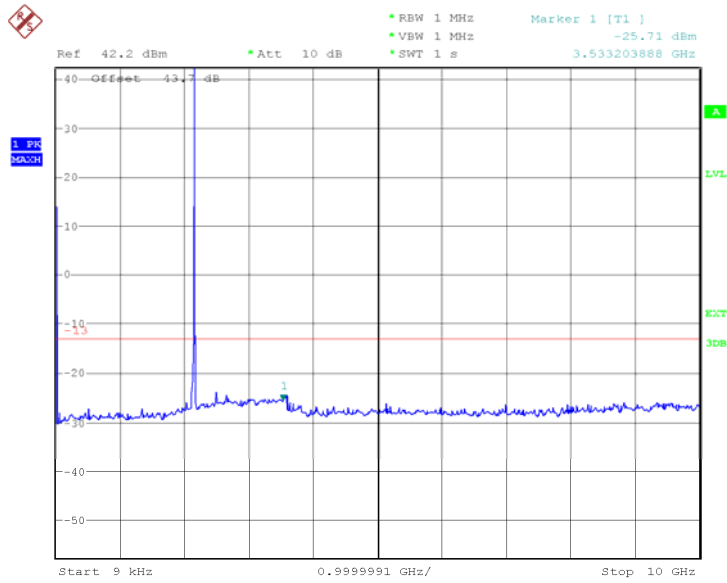


Date: 17.DEC.2008 03:10:53

Note: The emission beyond the limit is the operating frequency.



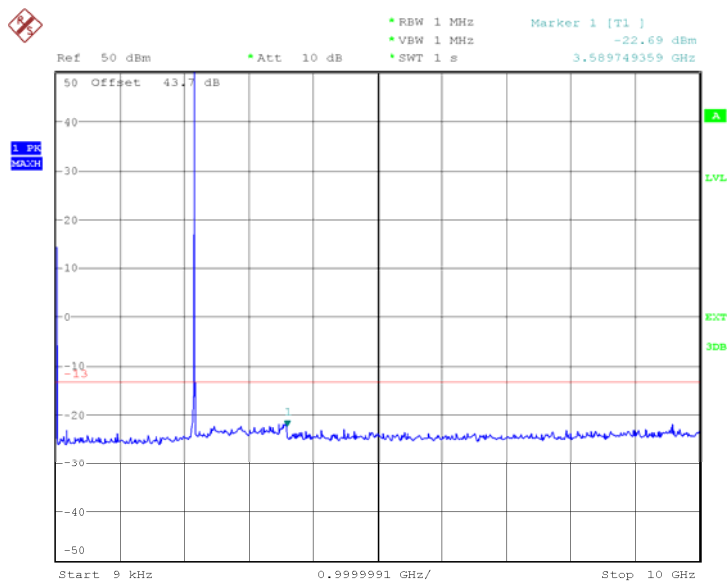
TM5



Date: 17.DEC.2008 04:24:15

Note: The emission beyond the limit is the operating frequency.

TM6



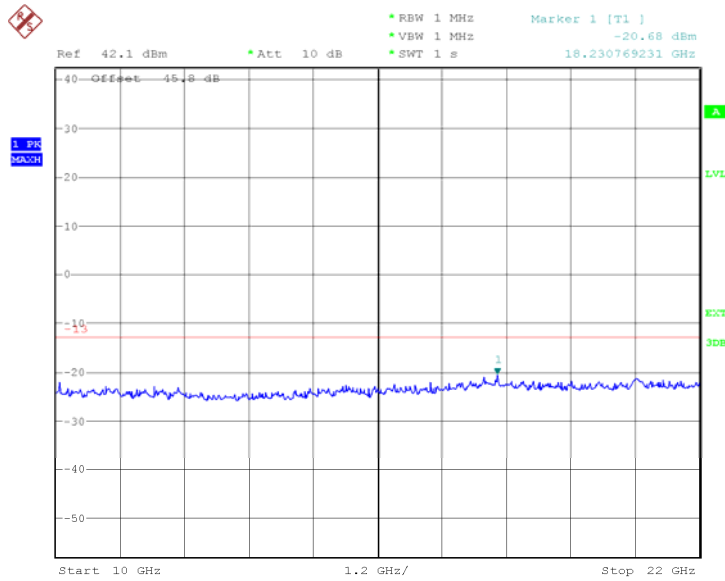
Date: 17.DEC.2008 06:21:37

Note: The emission beyond the limit is the operating frequency.



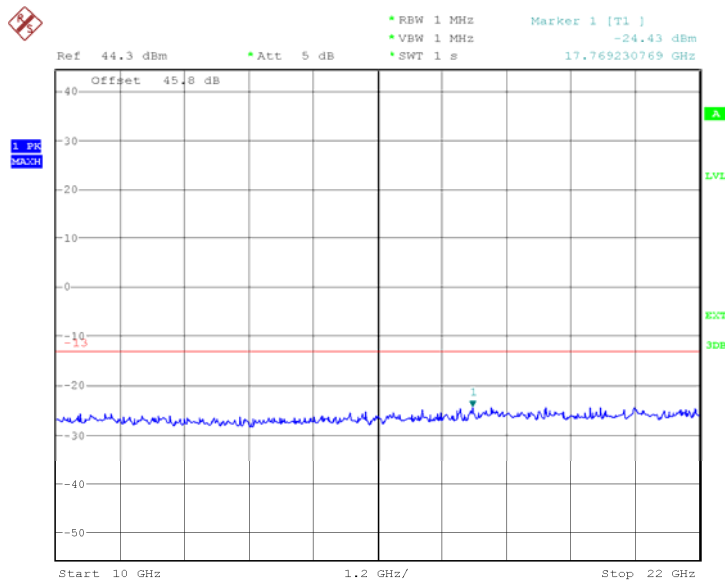
10GHz to 22GHz

TM1



Date: 17.DEC.2008 03:11:31

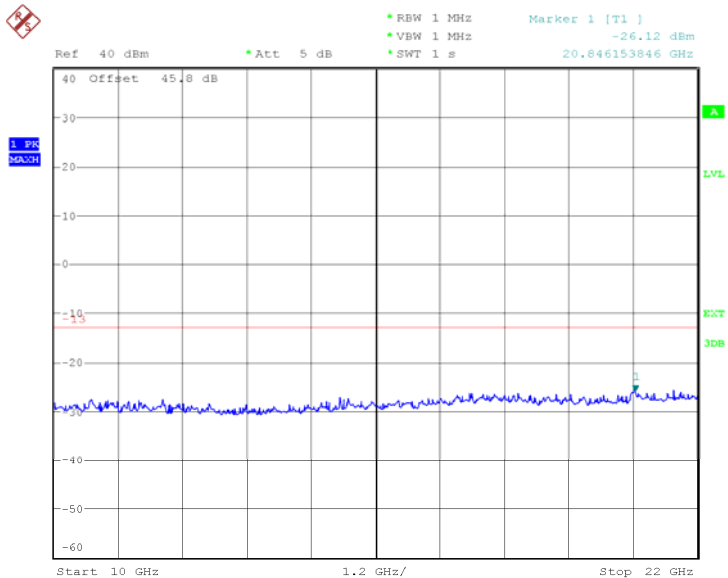
TM5



Date: 17.DEC.2008 04:24:49



TM6

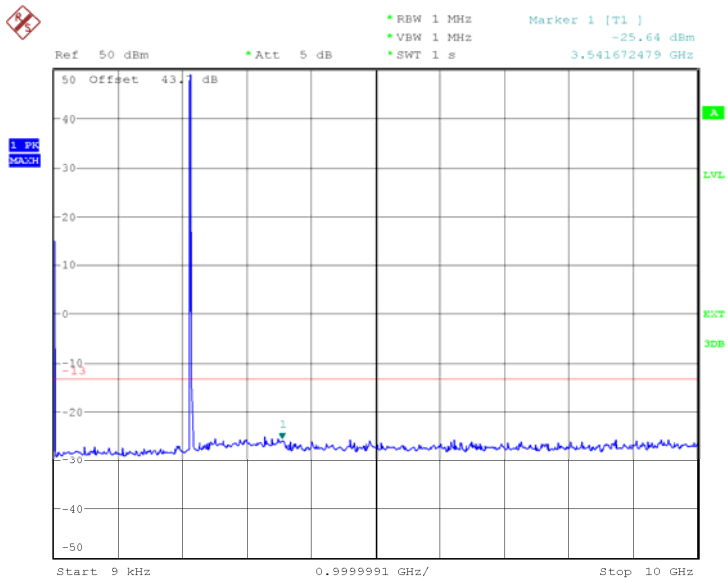


Date: 17.DEC.2008 06:22:31

- Mode 4

9kHz to 10GHz

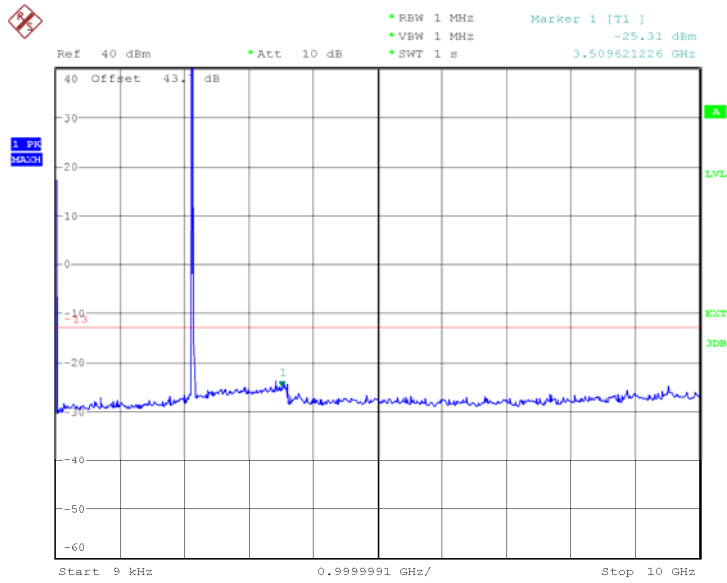
TM1



Date: 18.DEC.2008 04:22:52

Note: The emission beyond the limit is the operating frequency.

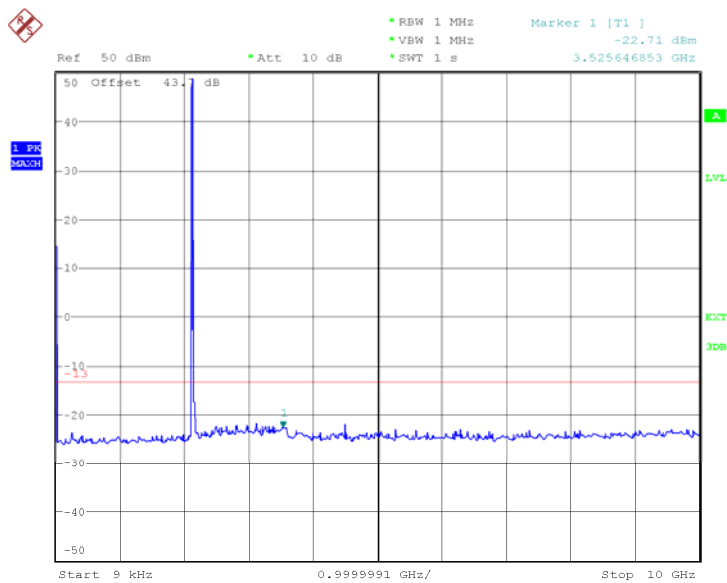
TM5



Date: 18.DEC.2008 08:27:55

Note: The emission beyond the limit is the operating frequency.

TM6



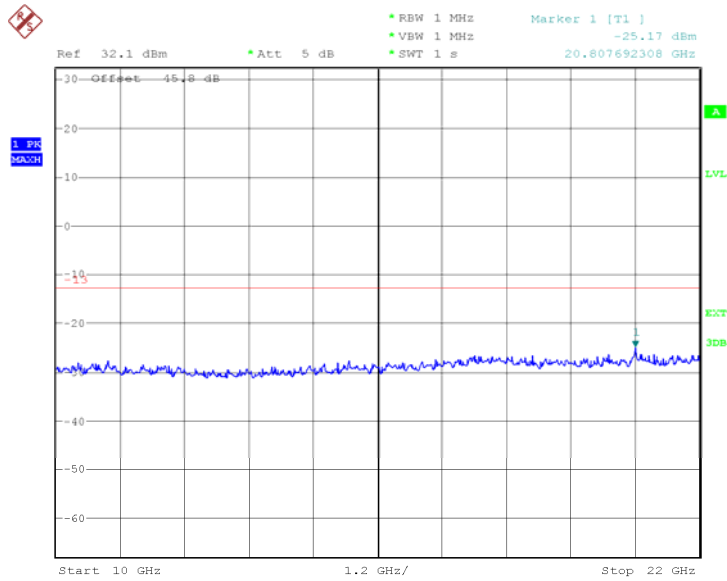
Date: 17.DEC.2008 08:45:33

Note: The emission beyond the limit is the operating frequency.



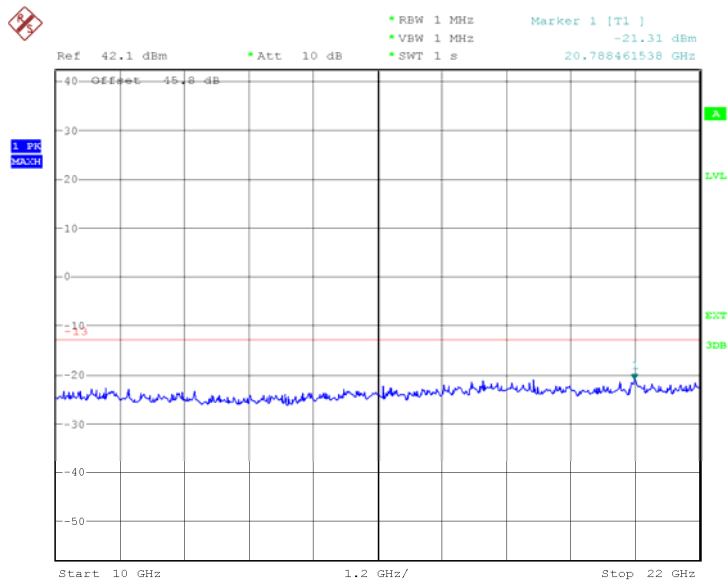
10GHz to 22GHz

TM1



Date: 18.DEC.2008 04:23:35

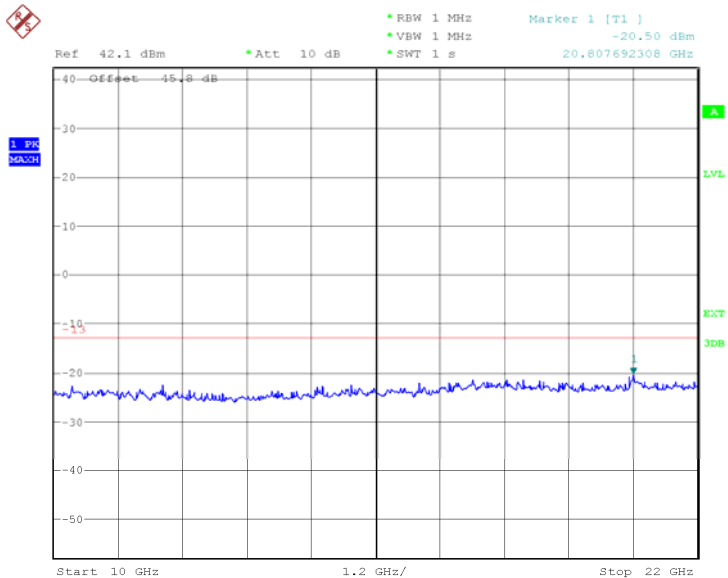
TM5



Date: 18.DEC.2008 08:28:17



TM6

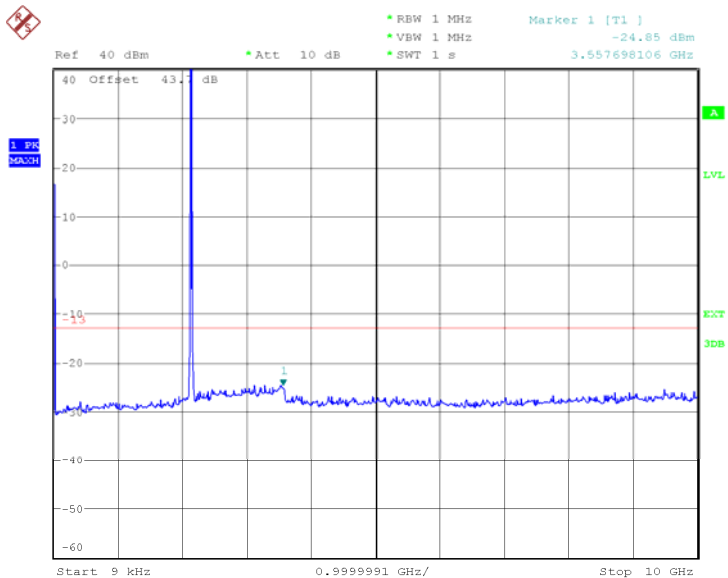


Date: 17.DEC.2008 08:46:13

- Mode 5

9kHz to 10GHz

TM1

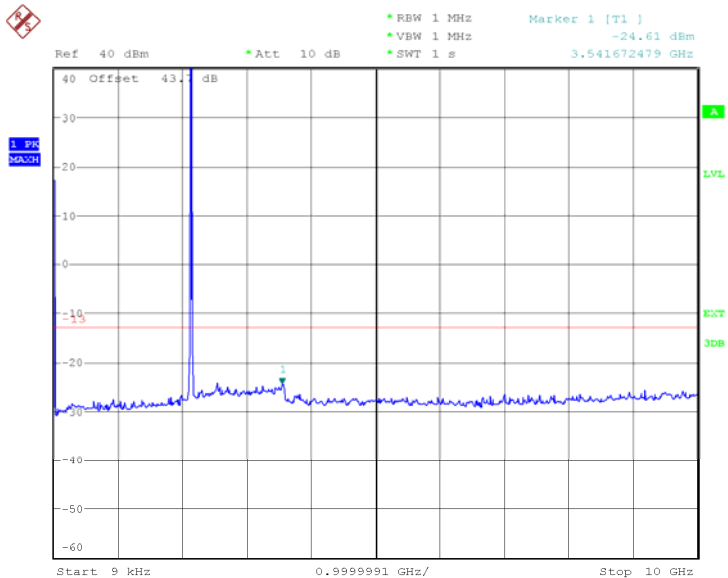


Date: 18.DEC.2008 09:23:25

Note: The emission beyond the limit is the operating frequency.



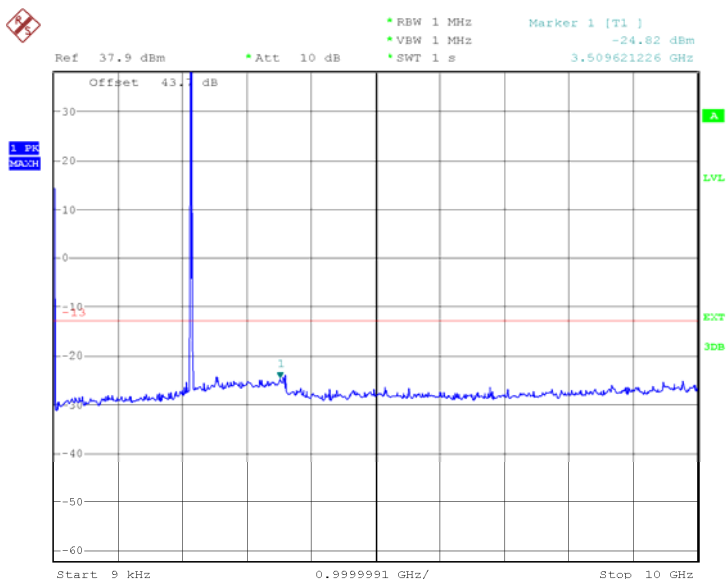
TM5



Date: 18.DEC.2008 08:11:13

Note: The emission beyond the limit is the operating frequency.

TM6



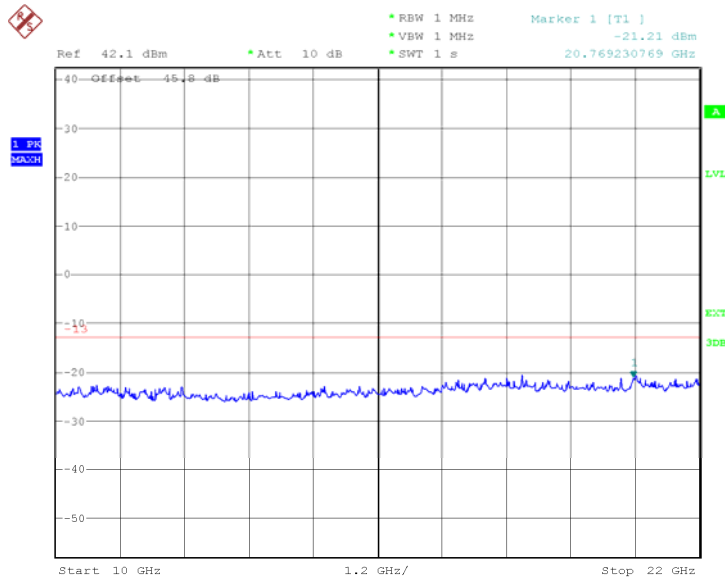
Date: 17.DEC.2008 09:35:02

Note: The emission beyond the limit is the operating frequency.



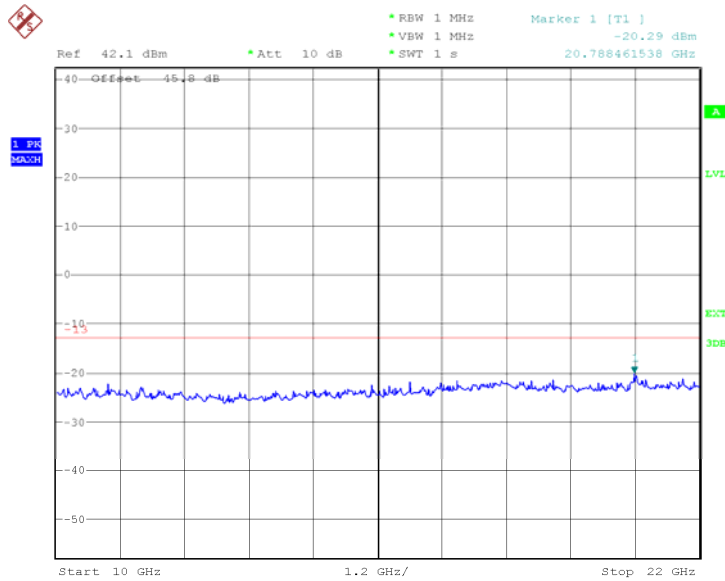
10GHz to 22GHz

TM1



Date: 18.DEC.2008 09:23:51

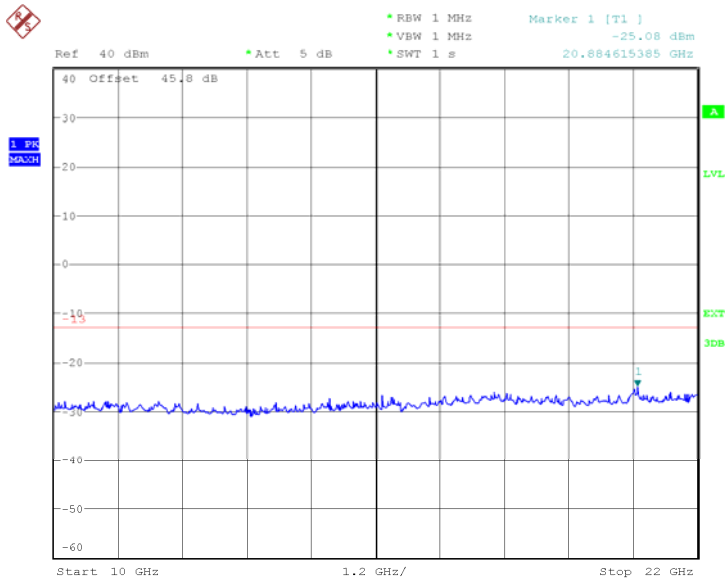
TM5



Date: 18.DEC.2008 08:11:39



TM6

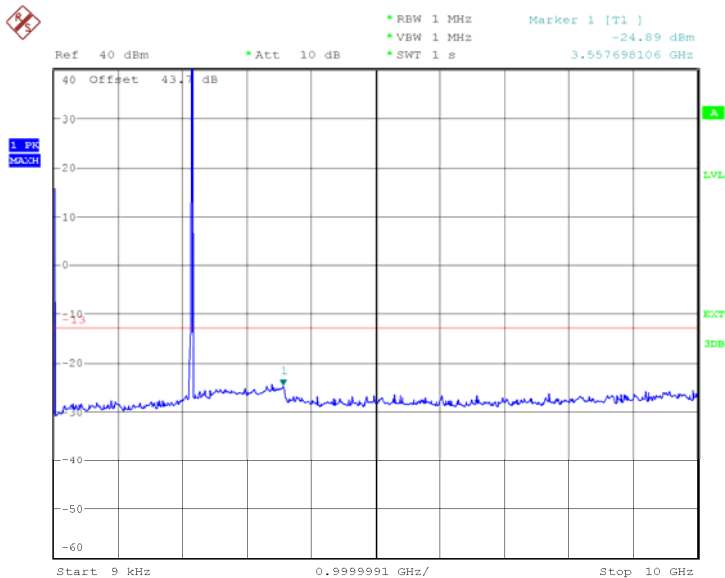


Date: 17.DEC.2008 09:33:22

- Mode 6

9kHz to 10GHz

TM1

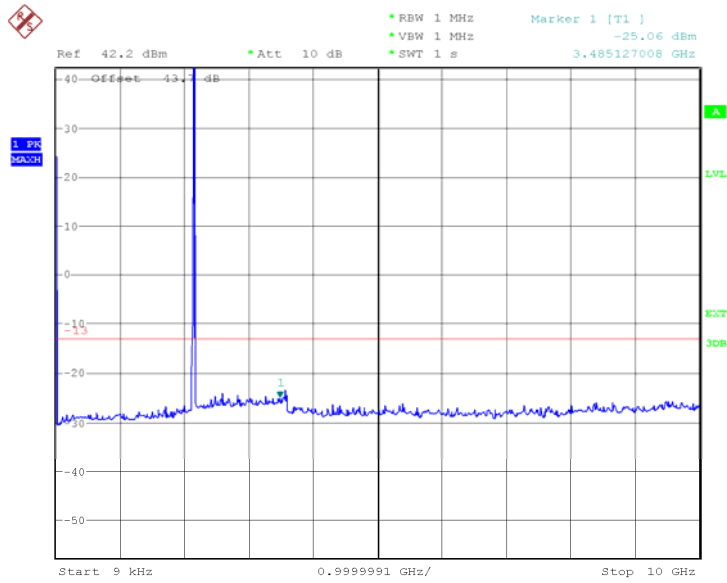


Date: 18.DEC.2008 09:36:24

Note: The emission beyond the limit is the operating frequency.



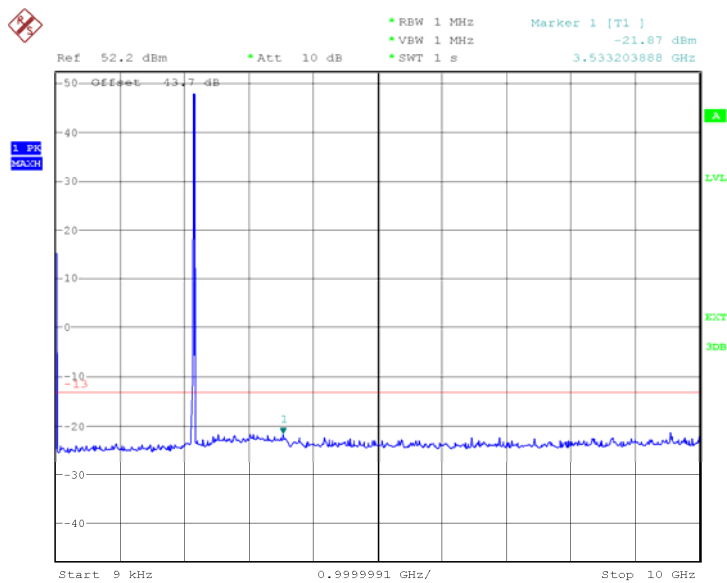
TM5



Date: 18.DEC.2008 08:43:15

Note: The emission beyond the limit is the operating frequency.

TM6



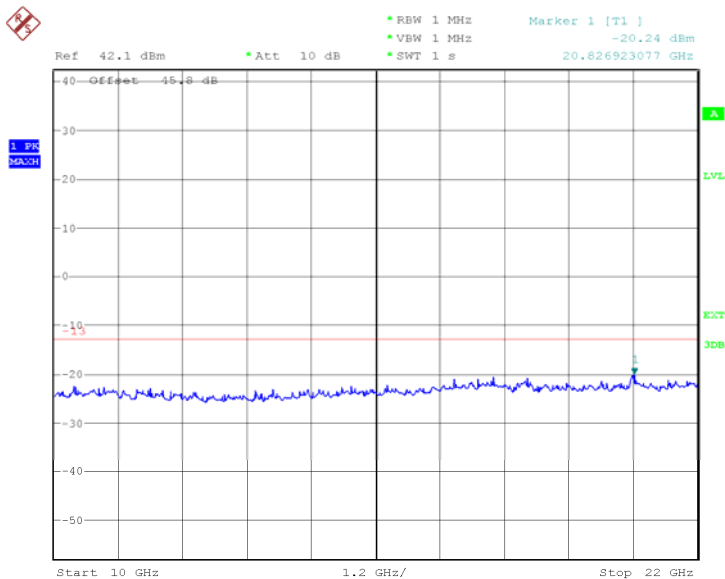
Date: 17.DEC.2008 09:18:47

Note: The emission beyond the limit is the operating frequency.



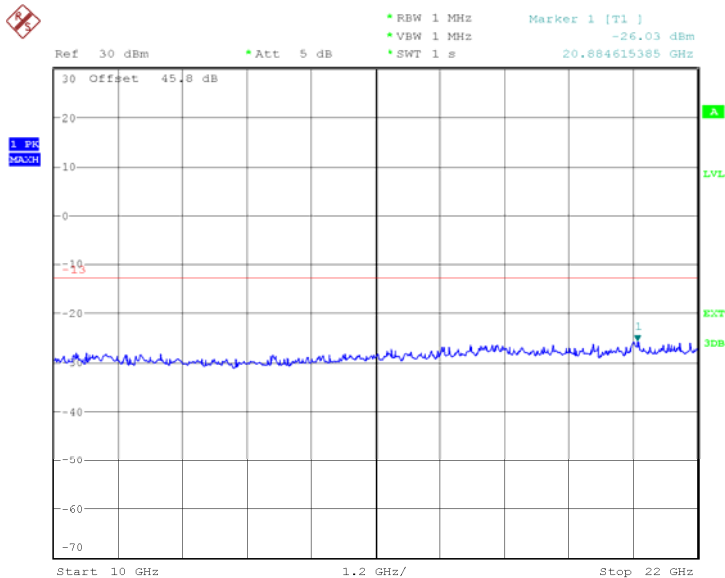
10GHz to 22GHz

TM1



Date: 18.DEC.2008 09:35:50

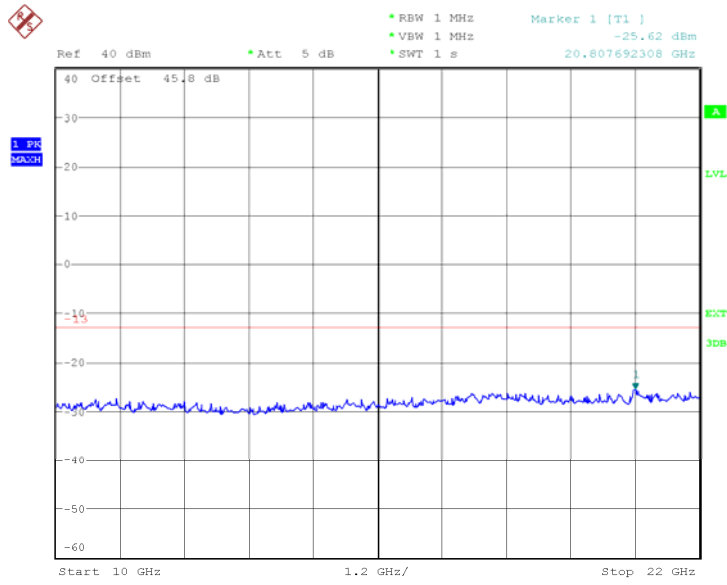
TM5



Date: 18.DEC.2008 08:44:14



TM6



Date: 17.DEC.2008 09:19:30

Limit	-13dBm
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## 2.8 RECEIVER SPURIOUS EMISSIONS

### 2.8.1 Specification Reference

Industry Canada RSS 139:2008 Clause 6.6

### 2.8.2 Equipment Under Test

RRU22 21IV40 (KRC 161 134/4)

### 2.8.3 Date of Test and Modification State

09,16 and 17 December 2008 – Modification State 0

### 2.8.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.8.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of Industry Canada RSS 139:2008.

In accordance with RSS-Gen Clause 6(b), the receiver spurious emissions from the antenna terminal were measured. The transmitter output power and the frequency spectrum investigated from 9kHz to 11GHz. Measurements were performed on the receiver antenna connector (ANT2). The EUT was set to transmitter mode on the combined TX/RX connector ANT1 and during the measurement the ANT1 was terminated with match load. The TX was activated in single carrier mode with TM1, TM5 or TM6 configuration.

The resolution was set to 1MHz and video bandwidths were set to 1MHz thus meeting the requirements of RSS-Gen Clause 6(b). The spectrum analyser detector was set to peak and trace was kept on Max Hold. The limit line was displayed, showing the -57dBm, 2 nanowatts in band 30MHz to 1GHz and -53dBm, 5 nanowatts above 1GHz.

The maximum path loss across the measurement band was used as the reference level offset to ensure worst case.

In addition, measurements were made up to the 5<sup>th</sup> harmonic of the fundamental.

The test was performed with the EUT in the following configurations and modes of operation as worst cases:

- Mode 1
- Mode 2
- Mode 3

### 2.8.6 Environmental Conditions

	09 December 2008	16 December 2008	17 December 2008
Ambient Temperature	23.2°C	23.3°C	22.9°C
Relative Humidity	24.1%	24.4%	24.2%



### 2.8.7 Test Results

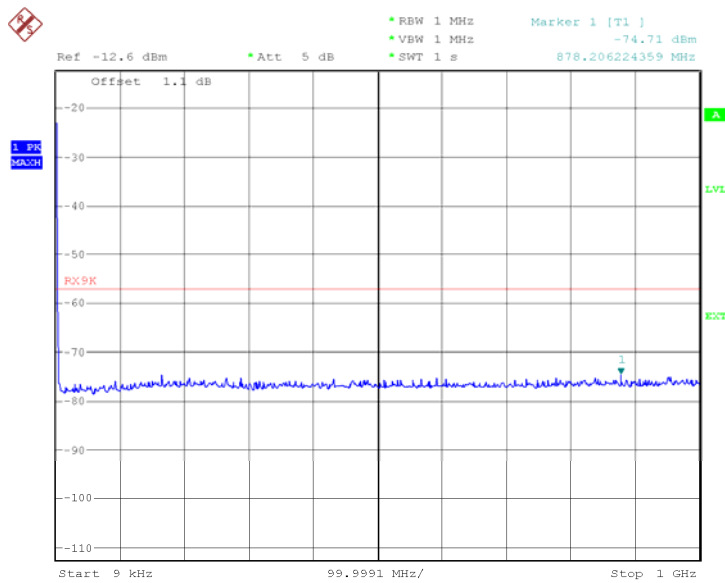
For the period of test the EUT met the requirements of Industry Canada RSS 139:2008 for Spurious Emissions.

The test results are shown below.

- Mode 1

9kHz to 1GHz

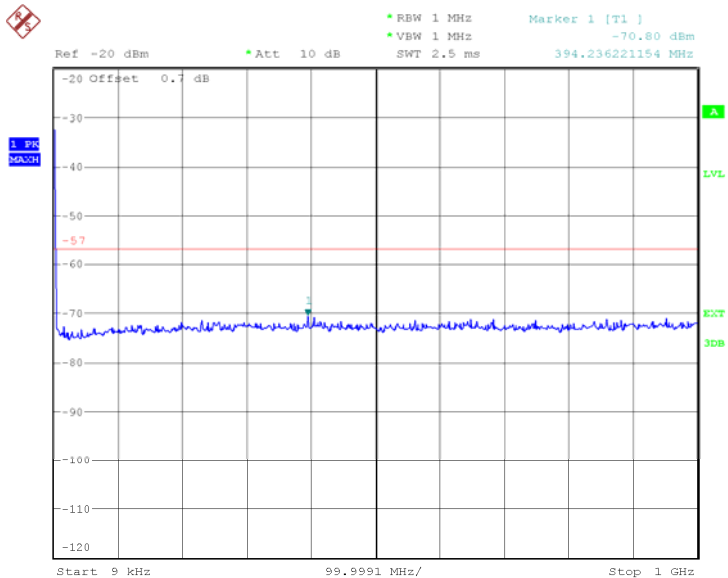
TM1



Date: 9.DEC.2008 05:59:35

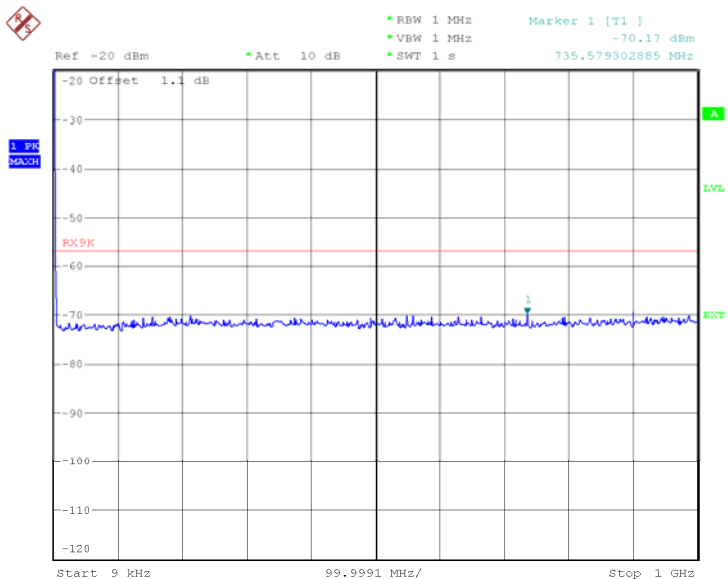


TM5



Date: 17.DEC.2008 04:08:57

TM6

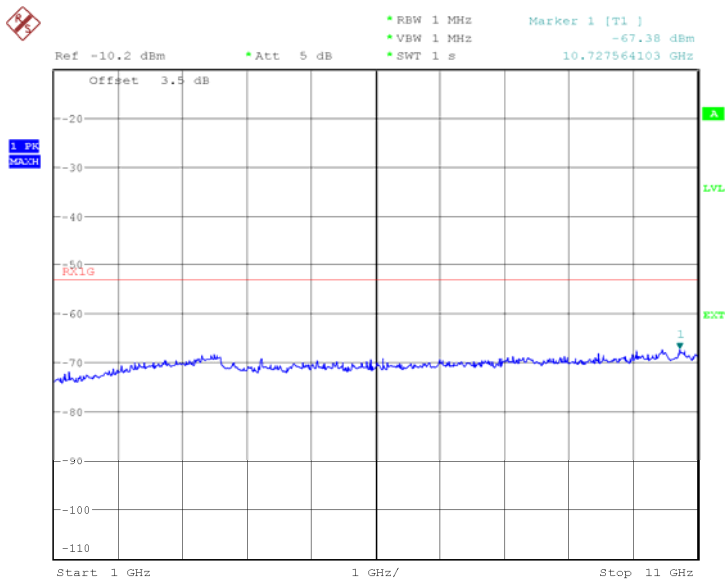


Date: 9.DEC.2008 03:23:03



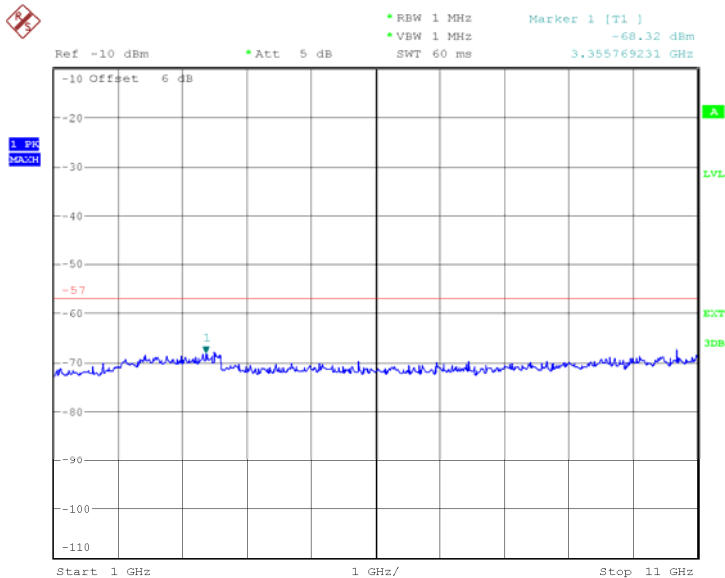
1GHz to 11GHz

TM1



Date: 9.DEC.2008 05:58:48

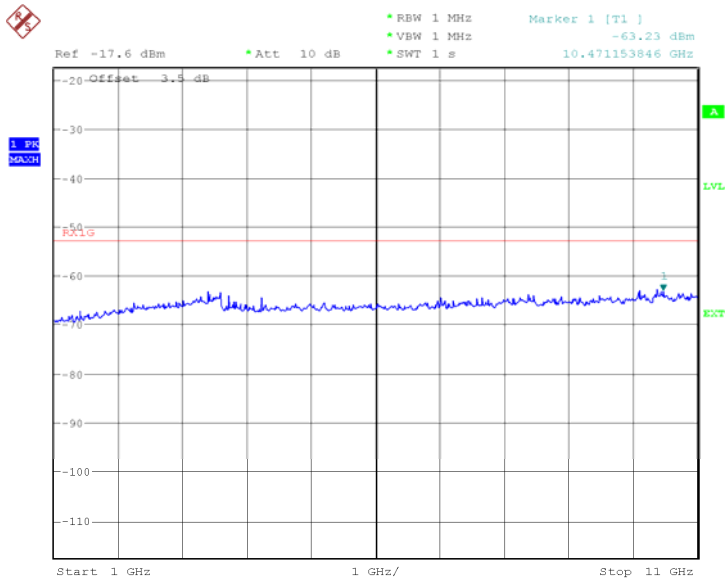
TM5



Date: 17.DEC.2008 04:09:43



TM6

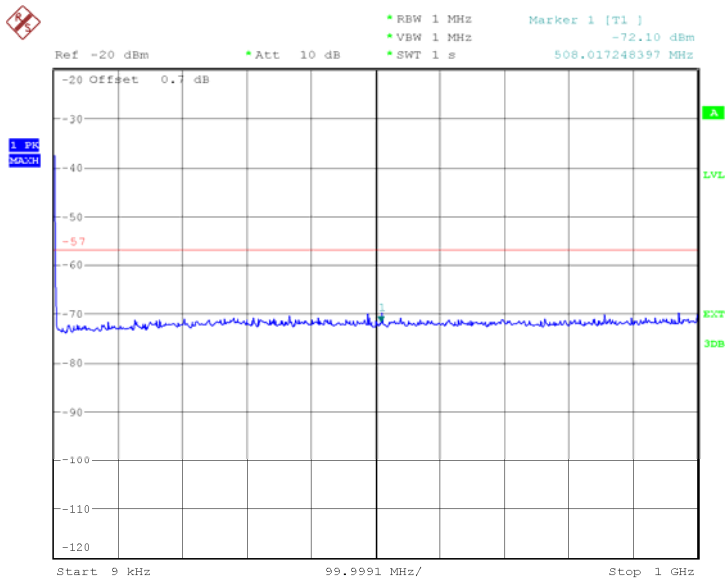


Date: 9.DEC.2008 03:24:44

- Mode 2

9kHz to 1GHz

TM1

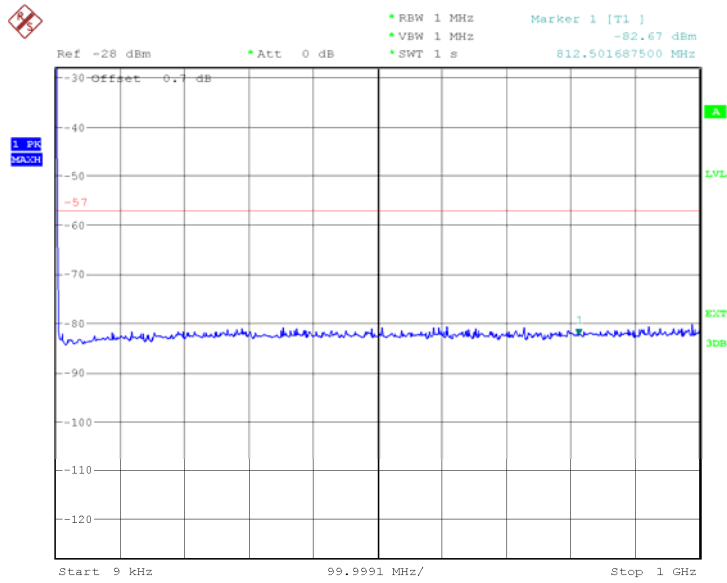


Date: 16.DEC.2008 10:23:10



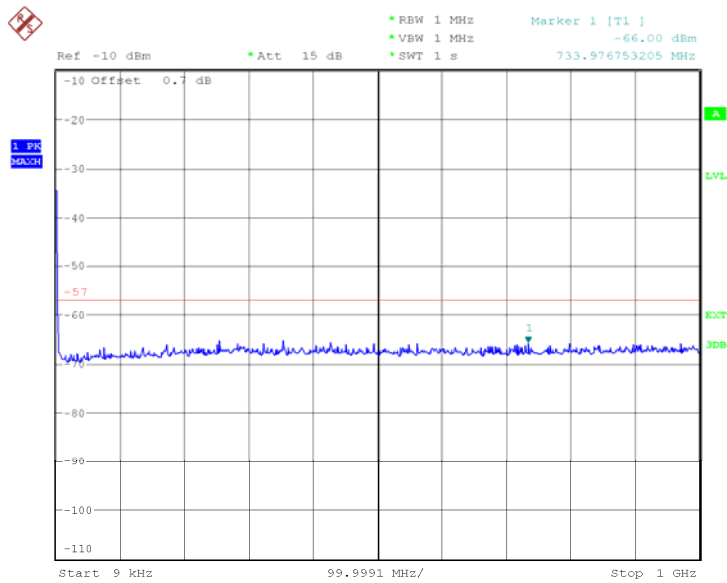


TM5



Date: 17.DEC.2008 02:12:45

TM6

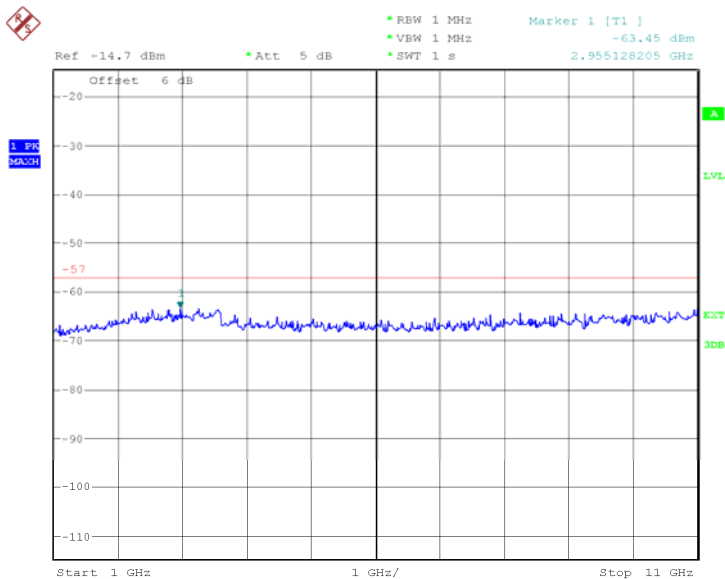


Date: 17.DEC.2008 07:52:29



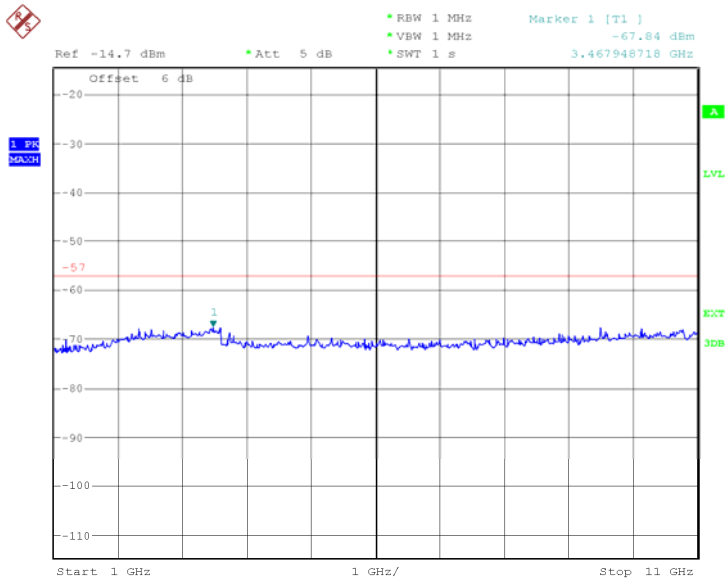
1GHz – 11GHz

TM1



Date: 16.DEC.2008 10:25:17

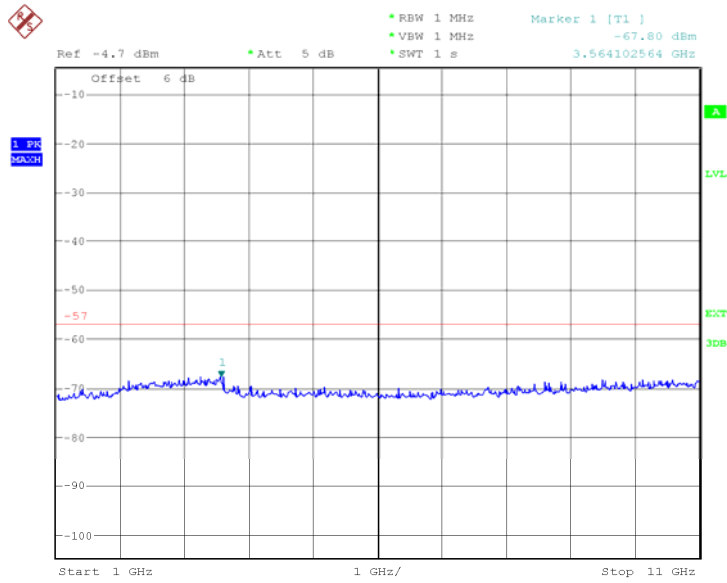
TM5



Date: 17.DEC.2008 02:11:01



TM6

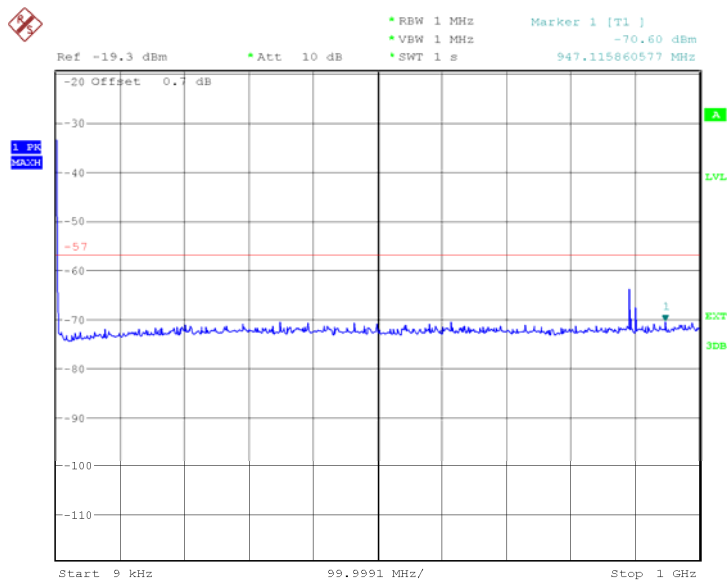


Date: 17.DEC.2008 07:53:10

- Mode 3

9kHz to 1GHz

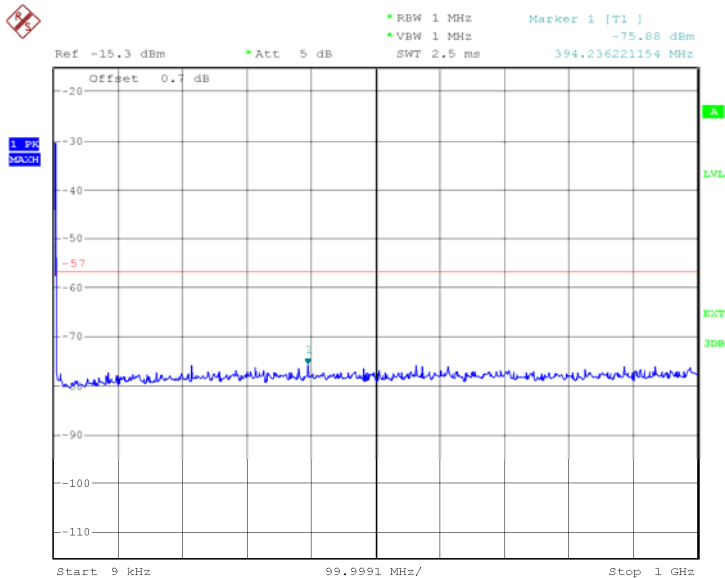
TM1



Date: 17.DEC.2008 03:29:37

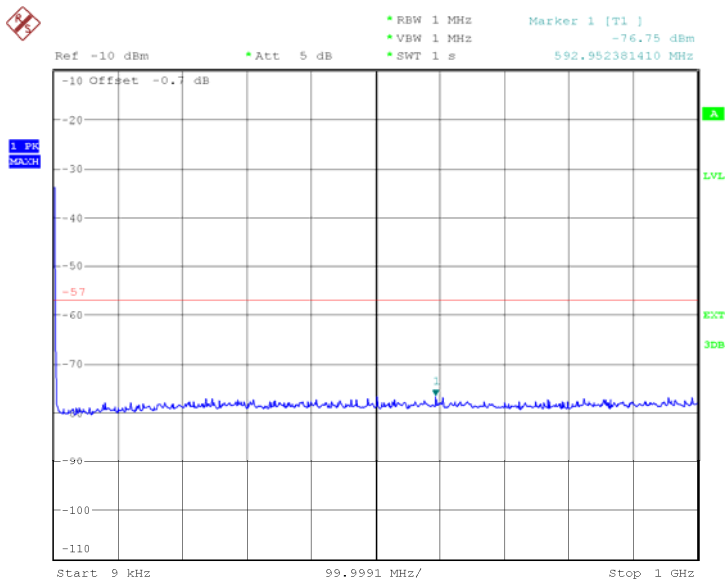


TM5



Date: 17.DEC.2008 04:16:32

TM6

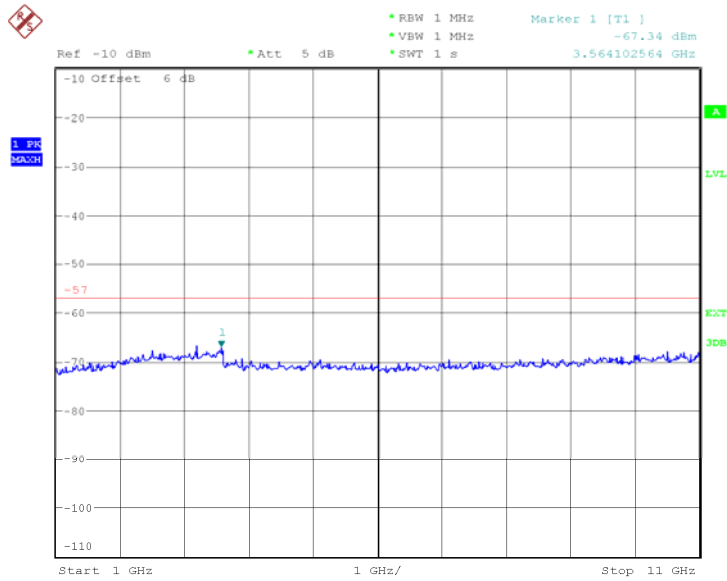


Date: 17.DEC.2008 06:31:31



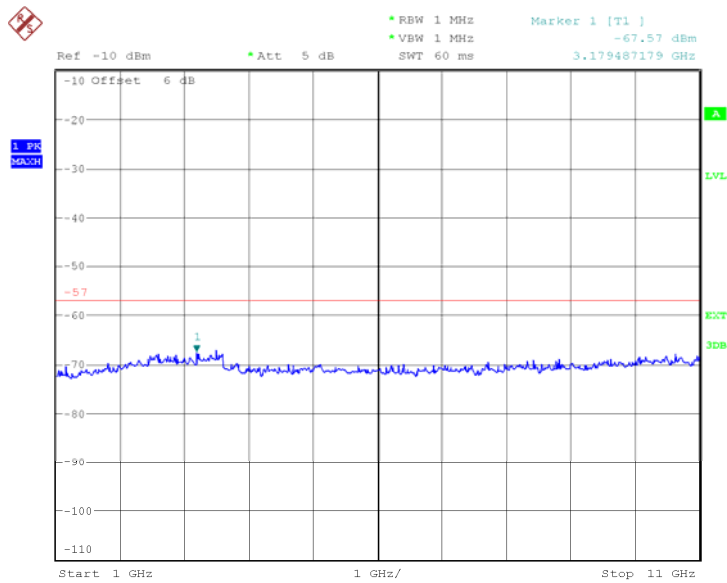
1GHz – 11GHz

TM1



Date: 17.DEC.2008 03:30:20

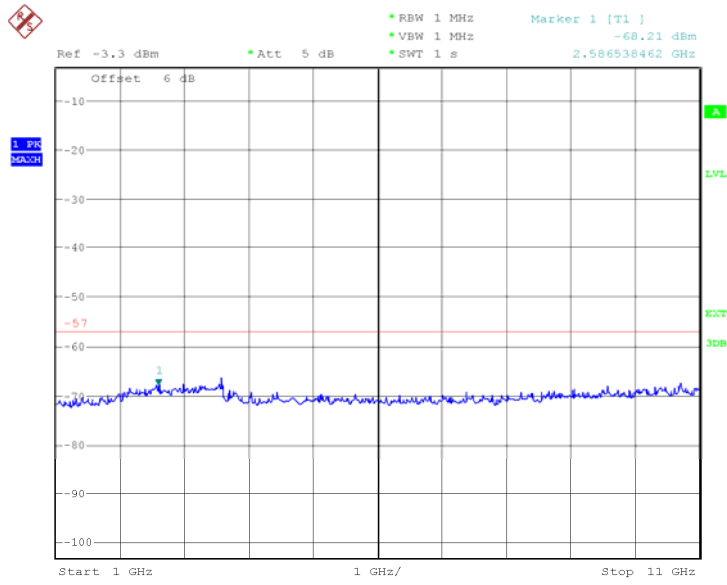
TM5



Date: 17.DEC.2008 04:15:50



TM6



Date: 17.DEC.2008 06:31:54

Limit	-57dBm(30MHz-1GHz) and -53dBm(above 1GHz)
-------	---



## 2.9 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

### 2.9.1 Specification Reference

FCC CFR 47 Part 27: 2007, Clause 2.1055, 27.54  
Industry Canada RSS 139:2008 Clause 6.3

### 2.9.2 Equipment Under Test

RRU22 21IV40 (KRC 161 134/4)

### 2.9.3 Date of Test and Modification State

16 to 18 December 2008 – Modification State 0

### 2.9.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.9.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008.

The EUT was set to transmit on maximum power with TM1, TM5 or TM6 configuration. A Spectrum Analyser was used to measure the frequency error. The temperature was adjusted between  $-30^{\circ}\text{C}$  and  $+50^{\circ}\text{C}$  in  $10^{\circ}$  steps as per 2.1055.

The test was performed with the EUT in the following configurations and modes of operation:

- Mode 2

### 2.9.6 Environmental Conditions

	16 December 2008	17 December 2008	18 December 2008
Ambient Temperature	23.3°C	22.9°C	22.3°C
Relative Humidity	24.4%	24.2%	24.6%

### 2.9.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008 for Frequency Stability Under Temperature Variations.

The test results are shown below.

- Mode 2

TM1

Temperature Interval (°C)	Deviation (Hz)
-30	11.64
-20	17.73
-10	-11.76
0	23.27
+10	16.11
+20	-16.96
+30	19.79
+40	-17.40
+50	-13.44

TM5

Temperature Interval (°C)	Deviation (Hz)
-30	-17.67
-20	21.06
-10	12.34
0	-14.56
+10	-15.71
+20	-15.08
+30	20.16
+40	-12.58
+50	-20.72



TM6

Temperature Interval (°C)	Deviation (Hz)
-30	18.15
-20	-11.93
-10	-13.07
0	13.48
+10	-21.08
+20	14.9
+30	-16.85
+40	22.76
+50	15.02

Limit	$\pm 1.0$ ppm or $\pm 2.1526$ kHz
-------	-----------------------------------

Remarks

The frequency stability of the EUT is sufficient to keep it within the authorised frequency ranges at any temperature interval across the measured range.



## **2.10 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS**

### **2.10.1 Specification Reference**

FCC CFR 47 Part 27: 2007, Clause 2.1055, 27.54  
Industry Canada RSS 139:2008 Clause 6.3

### **2.10.2 Equipment Under Test**

RRU22 21V40 (KRC 161 134/4)

### **2.10.3 Date of Test and Modification State**

17 December 2008 – Modification State 0

### **2.10.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.10.5 Test Method and Operating Modes**

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008.

The EUT was set to transmit on maximum power with TM1, TM5 or TM6. A Spectrum Analyser was used to measure the frequency error. The supplied voltage was varied from 85 to 115 percent of the nominal value.

The test was performed with the EUT in the following configurations and modes of operation:

- Mode 2

### **2.10.6 Environmental Conditions**

	17 December 2008
Ambient Temperature	22.9°C
Relative Humidity	24.2%

### 2.10.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 27: 2007 and Industry Canada RSS 139:2008 for Frequency Stability Under Voltage Variations.

The test results are shown below.

- Mode 2

20°C

TM1

DC Voltage (V)	Deviation (Hz)
40.8	-14.98
48.0	-16.96
55.2	19.35

TM5

DC Voltage (V)	Deviation (Hz)
40.8	15.74
48.0	-15.08
55.2	12.39

TM6

DC Voltage (V)	Deviation (Hz)
40.8	11.14
48.0	14.9
55.2	15.48

Limit	±1.0 ppm or ±2.1526 kHz
-------	-------------------------



**SECTION 3**

**TEST EQUIPMENT USED**

### 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	Serial No.	Calibration Due
<b>Section 2.1, 2.2, 2.3, 2.4 2.5, 2.7 and 2.8 – Maximum Conducted Output Power , Modulation Characteristics, Peak-Average Ratio, Occupied Bandwidth , Spurious Emissions at Antenna Terminals (<math>\pm 1</math>MHz) , Conducted Spurious Emissions and Receiver Spurious Emissions.</b>				
Spectrum Analyser	R&S	FSQ26	200014	2009/09/24
40dB Attenuator	Aeroflex Weinschel	48-40-43-LIM	BR5025	O/P MON
Network Analyzer	Agilent	8720D	US38431317	2009/05/03
Power Supply	Delta	SM70-45D	-	O/P MON
Power Supply	Dahua	DH1716-5D	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	2009/01/03
Thermo-hygrometer	AZ Instruments	8705	9151655	2009/12/16
<b>Section 2.6 – Radiated Spurious Emissions</b>				
EMI Receiver	Rohde & Schwarz	ESI 40	100015	2009/08/19
Ultra log test antenna	Rohde & Schwarz	HL562	100167	2009/08/19
Double-Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF 906	100029	2009/08/19
Antenna master	Frankonia	MA 260	-	TU
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	TU
Signal generator	Rohde & Schwarz	SMR 20	100086	2009/08/19
Semi- Anechoic Chamber	Frankonia	23.18m $\times$ 16.88m $\times$ 9.60m	-	2010/09/23
Digital Multimeter	FLUKE	179	91820401	2009/01/03
Thermo-hygrometer	AZ Instruments	8705	9151655	2009/12/16
<b>Section 2.9 and 2.10 – Frequency Stability Under Temperature and Voltage Variations</b>				
Spectrum Analyser	R&S	FSQ8	200065	2009/10/15
40dB Attenuator	Aeroflex Weinschel	48-40-43-LIM	BR5025	O/P MON
Network Analyzer	Agilent	8720D	US38431317	2009/05/03
Temperature Chamber	Zengda	WD7-1.0	200407167	O/P MON
Power Supply	Delta	SM70-45D	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	2009/01/03
Thermo-hygrometer	AZ Instruments	8705	9151655	2009/12/16

O/P MON      Output monitored with calibrated equipment  
 TU              Traceability Unscheduled

### 3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Substitution Antenna, Radiated Field	30MHz to 22GHz Amplitude	2.6dB
Worst case error for both Time and Frequency measurement 12 parts in 10 <sup>6</sup> .		

\* In accordance with CISPR 16-4



**SECTION 4**

**ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



**4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT**

This report relates only to the actual item/items tested.

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