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# Report On

FCC Testing of the  
Ericsson RRU22 1940 (KRC 161 134/2)  
In accordance with FCC CFR 47 Part 24 and Industry Canada RSS 133

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8BKRC161134-2  
IC: 287AB-AW1611342

Document 75905216 Report 01 Issue 2

January 2009



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COMMERCIAL-IN-CONFIDENCE

**REPORT ON**

FCC Testing of the  
Ericsson RRU22 1940 (KRC 161 134/2)  
In accordance with FCC CFR 47 Part 24 and Industry Canada RSS 133

Document 75905216 Report 01 Issue 2

January 2009


**PREPARED FOR**

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**APPROVED BY**

  
M Jenkins  
Authorised Signatory

**DATED**


07 January 2009

**This report has been re-issued as Issue 2 to update the IC ID.**

**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 24 and Industry Canada RSS 133. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

  
C Zhang

  
Q Li



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**SECTION 1**

**REPORT SUMMARY**

FCC Testing of the Ericsson RRU22 1940 (KRC 161 134/2)  
In accordance with FCC CFR 47 Part 24 and Industry Canada RSS 133



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRU22 1940 (KRC 161 134/2) to the requirements of FCC CFR 47 Part 24: 2007 and Industry Canada RSS 133:2008.

Testing was carried out in support of an application for Grant of Equipment Authorisation of RRU22 1940 (KRC 161 134/2).

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 1940 (KRC 161 134/2)
Serial Number(s)	CB 47623837
Software Version	Not Applicable
Hardware Version	R1H
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 24: 2007 Industry Canada RSS 133: 2008
Incoming Release Date	Declaration of Build Status 07 December 2008
Start of Test	01 December 2008
Finish of Test	15 December 2008
Name of Engineer(s)	C Zhang Q Li
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 24: 2007 and Industry Canada RSS 133:2008, is shown below.

Configuration 1 - Base Station							
Section	FCC Clause	IC Clause	Test Description	Mode	Mod State	Result	Comments
-	24.232(a)	6.4	Effective Isotropically Radiated Power			N/A	No integral antenna.
2.1	24.232 (a)	6.4	Maximum Peak Output Power - Conducted	1932.4 MHz	0	Pass	
				1957.6 MHz	0	Pass	
				1987.6 MHz	0	Pass	
				1932.4 + 1942.4 MHz	0	Pass	
				1952.6 + 1962.6 MHz	0	Pass	
				1977.6 + 1987.6 MHz	0	Pass	
2.2	24.232(d)	-	Peak – Average Ratio	1932.4 MHz	0	Pass	
				1932.4 + 1942.4 MHz	0	Pass	
2.3	2.1047 (d)		Modulation Characteristics	1932.4 MHz	0	Pass	
2.4	2.1049, 24.238(b)	RSS-Gen 4.6.1	Occupied Bandwidth	1932.4 MHz	0	Pass	
				1957.6 MHz	0	Pass	
				1987.6 MHz	0	Pass	
2.5	2.1051, 24.238(b)	6.5	Spurious Emissions at Antenna Terminals (±1MHz)	1932.4 MHz	0	Pass	
				1957.6 MHz		N/A	
				1987.6 MHz	0	Pass	
				1932.4 + 1942.4 MHz	0	Pass	
				1952.6 + 1962.6 MHz		N/A	
				1977.6 + 1987.6 MHz	0	Pass	
2.6	2.1053, 24.238(a)	6.5	Radiated Spurious Emissions	1932.4 MHz	0	Pass	
				1932.4 + 1942.4 MHz	0	Pass	
2.7	2.1051, 24.238(a)	6.5	Conducted Spurious Emissions	1932.4 MHz	0	Pass	
				1957.6 MHz	0	Pass	
				1987.6 MHz	0	Pass	
				1932.4 + 1942.4 MHz	0	Pass	
				1952.6 + 1962.6 MHz	0	Pass	
				1977.6 + 1987.6 MHz	0	Pass	
2.8	-	6.6	Receiver Spurious Emissions	1932.4 MHz	0	Pass	
				1957.6 MHz	0	Pass	
				1987.6 MHz	0	Pass	
2.9	2.1055, 24.235	6.3	Frequency Stability Under Temperature Variations	1932.4 MHz		N/A	
				1957.6 MHz	0	Pass	
				1987.6 MHz		N/A	
2.10	2.1055, 24.235	6.3	Frequency Stability Under Voltage Variations	1932.4 MHz		N/A	
				1957.6 MHz	0	Pass	
				1987.6 MHz		N/A	

N/A – Not Applicable

## 1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Equipment
MANUFACTURER	Ericsson
TYPE	RRU22 1940
PART NUMBER	KRC 161 134/2
SERIAL NUMBER	CB 47623837
HARDWARE VERSION	R1H
SOFTWARE VERSION	--
TRANSMITTER OPERATING RANGE	1930-1990MHz
RECEIVER OPERATING RANGE	1850-1910MHz
COUNTRY OF ORIGIN	P.R. CHINA
INTERMEDIATE FREQUENCIES	--
ITU DESIGNATION OF EMISSION	4M17F9W
HIGHEST INTERNALLY GENERATED FREQUENCY	1987.6MHz
OUTPUT POWER (W or dBm)	46dBm/40W
FCC ID	TA8BKRC161134-2
IC ID	287AB-AW1611342
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	RRU22 1940 is radio part of WCDMA radio base station

<b>Signature</b>	<u>Chen Weiqun</u>
<b>Date</b>	<u>07 December 2008</u>
<b>D of B S Serial No</b>	<u>75905216/02</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 1940 (KRC 161 134/2) is an Ericsson Radio Equipment intended to operate with a compatible Radio Equipment Controller to form a WCDMA 1900MHz 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

### Configuration 1 – Base Station

The EUT was configured in accordance with FCC CFR 47 Part 24: 2007 and Industry Canada RSS 133:2008.

The EUT supports QPSK, 16QAM and 64QAM modulations at 1900MHz. 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 – 1932.4 MHz (Bottom Channel)

Mode 2 – 1957.6 MHz (Middle Channel)

Mode 3 – 1987.6 MHz (Top Channel)

Mode 4 – 1932.4 MHz+1942.4 MHz (Bottom Channel)

Mode 5 – 1952.6 MHz+1962.6 MHz (Middle Channel)

Mode 6 – 1977.6 MHz+1987.6 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	CB47623837

No modifications were made to the EUT during testing.

## 1.8 ALTERNATIVE TEST SITE

Under our UKAS Accreditation, TÜV Product Service Ltd conducted the testing at:

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 1940 (KRC 161 134/2)  
In accordance with FCC CFR 47 Part 24 and Industry Canada RSS 133



## **2.1 MAXIMUM PEAK OUTPUT POWER - CONDUCTED**

### **2.1.1 Specification Reference**

FCC CFR 47 Part 24: 2007, Clause 24.232(a)  
Industry Canada RSS 133:2008 Clause 6.4

### **2.1.2 Equipment Under Test**

RRU22 1940 (KRC 161 134/2)

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

03 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 24: 2007 and Industry Canada RSS 133:2008.

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:

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

### **2.1.6 Environmental Conditions**

	03 December 2008
Ambient Temperature	20.4°C
Relative Humidity	25.2%

### 2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24: 2007 and Industry Canada RSS 133:2008 for Maximum Peak Output Power - Conducted.

The test results are shown below.

#### Configuration 1 - Mode 1

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	1932.4	41.7	46.67	46.452
TM5	1932.4	41.7	46.74	47.206
TM6	1932.4	41.7	46.55	45.186

#### Configuration 1 - Mode 2

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	1957.6	41.7	46.76	47.424
TM5	1957.6	41.7	46.73	47.098
TM6	1957.6	41.7	46.69	46.666

#### Configuration 1 - Mode 3

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	1987.6	41.7	46.60	45.709
TM5	1987.6	41.7	46.69	46.666
TM6	1987.6	41.7	46.51	44.771

#### Configuration 1 - Mode 4

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	1932.4+1942.4	41.7	46.56	45.290
TM5	1932.4+1942.4	41.7	46.70	46.774
TM6	1932.4+1942.4	41.7	46.58	45.499

#### Configuration 1 - Mode 5

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	1952.6+1962.6	41.7	46.81	47.973
TM5	1952.6+1962.6	41.7	46.79	47.753
TM6	1952.6+1962.6	41.7	46.74	47.206

Configuration 1 - Mode 6

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
TM1	1977.6+1987.6	41.7	46.79	47.753
TM5	1977.6+1987.6	41.7	46.83	48.195
TM6	1977.6+1987.6	41.7	46.76	47.424

Limit	$\leq 1640\text{W}$ or $\leq 62\text{dBm}$ for FCC $\leq 100\text{W}$ or $\leq 50\text{dBm}$ for IC
-------	--

Remarks

The EUT does not exceed 1640W or 62dBm for FCC,  $\leq 100\text{W}$  or  $\leq 50\text{dBm}$  for IC at the measured frequencies.



## 2.2 PEARK – AVERAGE RATIO

### 2.2.1 Specification Reference

FCC CFR 47 Part 24: 2007, Clause 24.232(d)

### 2.2.2 Equipment Under Test

RRU22 1940 (KRC 161 134/2)

### 2.2.3 Date of Test and Modification State

03 and 11 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 24: 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:

Configuration 1 - Mode 1  
- Mode 4

### 2.2.6 Environmental Conditions

	03 December 2008	11 December 2008
Ambient Temperature	20.4°C	23.5°C
Relative Humidity	25.2%	26.3%



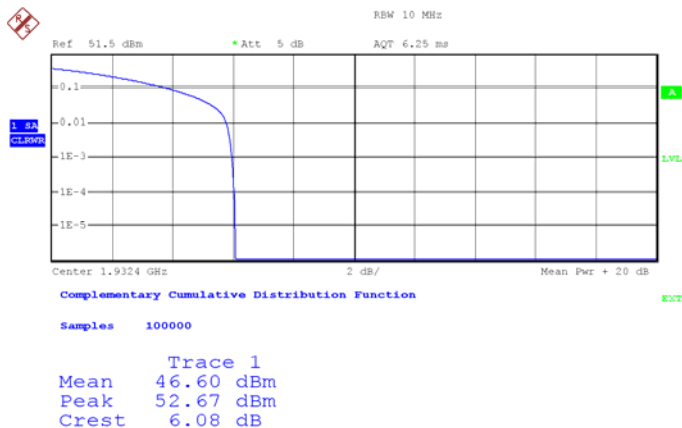
### 2.2.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24: 2007 Peak – Average Ratio.

The test results are shown below.

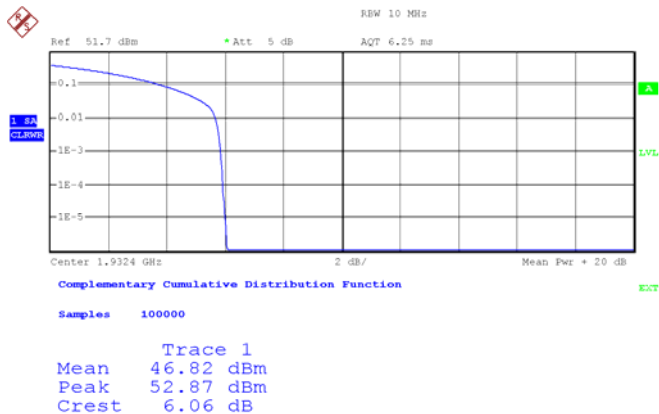
#### Configuration 1 - Mode 1

##### TM1



Date: 3.DEC.2008 03:17:48

##### TM5

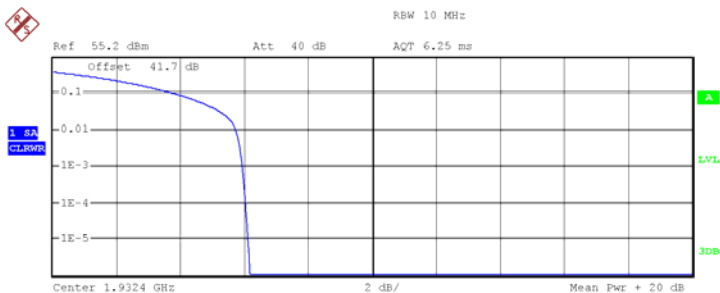


Date: 3.DEC.2008 05:12:48





TM6



Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 11.2MHz

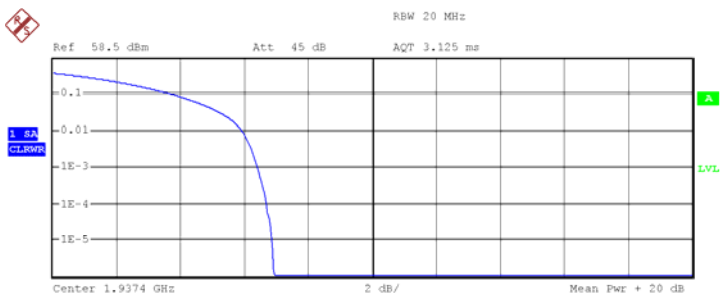
Trace 1  
 Mean 46.47 dBm  
 Peak 52.65 dBm  
 Crest 6.17 dB

10 % 3.78 dB  
 1 % 5.74 dB  
 .1 % 5.96 dB  
 .01 % 6.06 dB

Date: 11.DEC.2008 03:56:06

Configuration 1 – mode 4

TM1



Complementary Cumulative Distribution Function

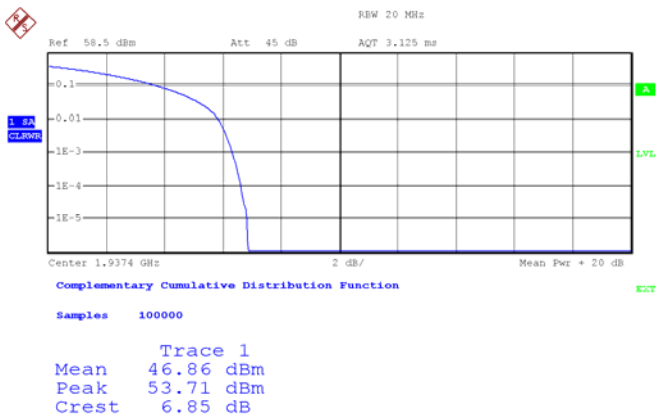
Samples 100000

Trace 1  
 Mean 46.79 dBm  
 Peak 53.71 dBm  
 Crest 6.92 dB

Date: 3.DEC.2008 08:28:45

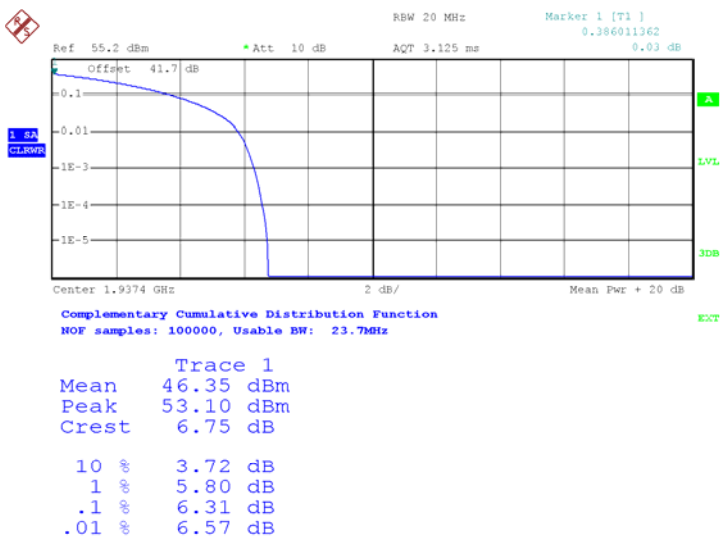


TM5



Date: 3.DEC.2008 08:22:56

TM6



Date: 11.DEC.2008 06:49:48

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 1940 (KRC 161 134/2)

**2.3.3 Date of Test and Modification State**

10 and 11 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 1900MHz. 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:

Configuration 1 - Mode 1

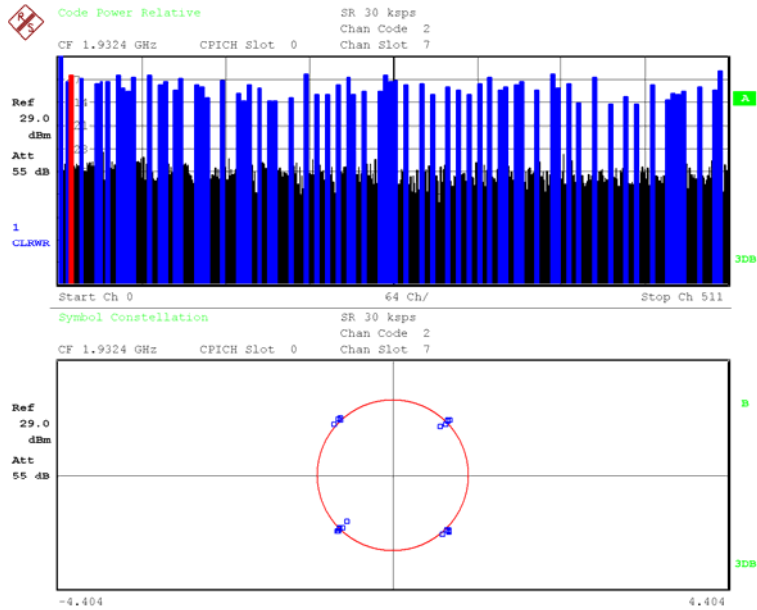
**2.3.5 Environmental Conditions**

	10 December 2008	11 December 2008
Ambient Temperature	21.8°C	23.5°C
Relative Humidity	24.2%	26.3%

**2.3.6 Test Result**

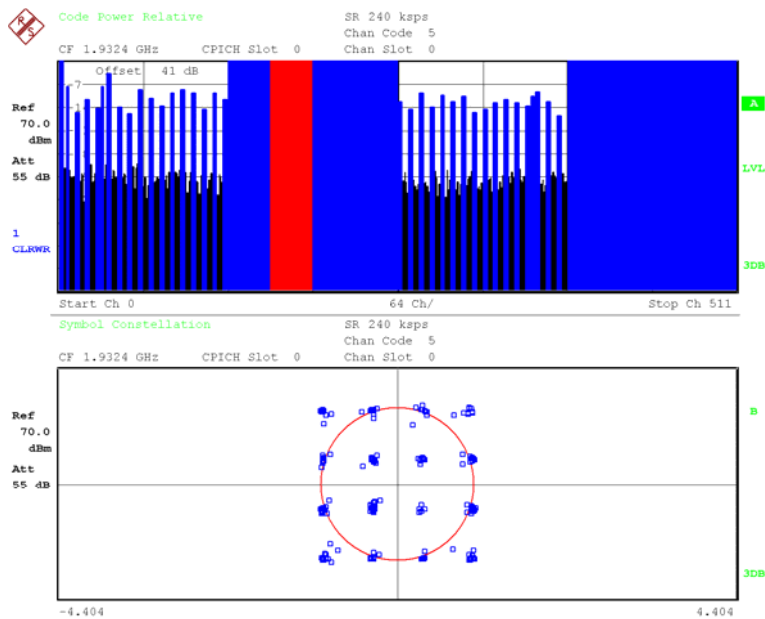
Plots are shown on the following page showing the EUT transmitting with all of the modulations:

EUT transmitting with QPSK modulation:



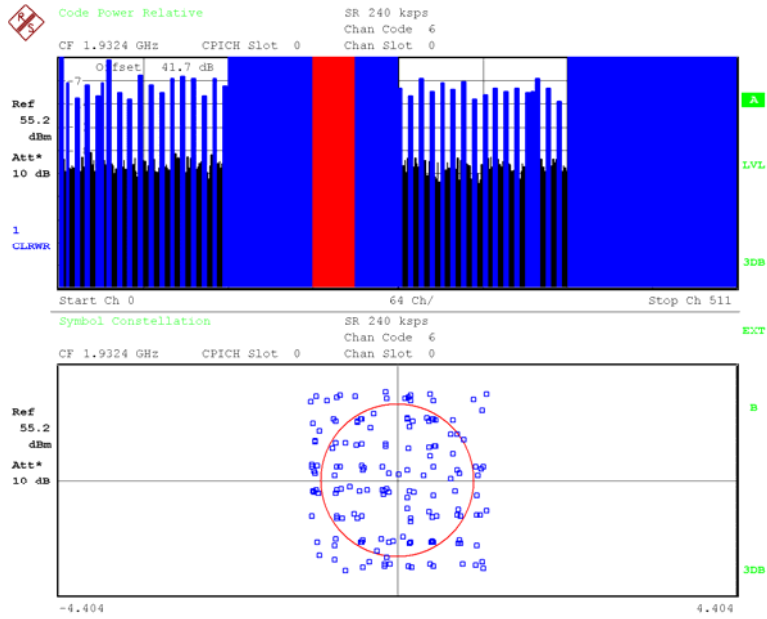
Date: 10.DEC.2008 02:55:52

EUT transmitting with 16QAM modulation:



Date: 10.DEC.2008 03:13:46

EUT transmitting with 64QAM modulation:



Date: 11.DEC.2008 06:55:46



## 2.4 OCCUPIED BANDWIDTH

### 2.4.1 Specification Reference

FCC CFR 47 Part 24: 2007, Clause 2.1049(h), 24.238(b)  
Industry Canada RSS 133:2008 Clause 2.3

### 2.4.2 Equipment Under Test

RRU22 1940 (KRC 161 134/2)

### 2.4.3 Date of Test and Modification State

03 and 11 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 24: 2007 and Industry Canada RSS 133:2008.

The EUT was transmitting at maximum power with TM1, TM5 and TM6. Using a resolution bandwidth of 30 kHz and a video bandwidth of 300 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:

Configuration 1 - Mode 1  
- Mode 2  
- Mode 3

### 2.4.6 Environmental Conditions

	03 December 2008	11 December 2008
Ambient Temperature	20.4°C	23.5°C
Relative Humidity	25.2%	26.3%

### 2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24: 2007 and Industry Canada RSS 133:2008 for Occupied Bandwidth.

#### Configuration 1 - Mode 1

	Frequency (MHz)	99% Power bandwidth (MHz)
TM1	1932.4	4.1667
TM5	1932.4	4.1667
TM6	1932.4	4.1827

#### Configuration 1 - Mode 2

	Frequency (MHz)	99% Power bandwidth (MHz)
TM1	1957.6	4.1827
TM5	1957.6	4.1667
TM6	1957.6	4.1987

#### Configuration 1 - Mode 3

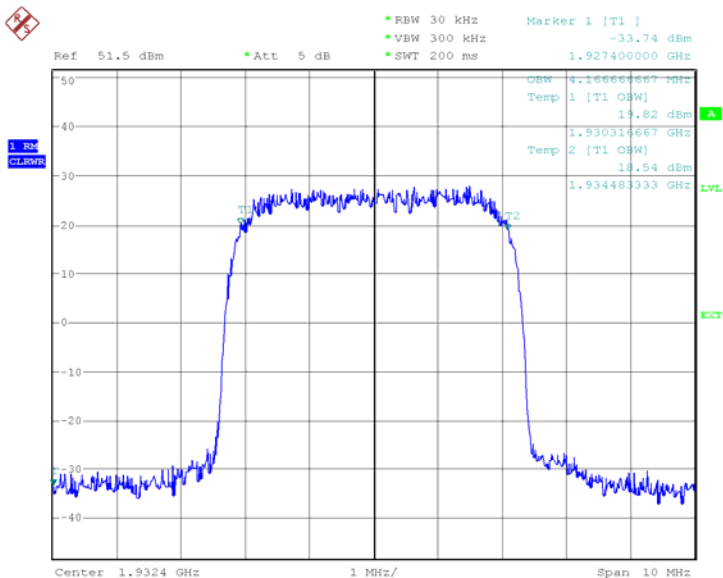
	Frequency (MHz)	99% Power bandwidth (MHz)
TM1	1987.6	4.1827
TM5	1987.6	4.1667
TM6	1987.6	4.1987



The plots of test results are shown below.

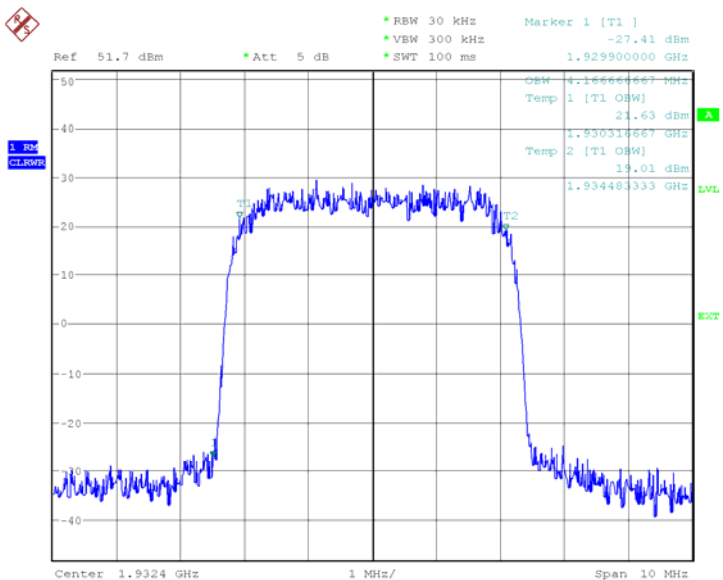
Configuration 1 - Mode 1

TM1



Date: 3.DEC.2008 03:18:08

TM5

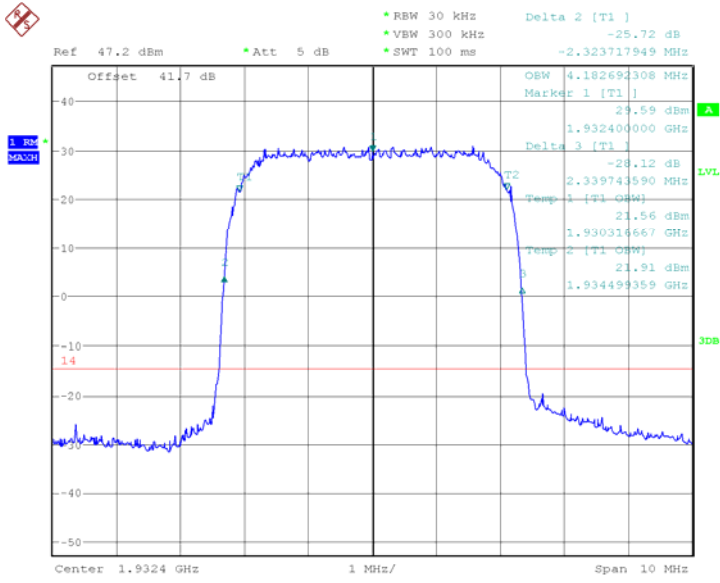


Date: 3.DEC.2008 05:12:26





TM6

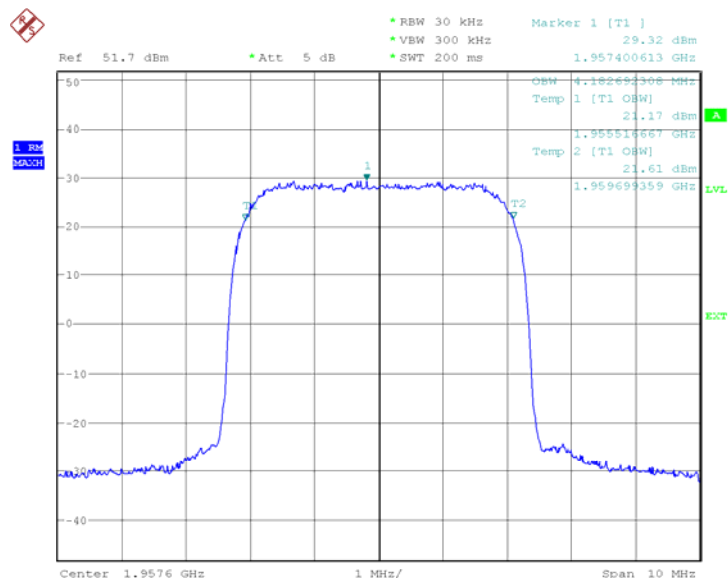


Date: 11.DEC.2008 03:55:35



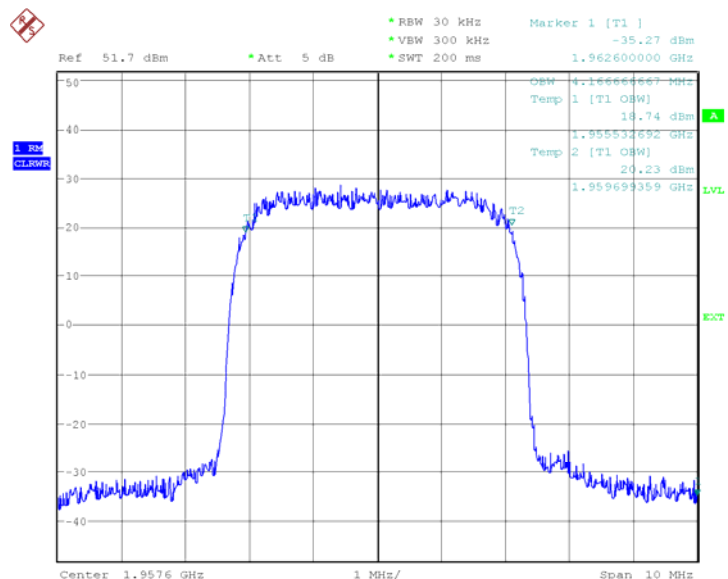
Configuration 1 - Mode 2

TM1



Date: 3.DEC.2008 02:28:55

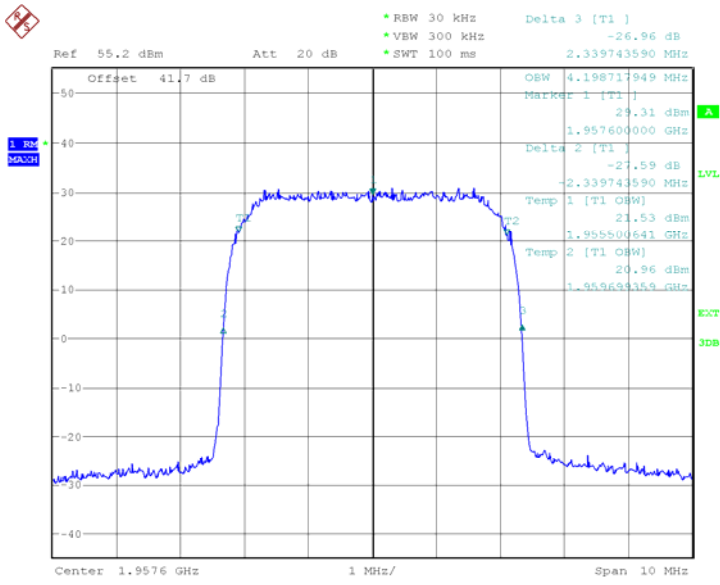
TM5



Date: 3.DEC.2008 02:53:06



TM6

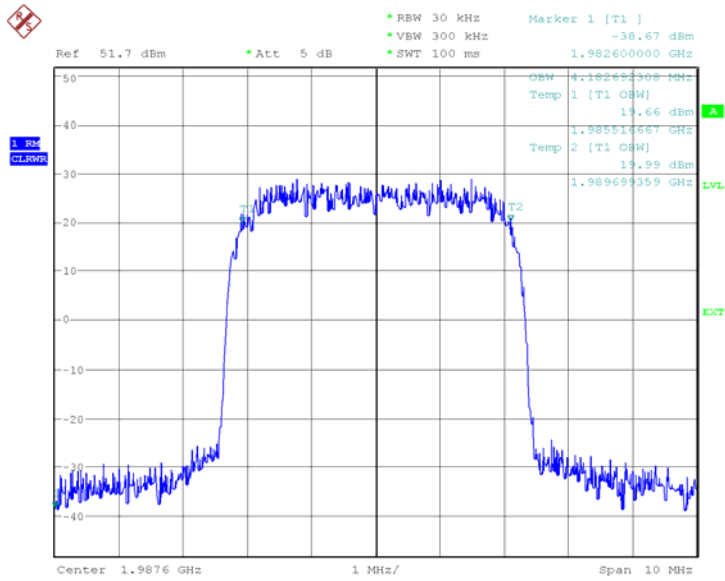


Date: 11.DEC.2008 04:20:26



Configuration 1 - Mode 3

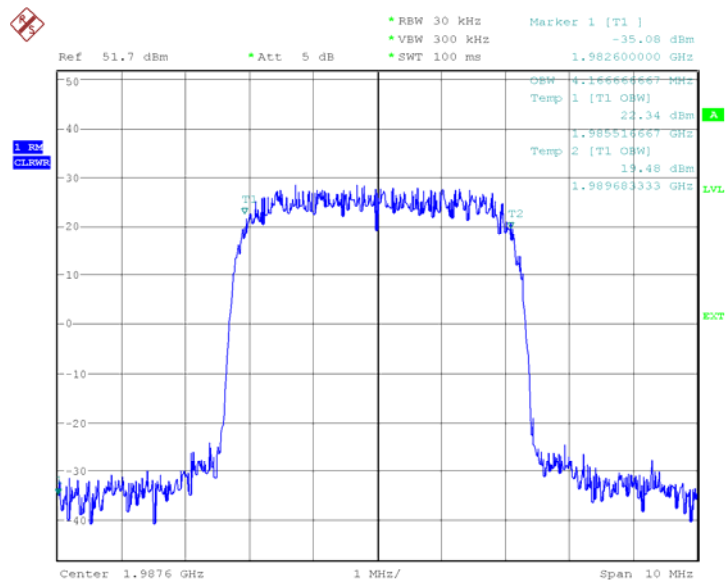
TM1



Date: 3.DEC.2008 05:24:30

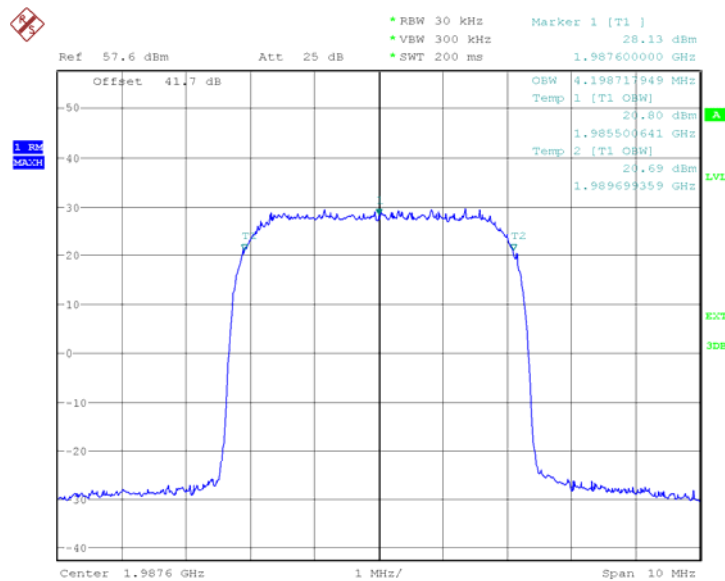


TM5



Date: 3.DEC.2008 05:38:01

TM6



Date: 11.DEC.2008 04:58:36



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

**2.5.1 Specification Reference**

FCC CFR 47 Part 24: 2007, Clause 2.1051, 24.238(b)  
 Industry Canada RSS 133:2008 Clause 6.5

**2.5.2 Equipment Under Test**

RRU22 1940 (KRC 161 134/2)

**2.5.3 Date of Test and Modification State**

03 and 11 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 24: 2007 and Industry Canada RSS 133:2008.

The measurements were made per definition in 24.238. 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 30kHz was used up to 1MHz away from the band edges. 30kHz is < 1% of the emission bandwidth (4.68 MHz between the 26dB points). The limit was adjusted with 1.5 dB to -14.5 dBm to compensate for the reduced bandwidth. 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:

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

**2.5.6 Environmental Conditions**

	03 December 2008	11 December 2008
Ambient Temperature	20.4°C	23.5°C
Relative Humidity	25.2%	26.3%



**2.5.7 Test Results**

For the period of test the EUT met the requirements of FCC CFR 47 Part 24: 2007 and Industry Canada RSS 133:2008 for Spurious Emissions Antenna Terminals ( $\pm 1\text{MHz}$ )

The test results are shown below.

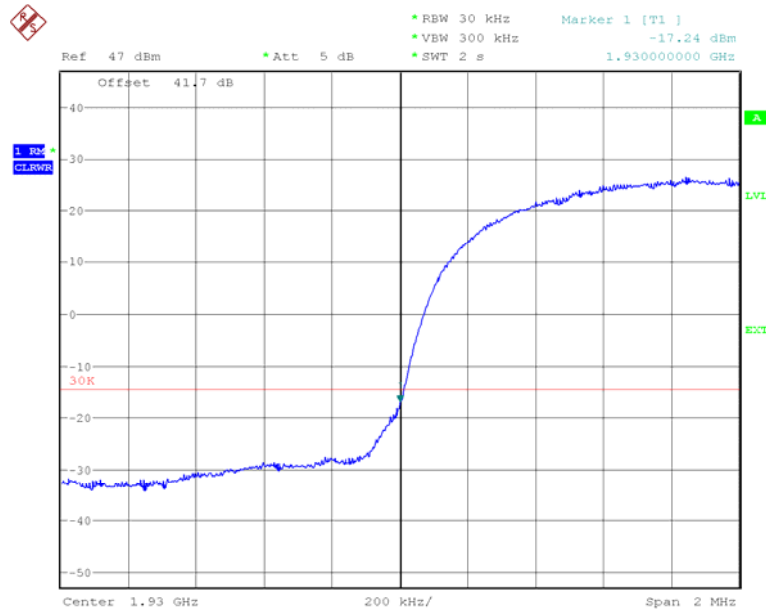
Below are the Frequencies the EUT was tested against along with the tested channels.

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 1934.2	Channel: 9662 Frequency: 1930MHz	Channel: 9662 Frequency : 1930MHz	Channel: 9662 Frequency : 1930MHz
Top 1987.6	Channel: 9938 Frequency : 1990MHz	Channel : 9938 Frequency : 1990MHz	Channel : 9938 Frequency : 1990MHz

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.

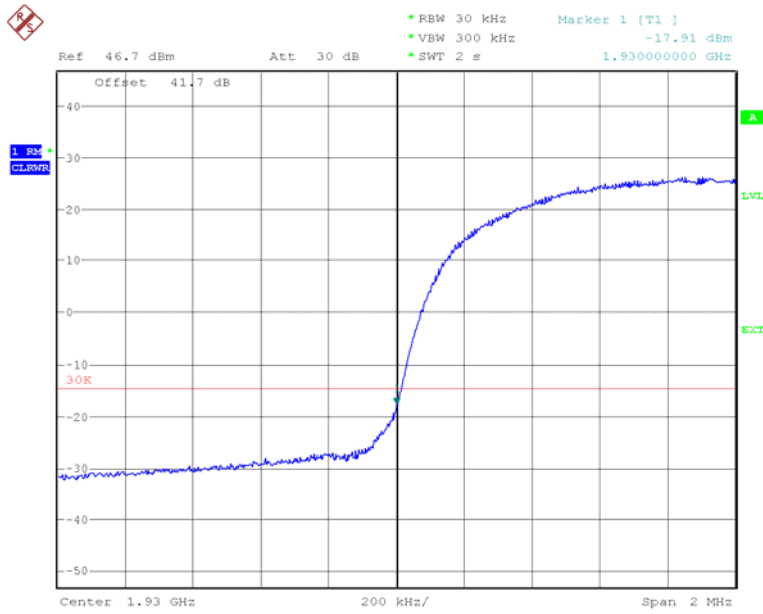
Configuration 1- Mode 1

TM1



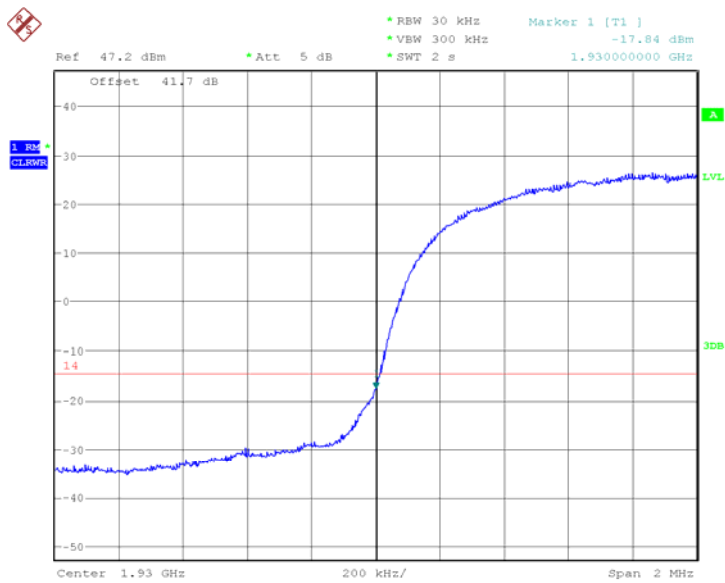
Date: 3.DEC.2008 04:28:30

TM5



Date: 3.DEC.2008 05:18:06

TM6



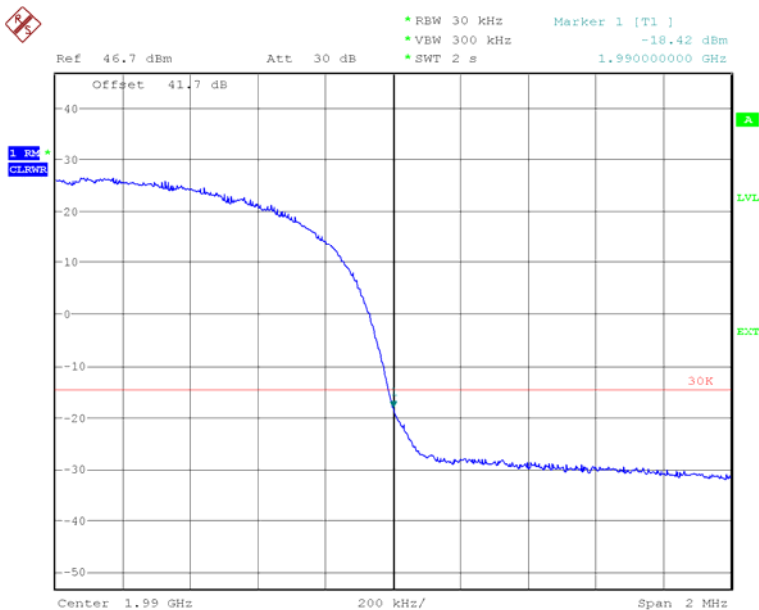
Date: 11.DEC.2008 03:52:55





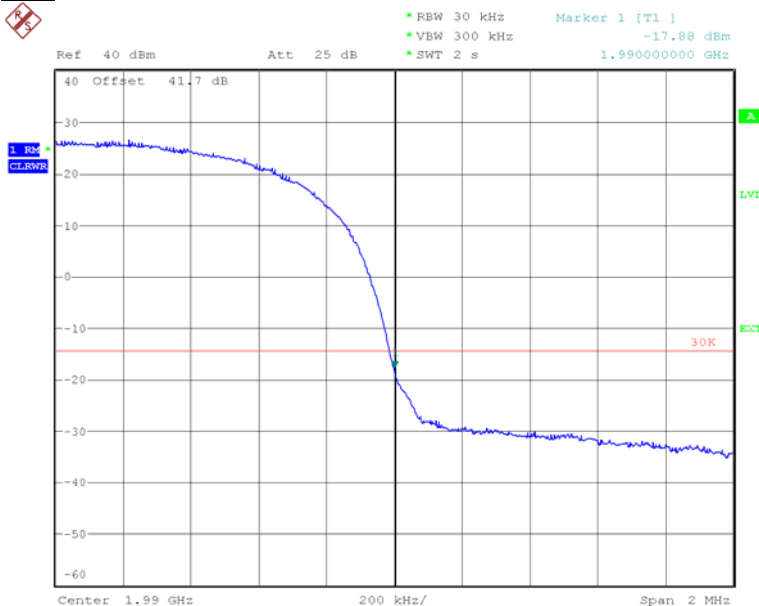
Configuration 1 - Mode 3

TM1



Date: 3.DEC.2008 05:30:29

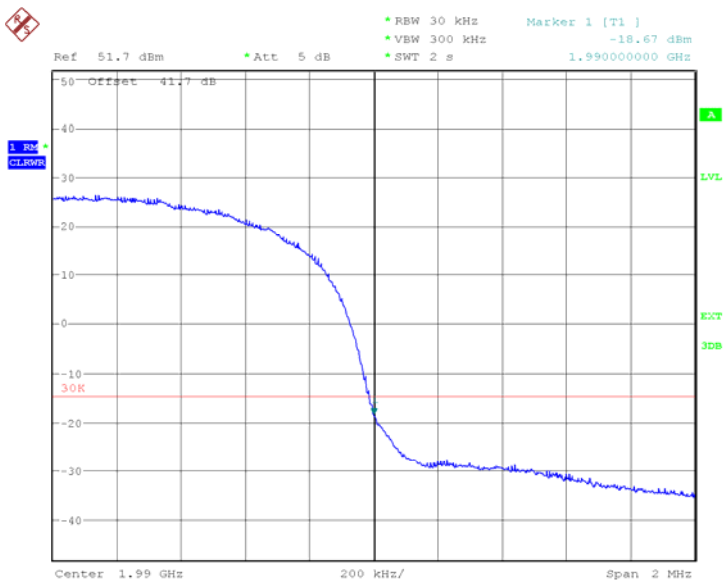
TM5



Date: 3.DEC.2008 05:44:44



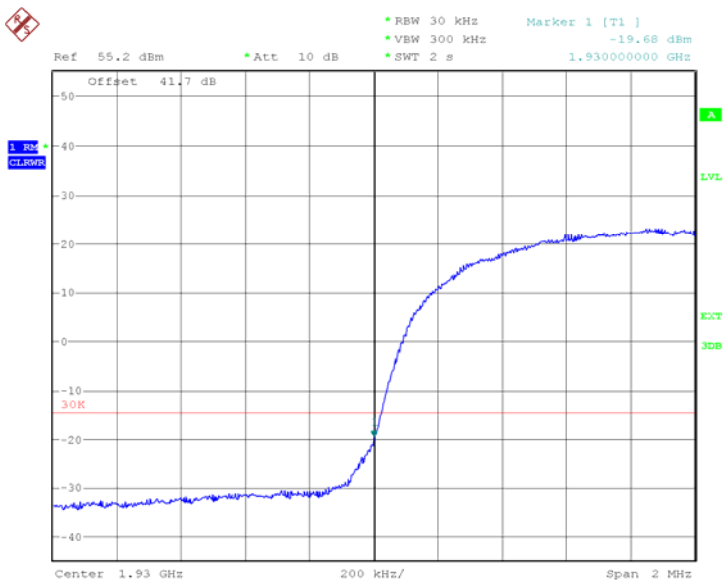
TM6



Date: 11.DEC.2008 04:54:05

Configuration 1 - Mode 4

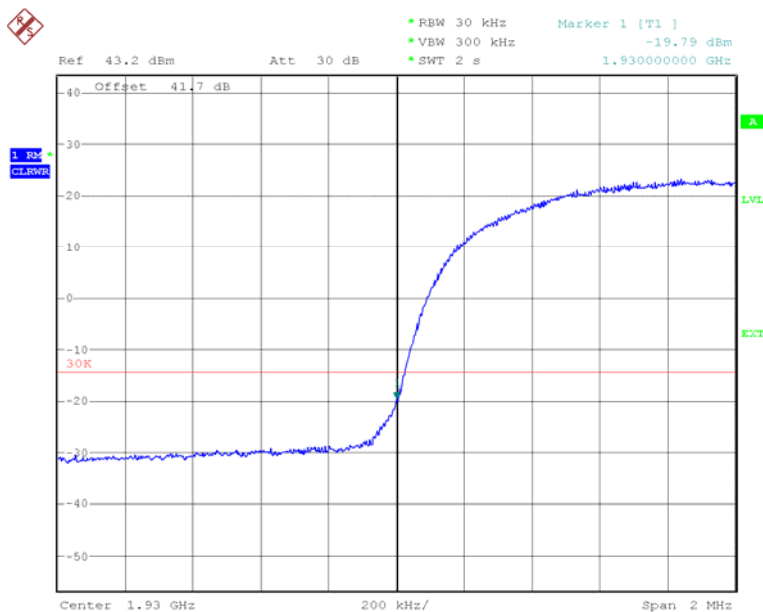
TM1



Date: 11.DEC.2008 07:16:22

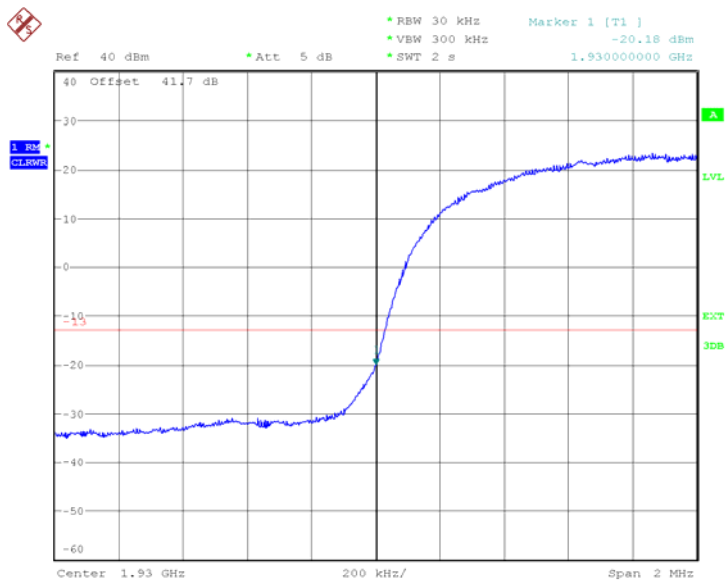


TM5



Date: 3.DEC.2008 06:41:33

TM6

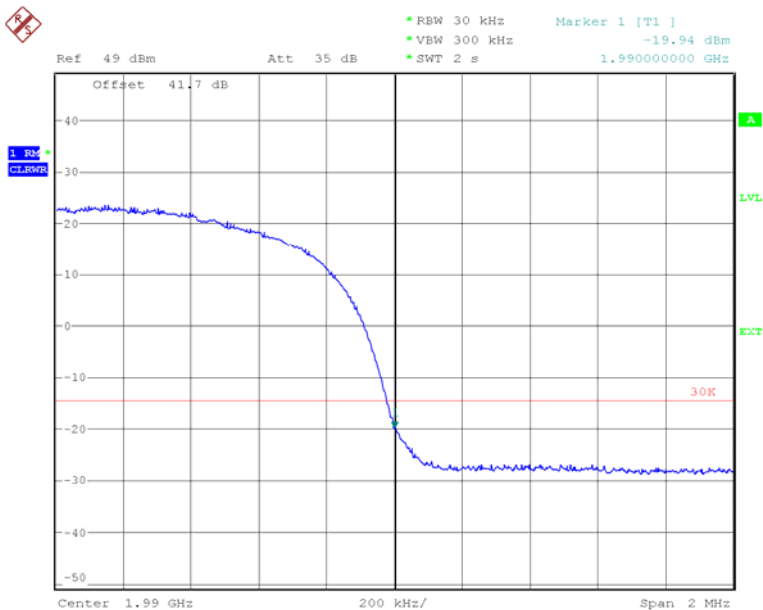


Date: 11.DEC.2008 06:49:09



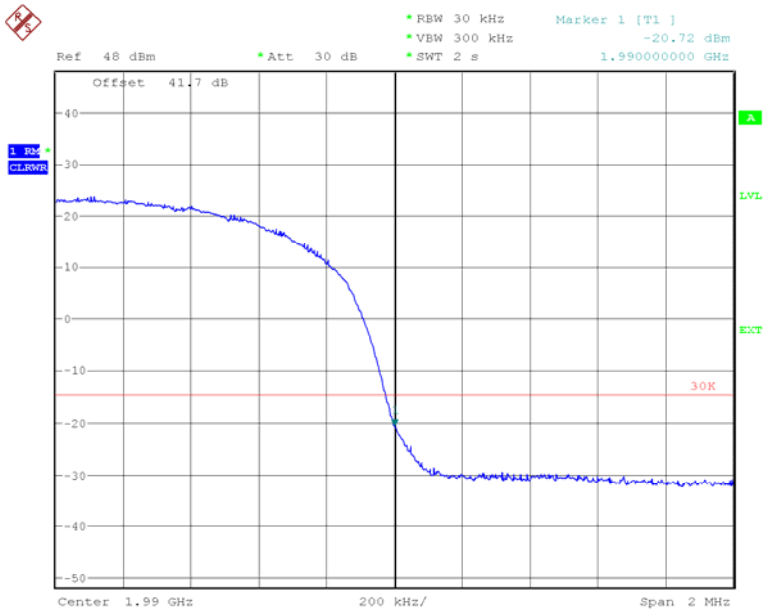
Configuration 1 - Mode 6

TM1



Date: 3.DEC.2008 07:42:36

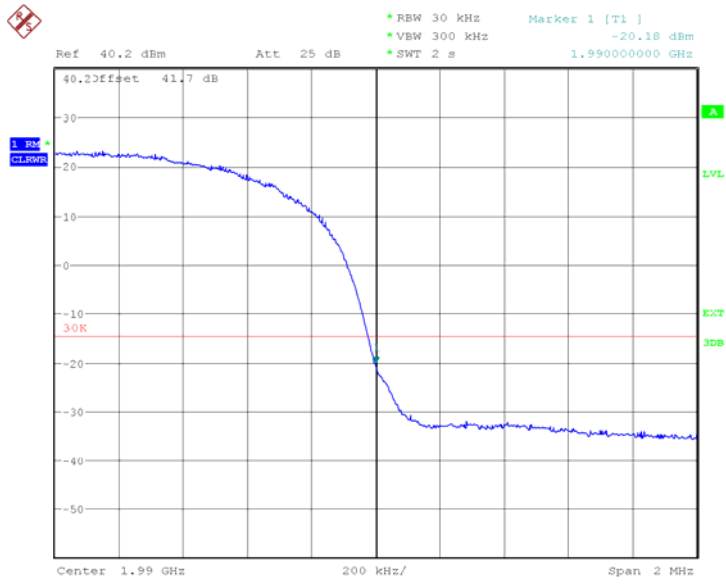
TM5



Date: 3.DEC.2008 08:09:13



TM6



Date: 11.DEC.2008 06:01:27

## **2.6 RADIATED SPURIOUS EMISSIONS**

### **2.6.1 Specification Reference**

FCC CFR 47 Part 24: 2007, Clause 2.1053, 24.238(a)  
Industry Canada RSS 133:2008 Clause 6.5

### **2.6.2 Equipment Under Test**

RRU22 1940 (KRC 161 134/2)

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

08, 09 and 15 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 24: 2007 and Industry Canada RSS 133:2008.

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 – 20GHz. 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:

$$\text{Field Strength of Carrier} - (43 + 10\text{Log}(P)) \text{ dB}$$

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:

$$E_{(v/m)} = (30 \times 1.64 \times 44.771)^{0.5} / 3 = 15.644 \text{V/m} = 143.9 \text{dB}\mu\text{V/m}$$

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

$$43 + 10\text{log}(44.771) = 59.5 \text{dB}$$

Therefore the limit at 3m measurement distance is:

$$143.9 - 59.5 = 84.4 \text{dB}\mu\text{V/m}$$

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:

- Configuration 1 - Mode 1
- Mode 4

**2.6.6 Environmental Conditions**

	08 December 2008	09 December 2008	15 December 2008
Ambient Temperature	18.2°C	19.4°C	18.4°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 24: 2007 and Industry Canada RSS 133:2008 Clause 6.5 for Radiated Spurious Emissions.

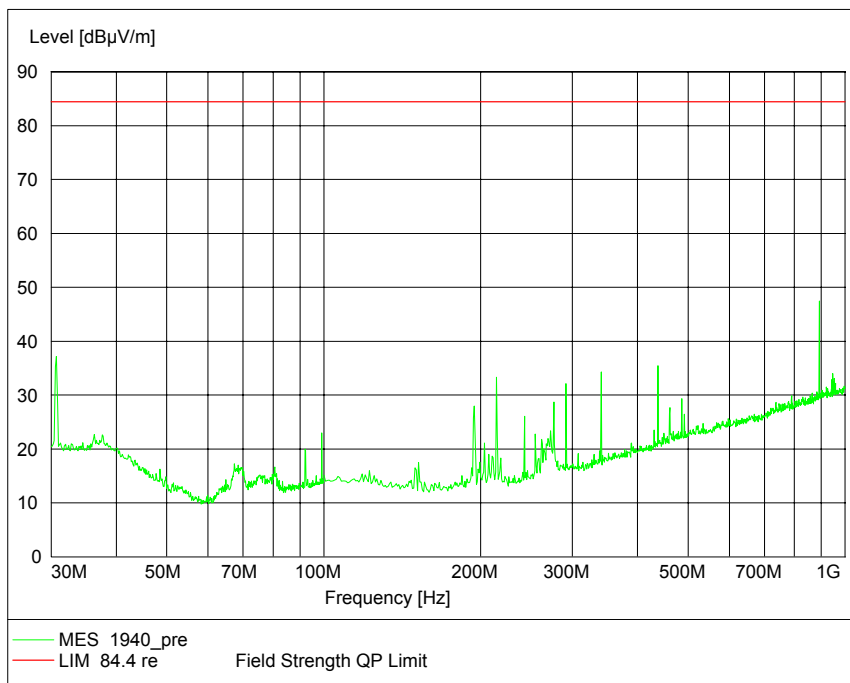
The test results are shown below.

Configuration 1 - Mode 1

No emissions were detected within 20dB of the limit.

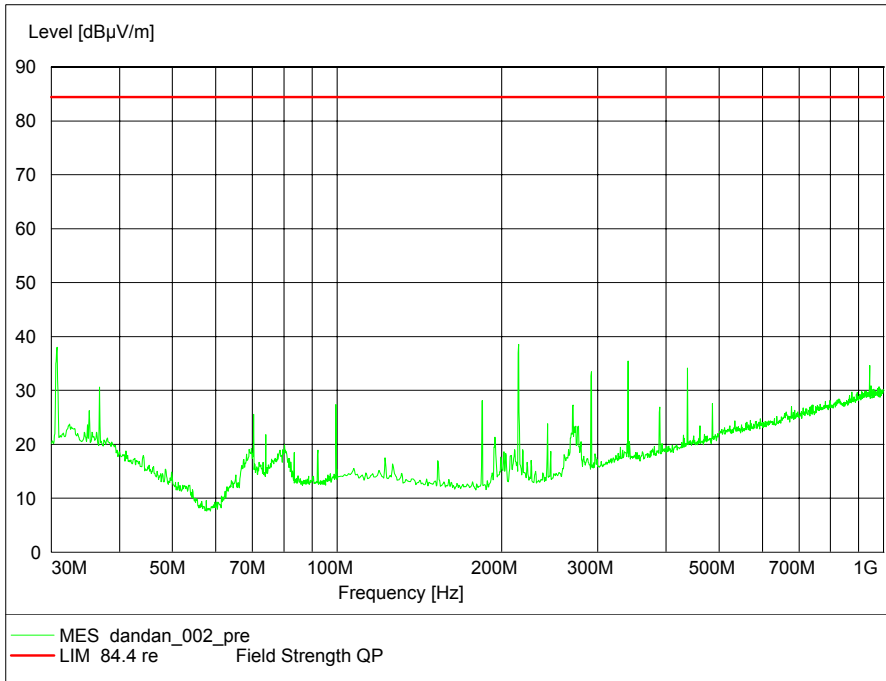
30MHz to 1GHz

TM1

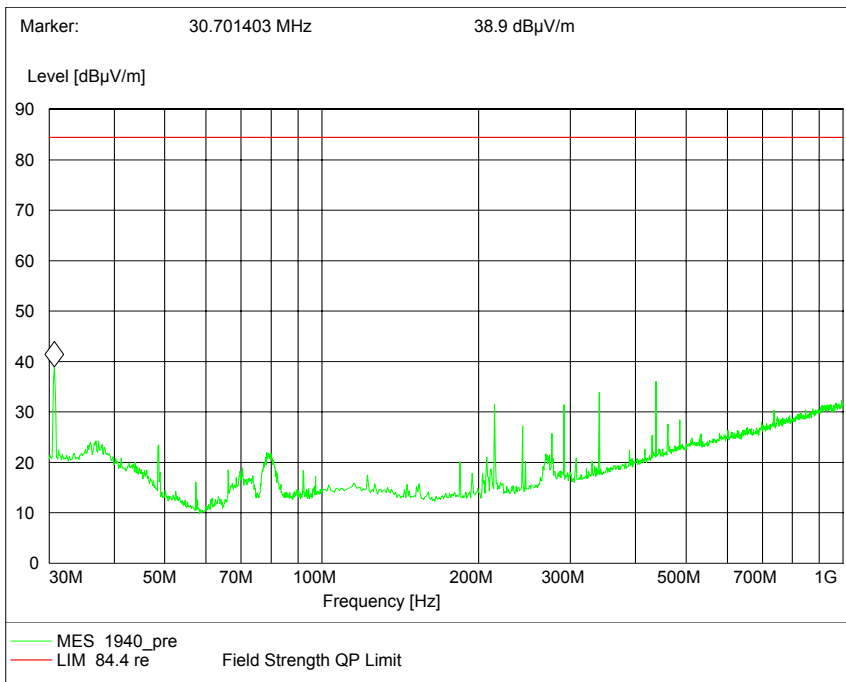




TM5

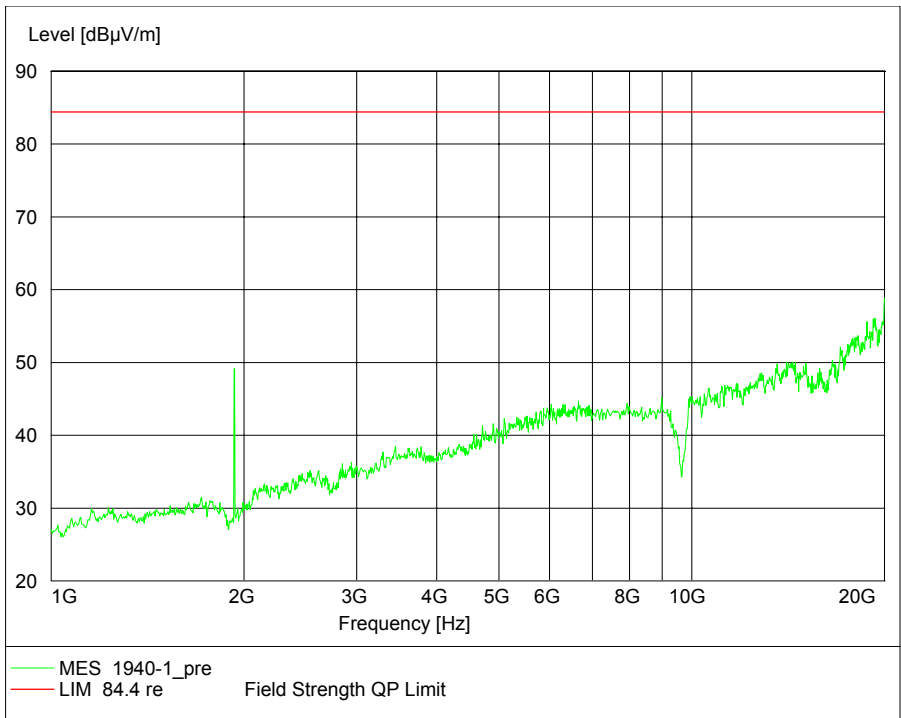


TM6

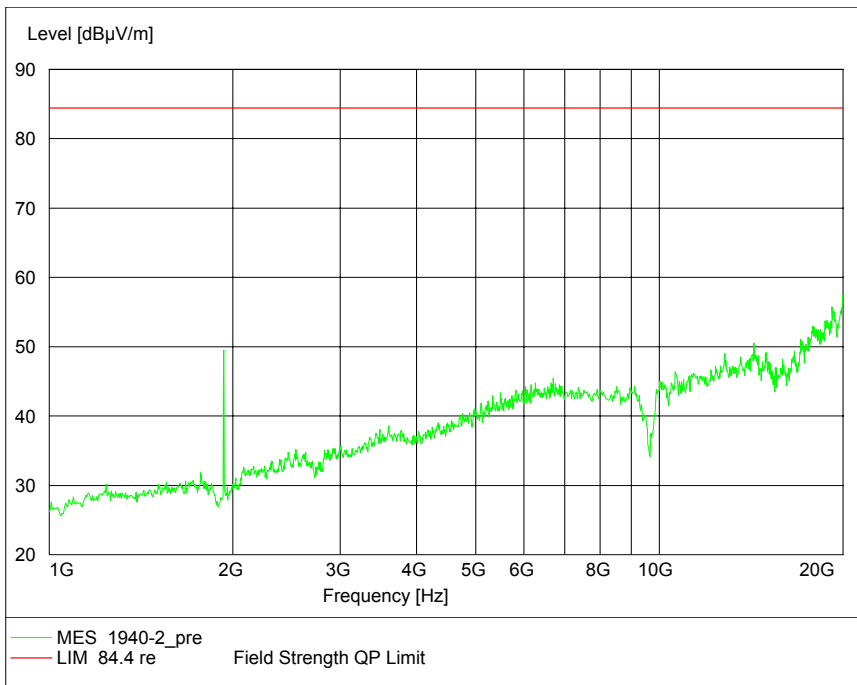


1GHz to 20GHz

TM1

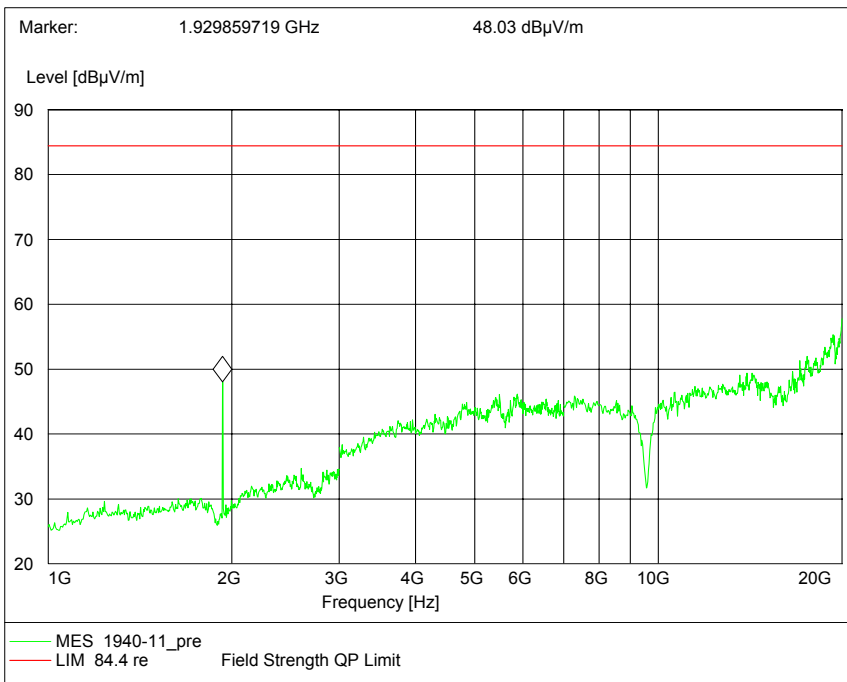


TM5





TM6

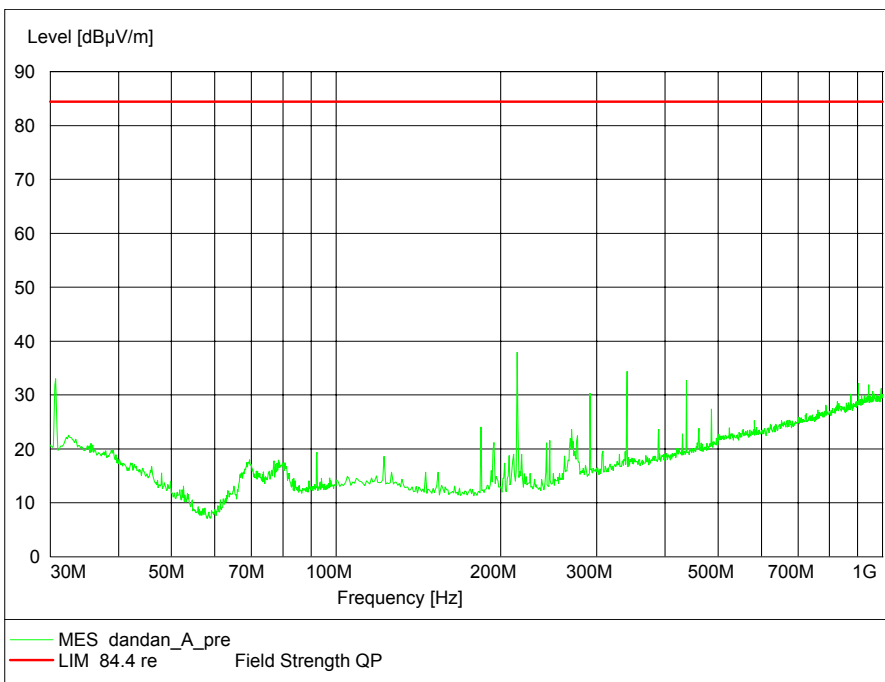


Configuration 1 - Mode 4

No emissions were detected within 20dB of the limit.

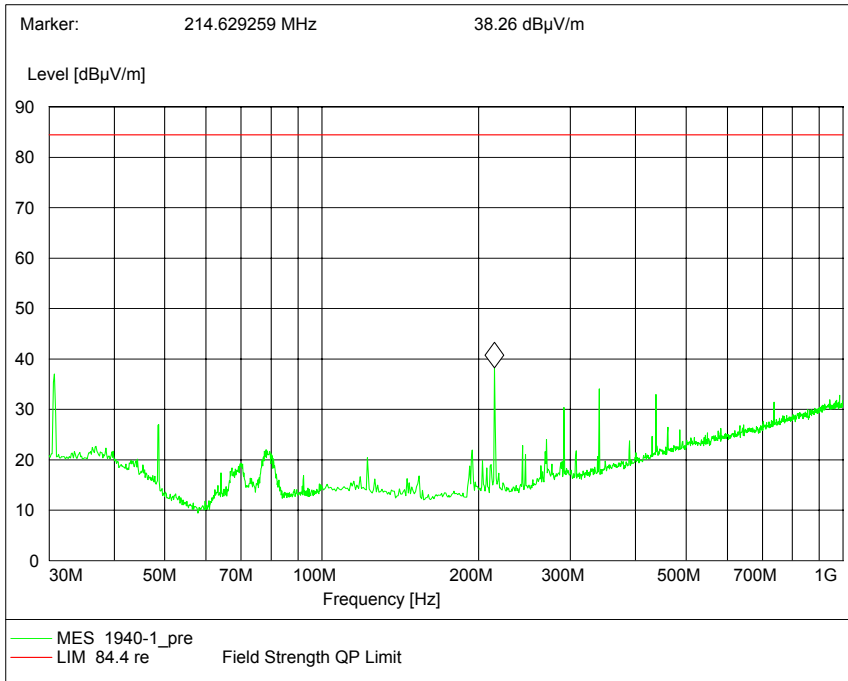
30MHz to 1GHz

TM1&TM5 – Maximum power



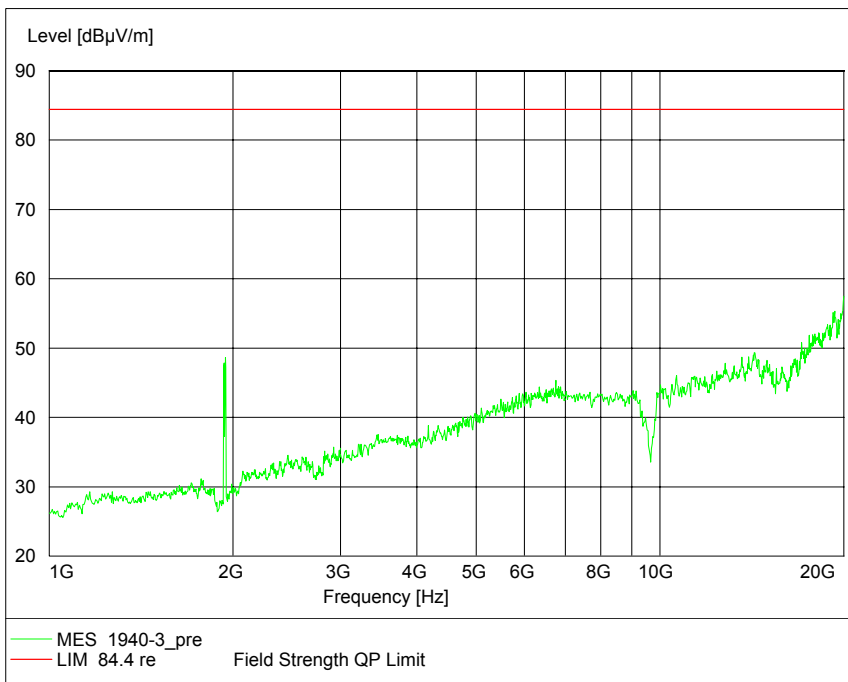


TM6&TM6 - Maximum power

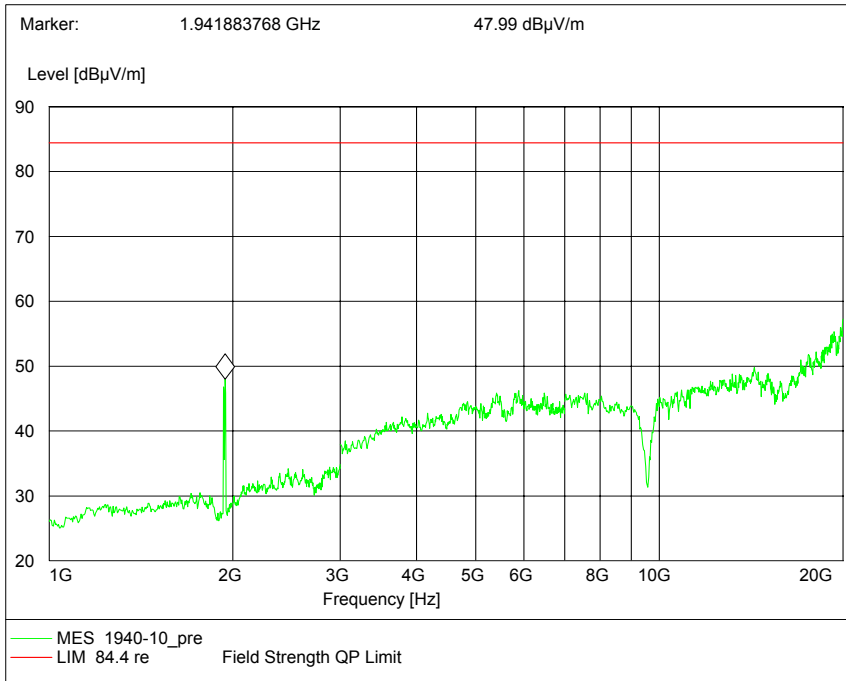


1GHz to 20GHz

TM1&TM5 – Maximum power



TM6&TM6 - Maximum power



Limit	84.4dBµV/m.
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## 2.7 CONDUCTED SPURIOUS EMISSIONS

### 2.7.1 Specification Reference

FCC CFR 47 Part 24: 2007, Clause 2.1051, 24.238 (a)  
Industry Canada RSS 133:2008 Clause 6.5

### 2.7.2 Equipment Under Test

RRU22 1940 (KRC 161 134/2)

### 2.7.3 Date of Test and Modification State

03 and 11 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 24: 2007 and Industry Canada RSS 133:2008.

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 9kHz to 20GHz. 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 24.238(b). 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:

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

### 2.7.6 Environmental Conditions

	03 December 2008	11 December 2008
Ambient Temperature	20.4°C	23.5°C
Relative Humidity	25.2%	26.3%

**2.7.7 Test Results**

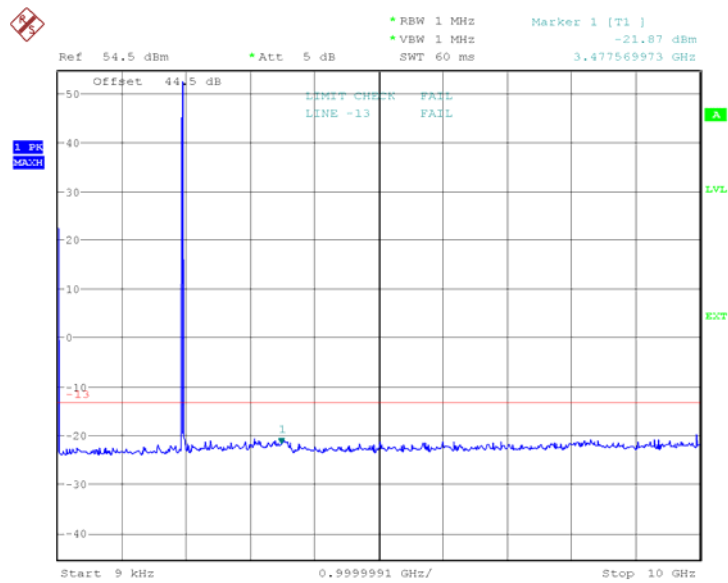
For the period of test the EUT met the requirements of FCC CFR 47 Part 24: 2007 and Industry Canada RSS 133:2008 for Spurious Emissions.

The test results are shown below.

Configuration 1 - Mode 1

9kHz to 10GHz

TM1

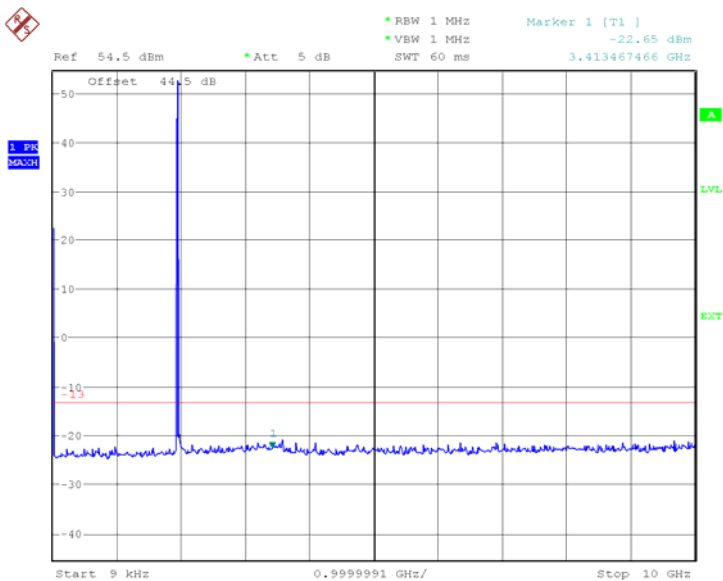


Date: 3.DEC.2008 03:19:49

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



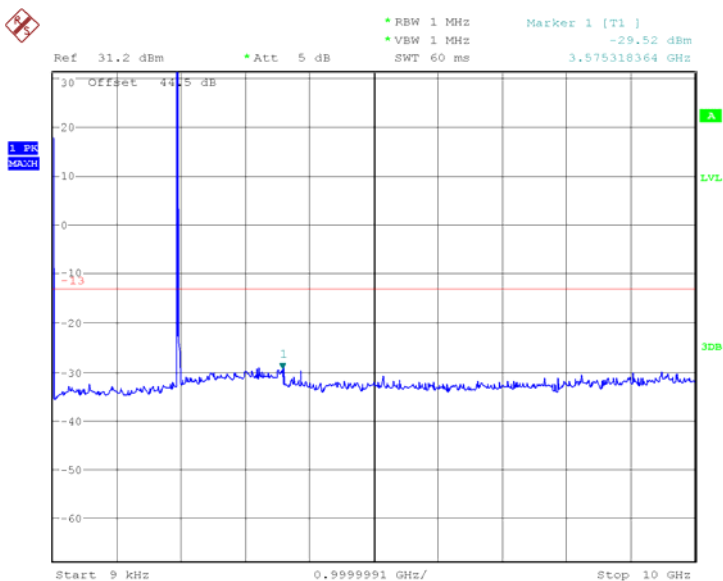
TM5



Date: 3.DEC.2008 05:14:20

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

TM6



Date: 11.DEC.2008 03:48:40

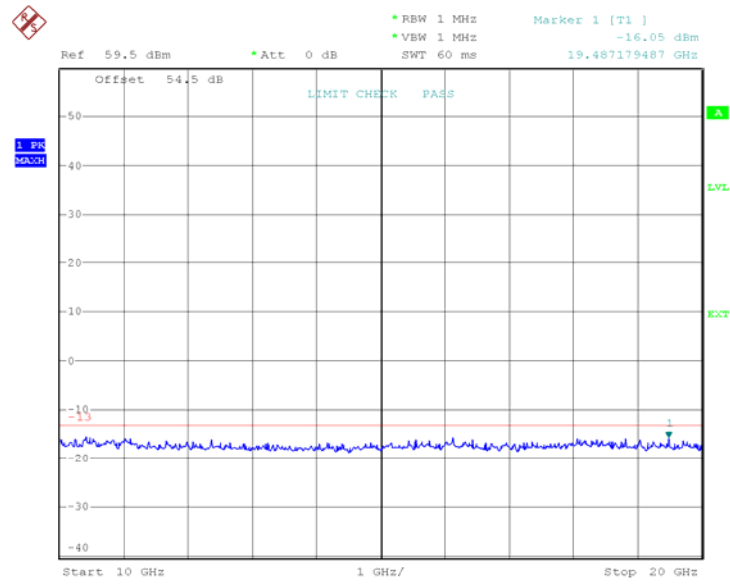
Note: The emission beyond the limit is the operating frequency.





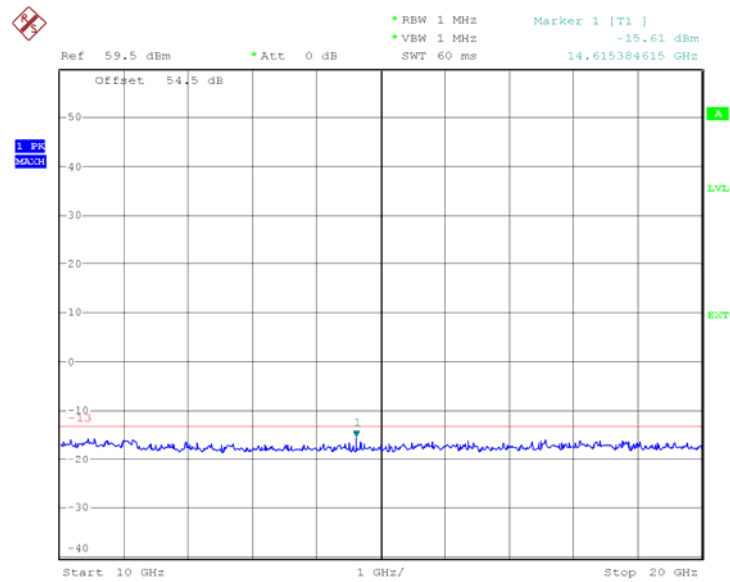
10GHz to 20GHz

TM1



Date: 3.DEC.2008 03:20:24

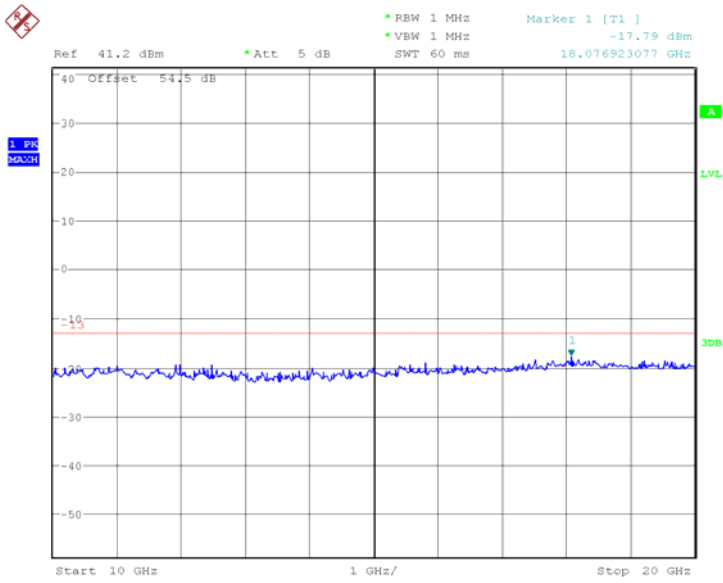
TM5



Date: 3.DEC.2008 05:15:03



TM6

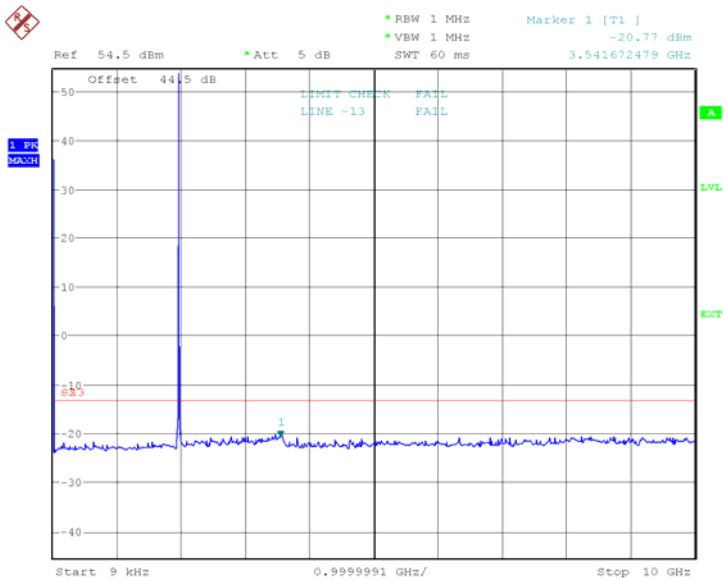


Date: 11.DEC.2008 03:49:25

Configuration 1 - Mode 2

9kHz to 10GHz

TM1

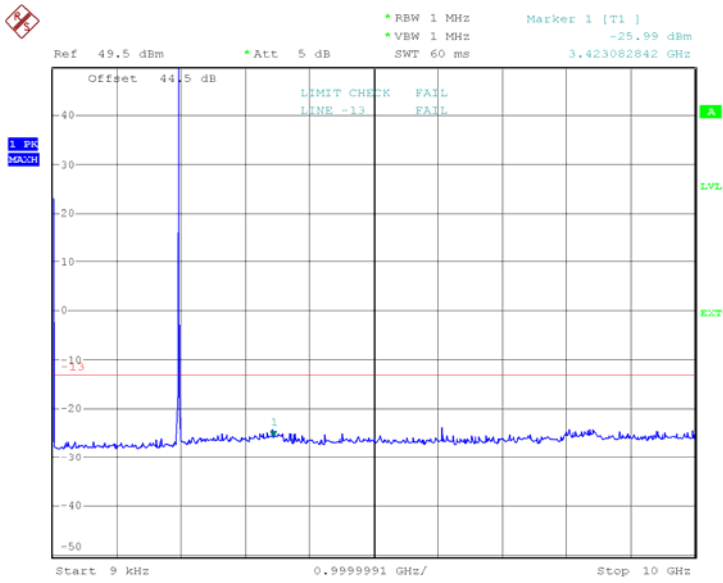


Date: 3.DEC.2008 02:41:35

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



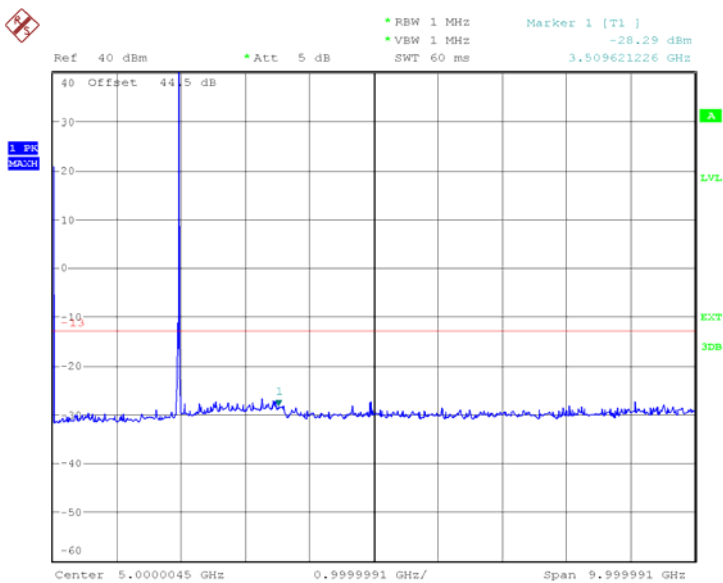
TM5



Date: 3.DEC.2008 02:55:37

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

TM6



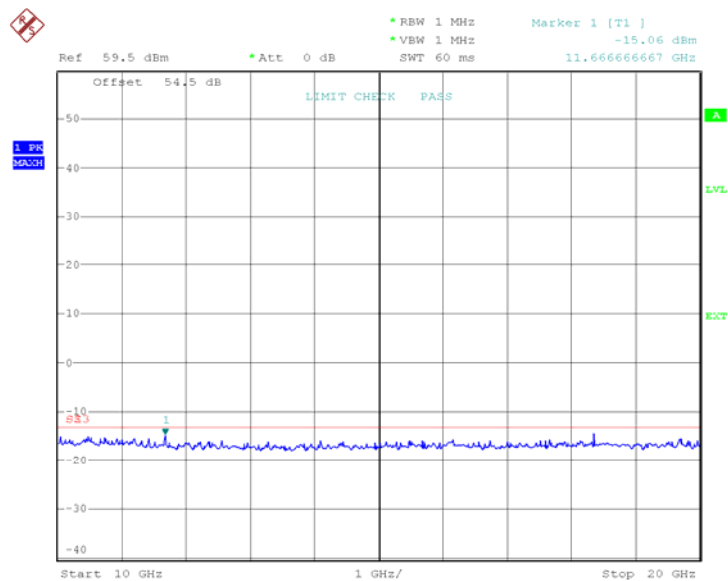
Date: 11.DEC.2008 04:22:40

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



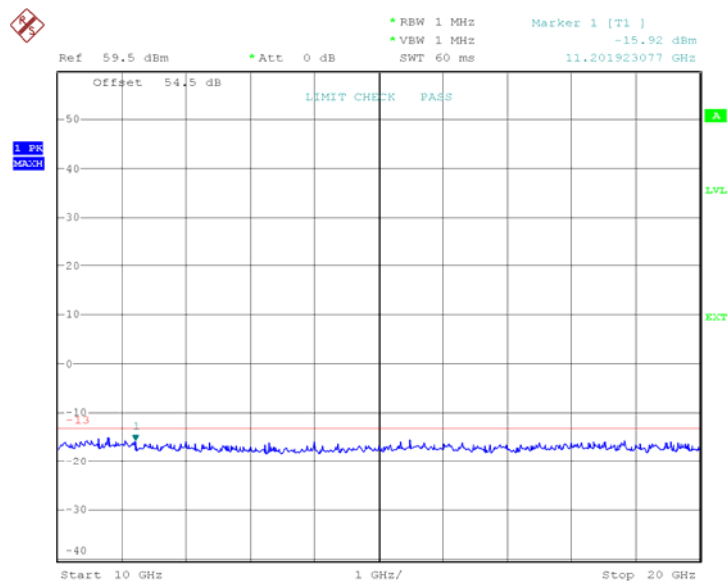
10GHz to 20GHz

TM1



Date: 3.DEC.2008 02:45:54

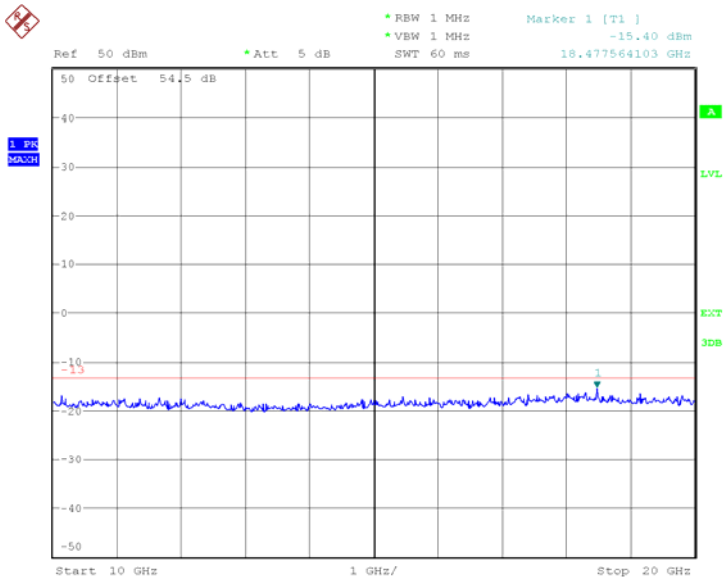
TM5



Date: 3.DEC.2008 02:56:35



TM6

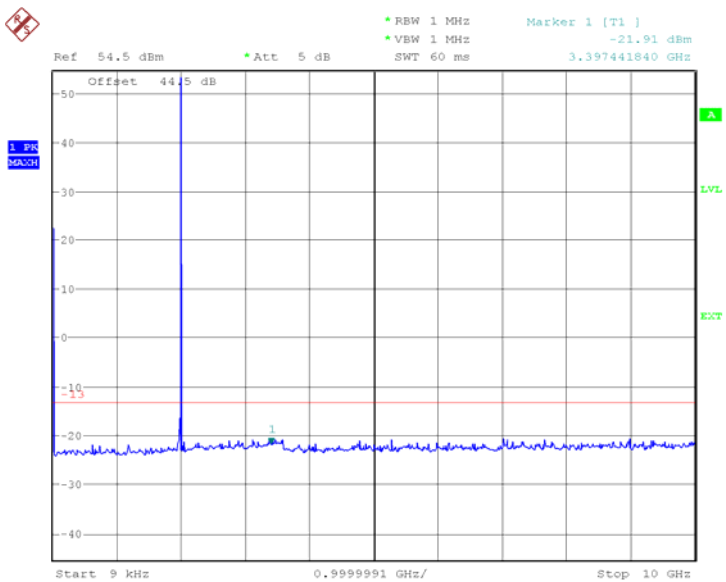


Date: 11.DEC.2008 04:23:24

Configuration 1 - Mode 3

9kHz to 10GHz

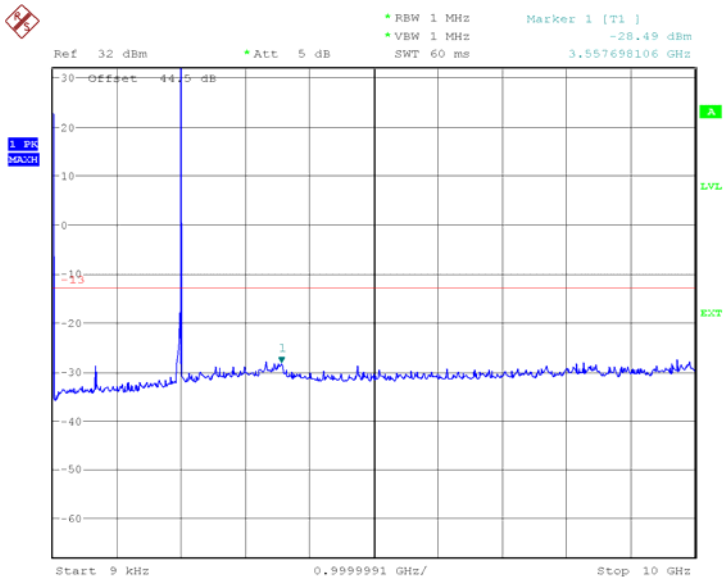
TM1



Date: 3.DEC.2008 05:26:16

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

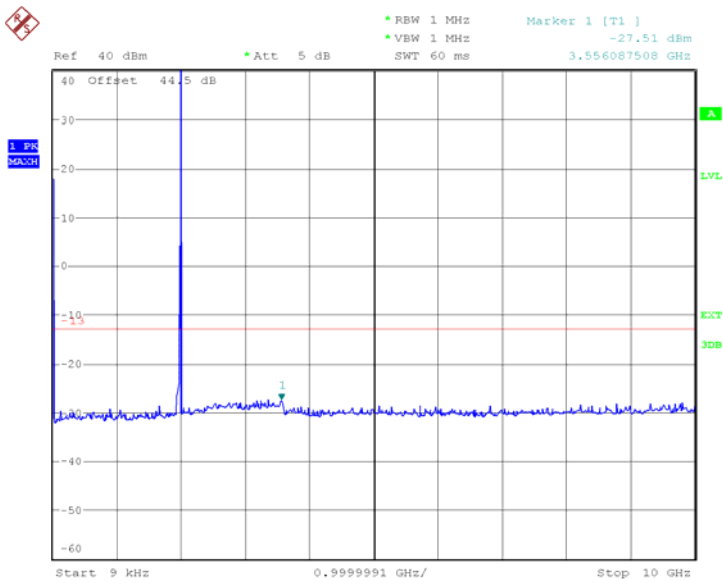
TM5



Date: 3.DEC.2008 05:41:21

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

TM6



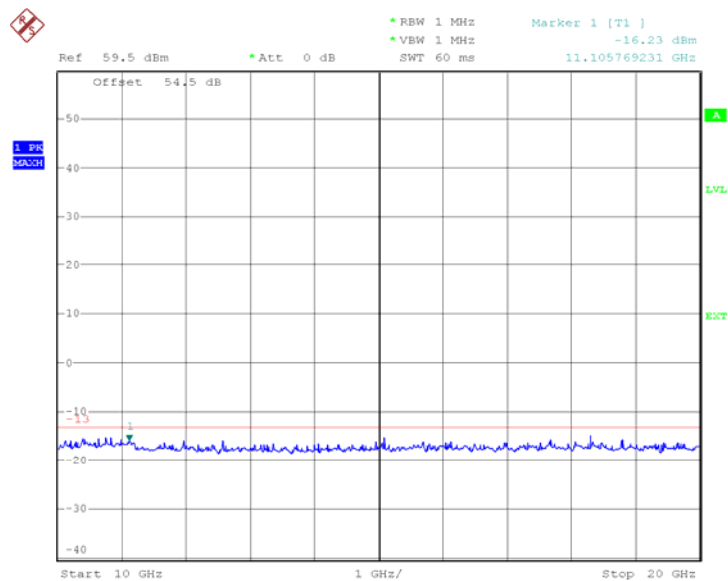
Date: 11.DEC.2008 04:47:38

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



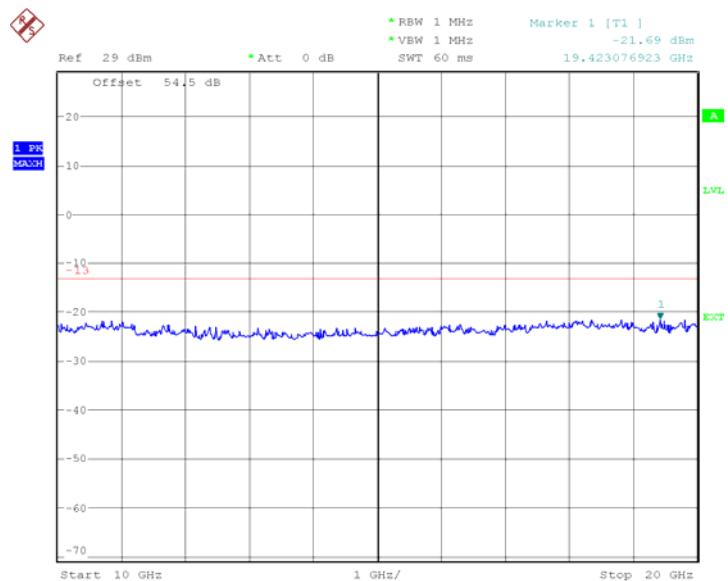
10GHz to 20GHz

TM1



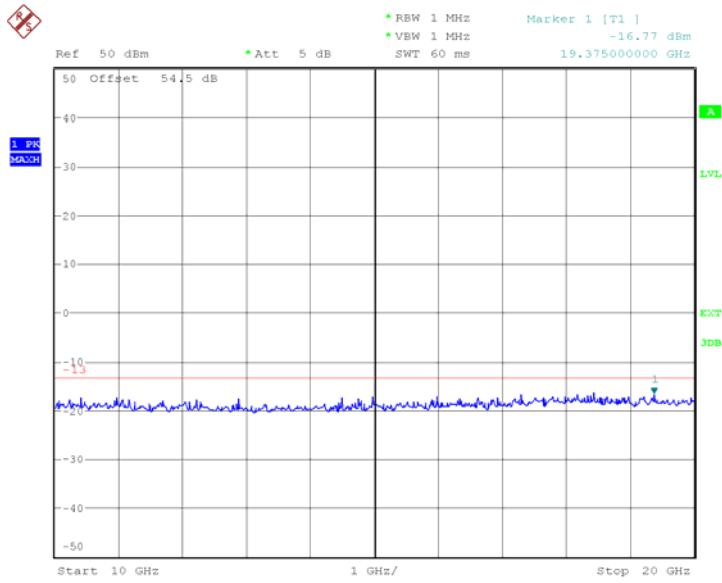
Date: 3.DEC.2008 05:27:10

TM5



Date: 3.DEC.2008 05:42:31

TM6

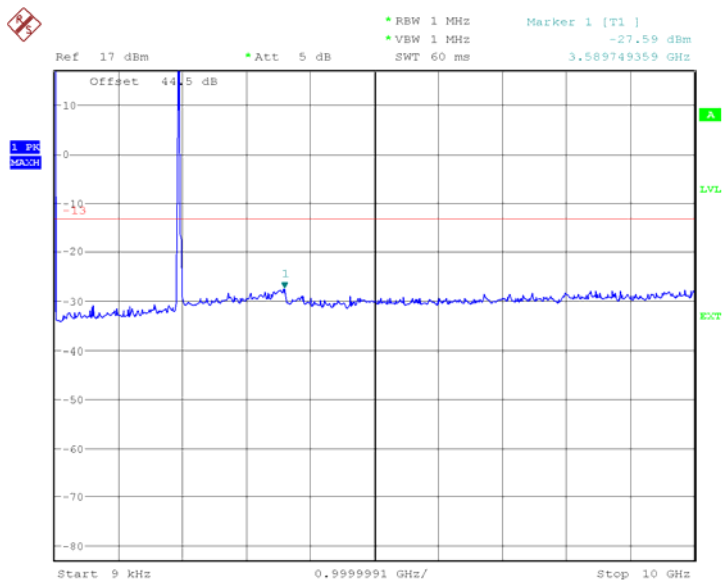


Date: 11.DEC.2008 04:48:18

Configuration 1 - Mode 4

9kHz to 10GHz

TM1

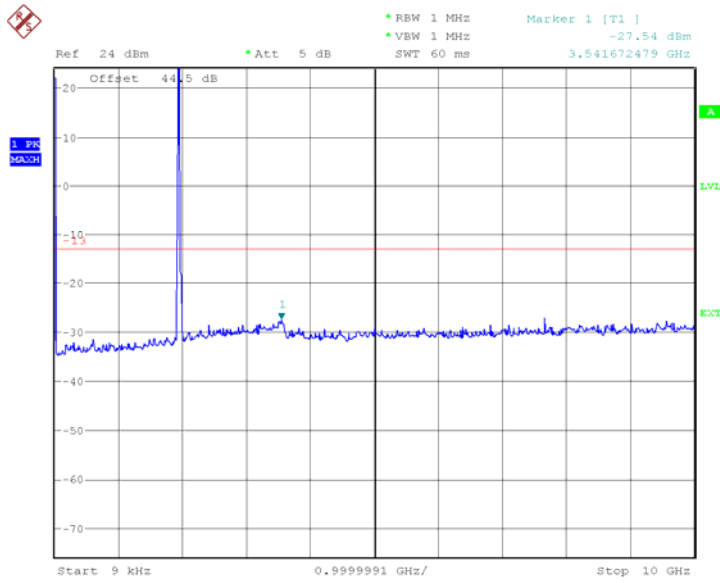


Date: 3.DEC.2008 06:05:59

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



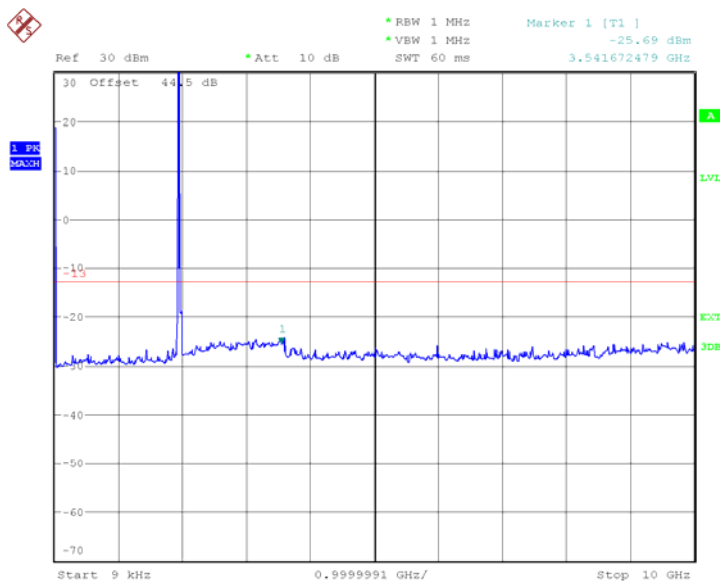
TM5



Date: 3.DEC.2008 06:37:58

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

TM6

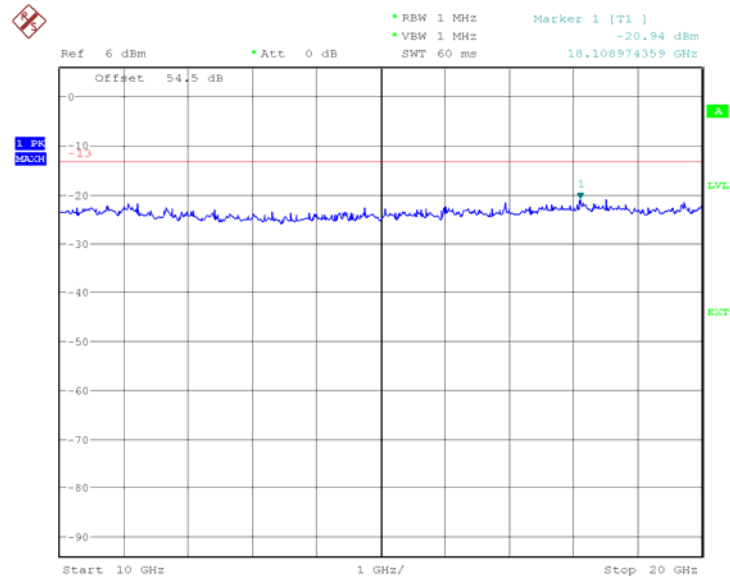


Date: 11.DEC.2008 06:46:05

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

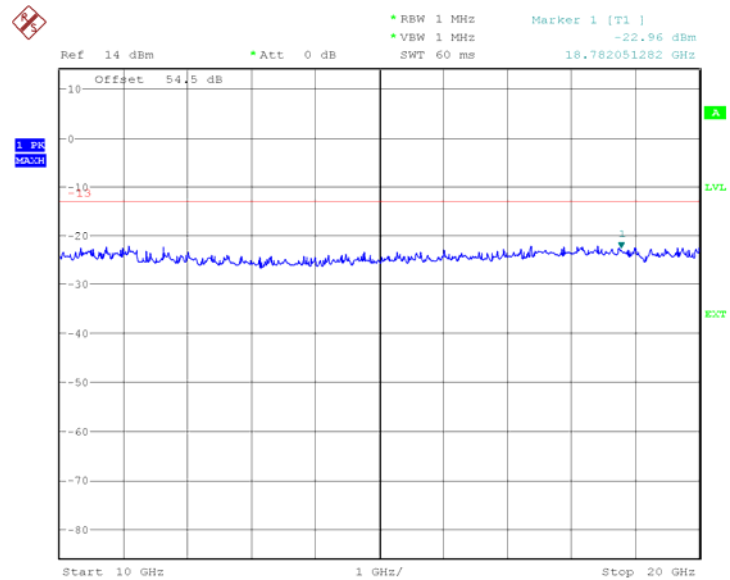
10GHz to 20GHz

TM1



Date: 3.DEC.2008 06:15:38

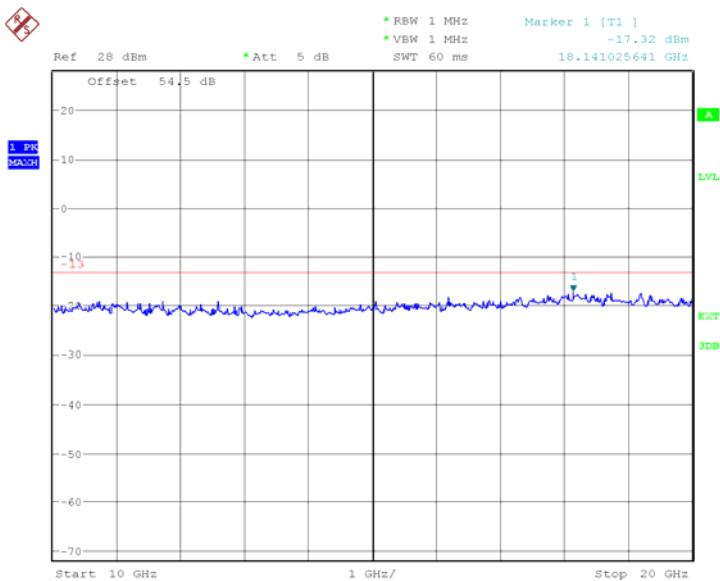
TM5



Date: 3.DEC.2008 06:39:42



TM6

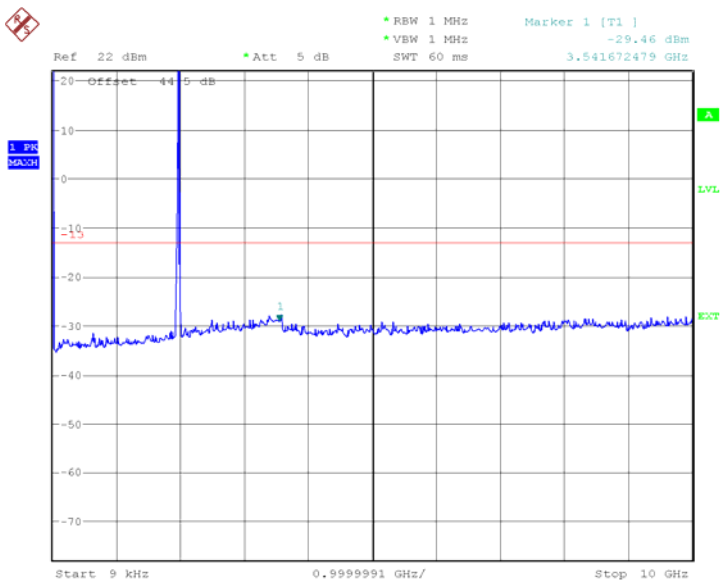


Date: 11.DEC.2008 06:47:39

Configuration 1 - Mode 5

9kHz to 10GHz

TM1

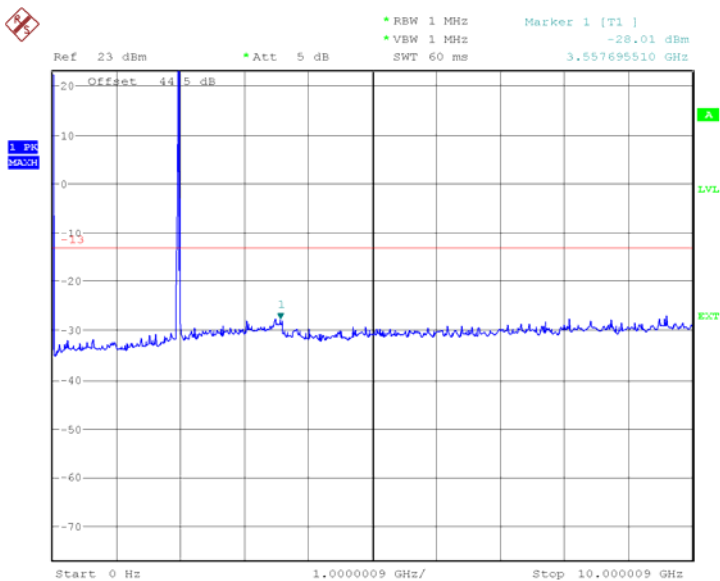


Date: 3.DEC.2008 07:22:56

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



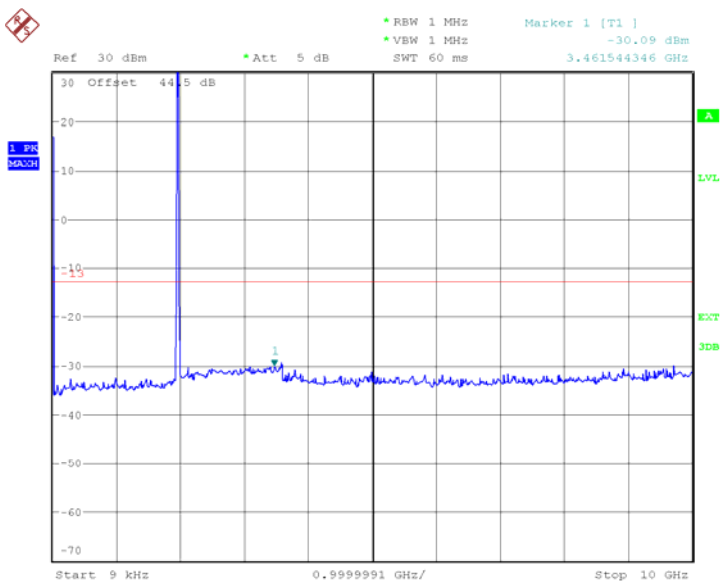
TM5



Date: 3.DEC.2008 07:09:48

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

TM6



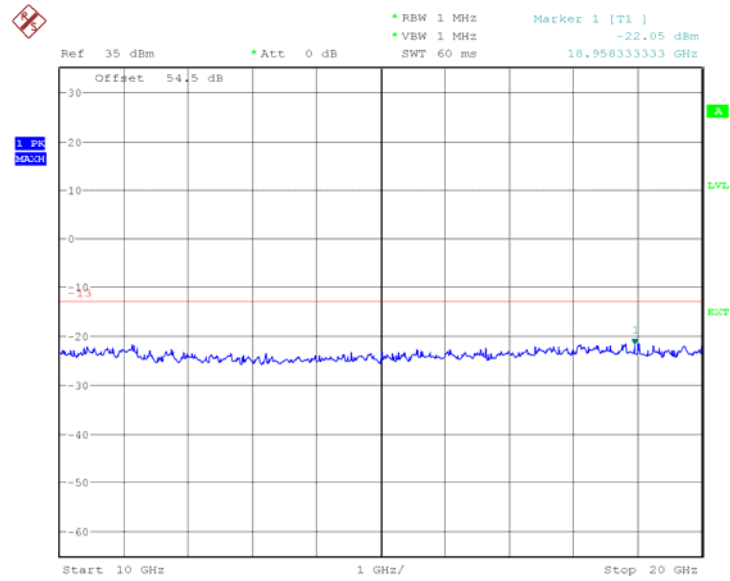
Date: 11.DEC.2008 06:27:15

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



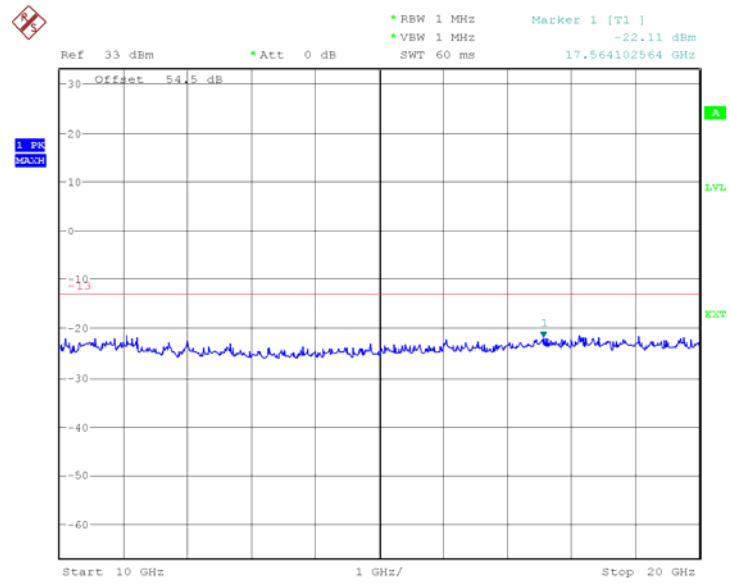
10GHz to 20GHz

TM1



Date: 3.DEC.2008 07:24:22

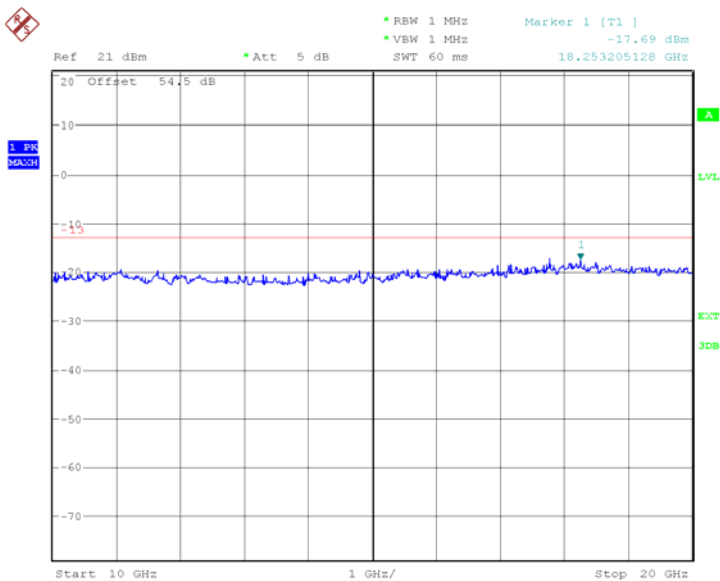
TM5



Date: 3.DEC.2008 07:10:33



TM6

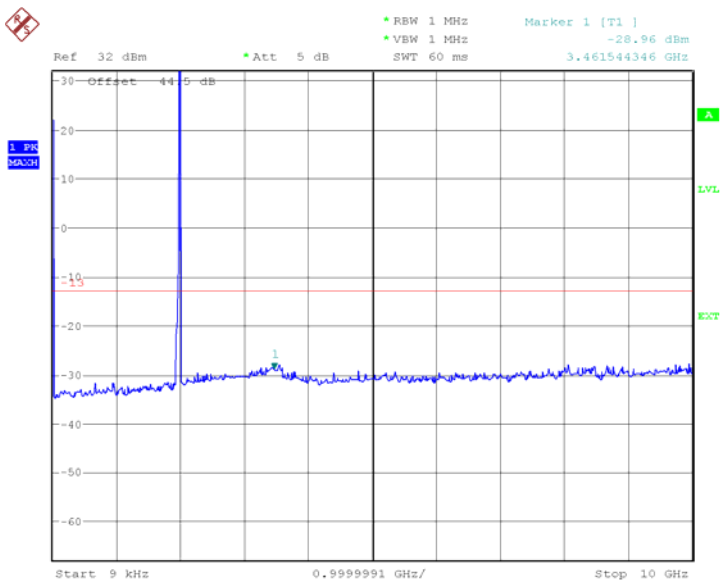


Date: 11.DEC.2008 06:29:10

Configuration 1 - Mode 6

9kHz to 10GHz

TM1

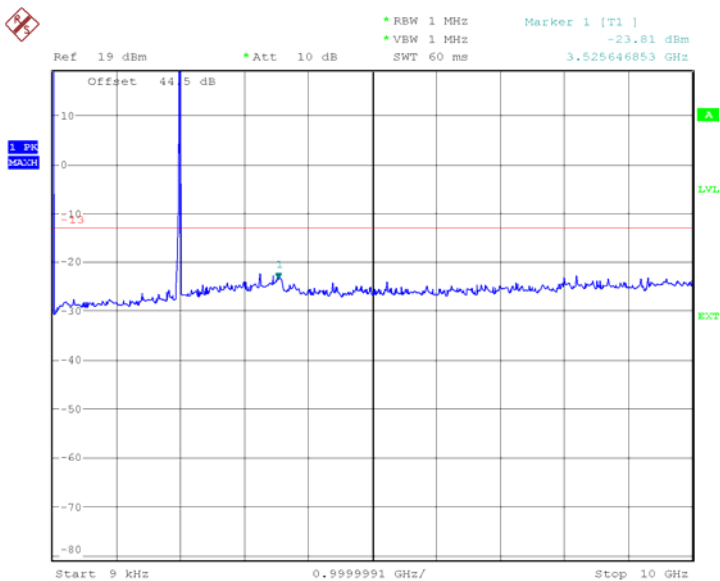


Date: 3.DEC.2008 07:39:12

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



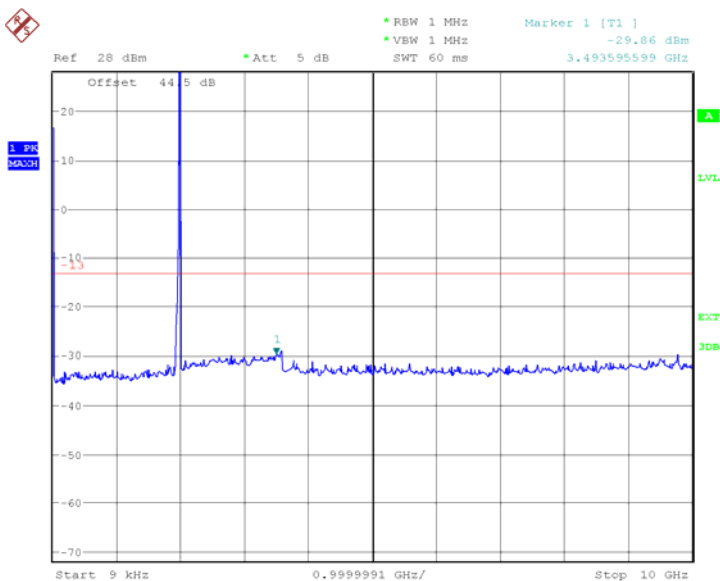
TM5



Date: 3.DEC.2008 08:05:24

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

TM6



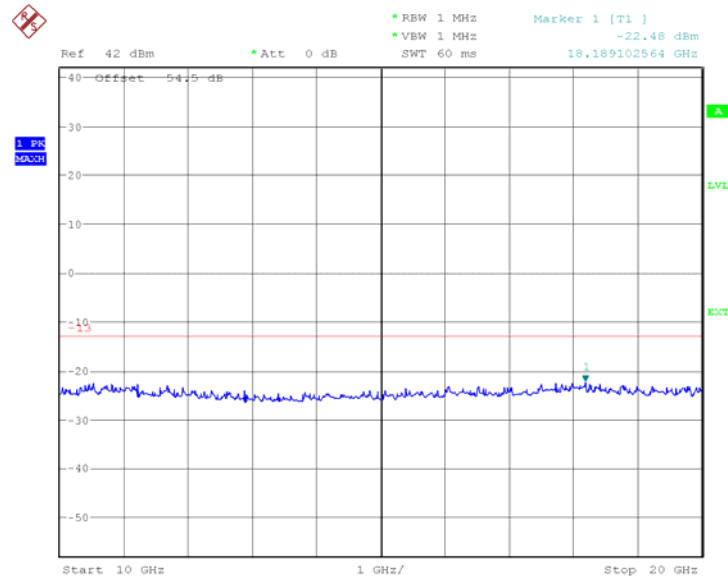
Date: 11.DEC.2008 05:58:50

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



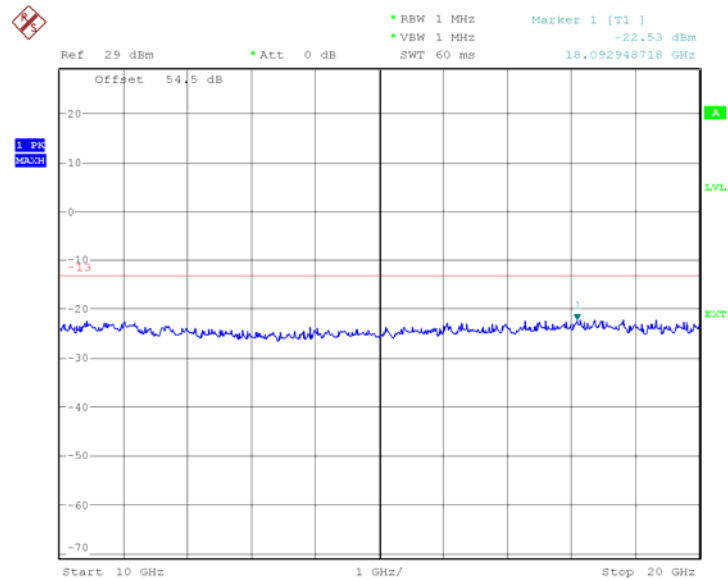
10GHz to 20GHz

TM1



Date: 3.DEC.2008 07:39:49

TM5

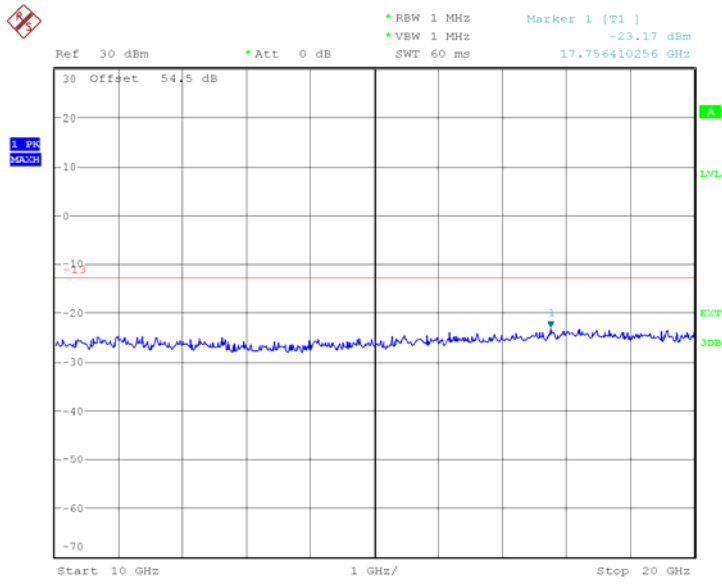


Date: 3.DEC.2008 08:06:07





TM6



Date: 11.DEC.2008 05:59:30

Limit	-13dBm
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## 2.8 RECEIVER SPURIOUS EMISSIONS

### 2.8.1 Specification Reference

Industry Canada RSS 133:2008 Clause 6.6

### 2.8.2 Equipment Under Test

RRU22 1940 (KRC 161 134/2)

### 2.8.3 Date of Test and Modification State

03 and 11 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 133:2008.

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 10GHz. 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:

Configuration 1 - Mode 1  
                           - Mode 2  
                           - Mode 3

### 2.8.6 Environmental Conditions

	03 December 2008	11 December 2008
Ambient Temperature	20.4°C	23.5°C
Relative Humidity	25.2%	26.3%

### 2.8.7 Test Results

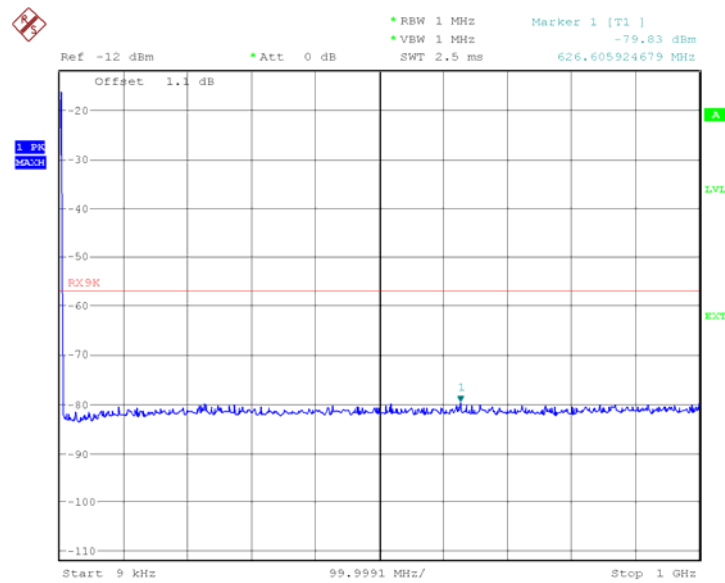
For the period of test the EUT met the requirements of Industry Canada RSS 133:2008 for Spurious Emissions.

The test results are shown below.

Configuration 1 - Mode 1

9kHz to 1GHz

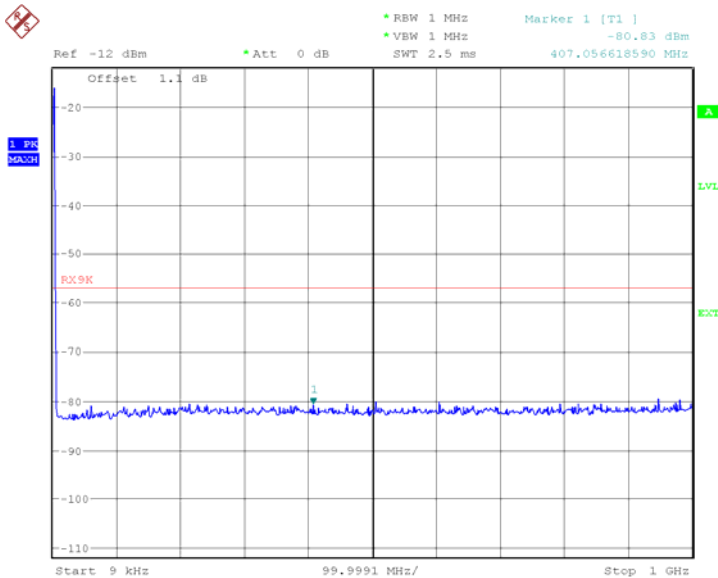
TM1



Date: 3.DEC.2008 09:12:54

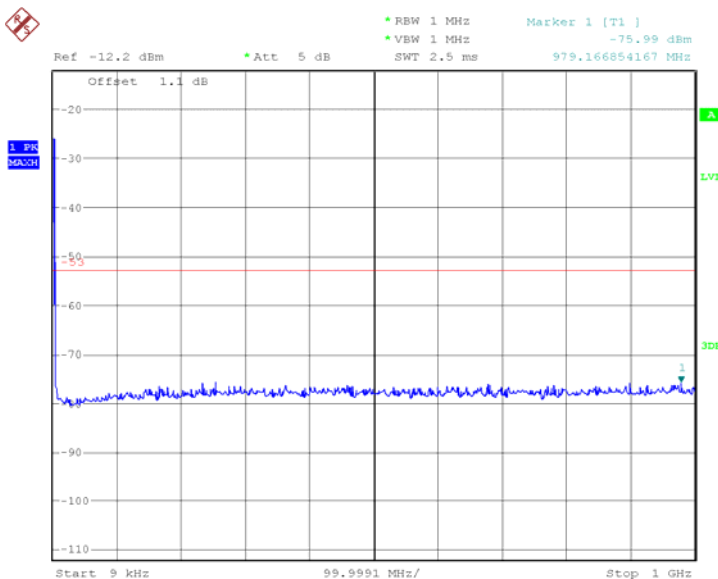


TM5



Date: 3.DEC.2008 09:20:01

TM6

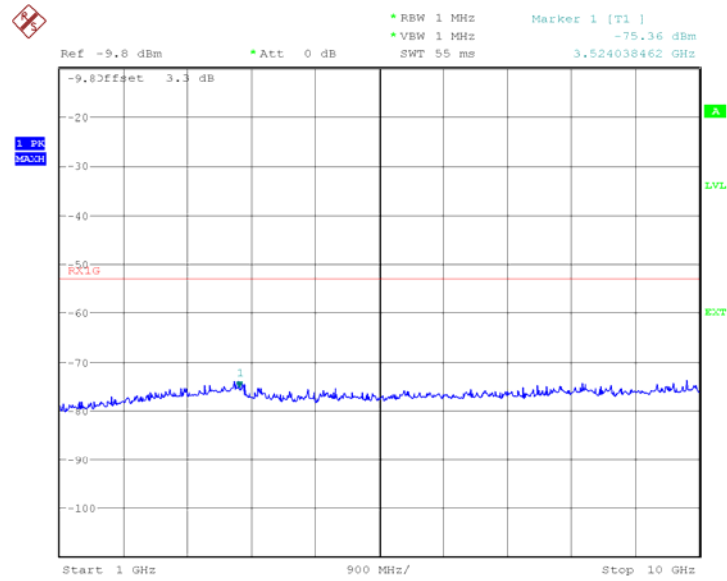


Date: 11.DEC.2008 03:43:24



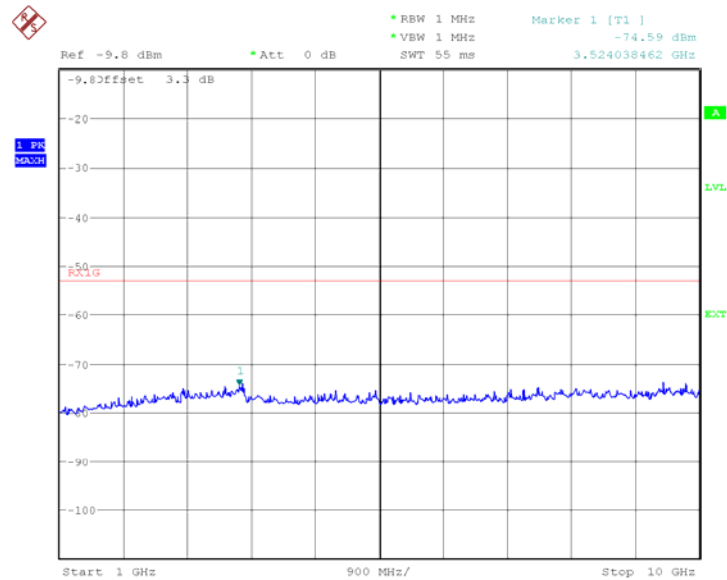
1GHz to 10GHz

TM1



Date: 3.DEC.2008 09:14:37

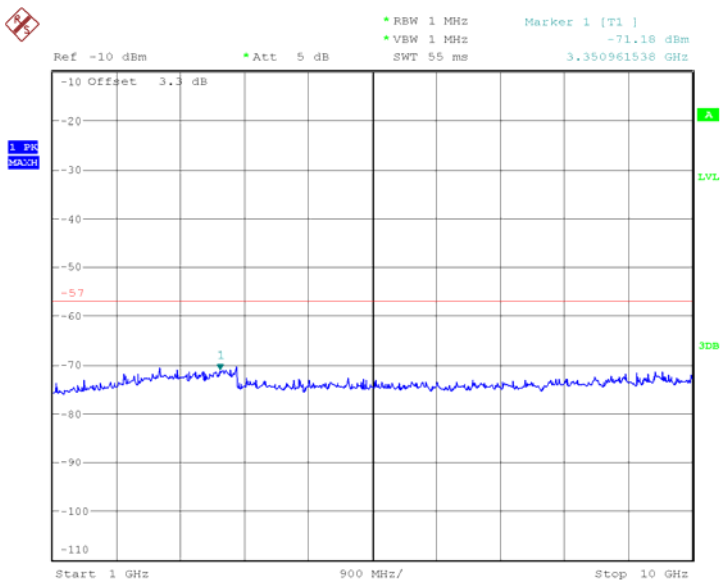
TM5



Date: 3.DEC.2008 09:18:54



TM6

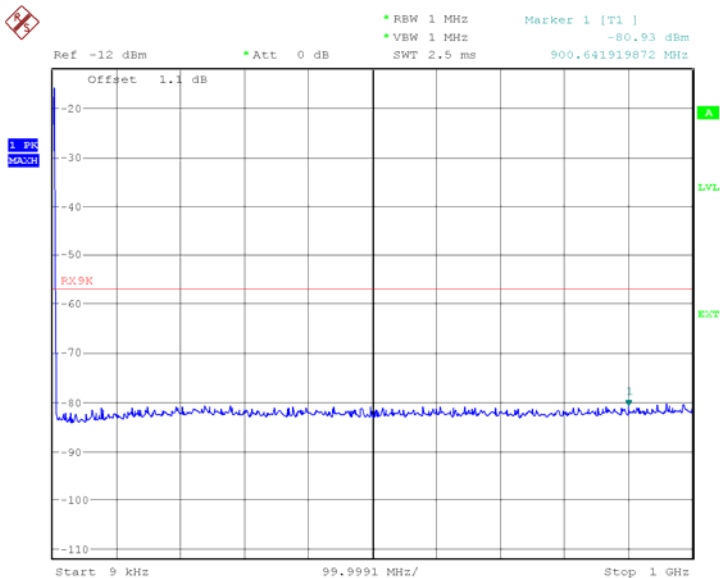


Date: 11.DEC.2008 03:42:41

Configuration 1 - Mode 2

9kHz to 1GHz

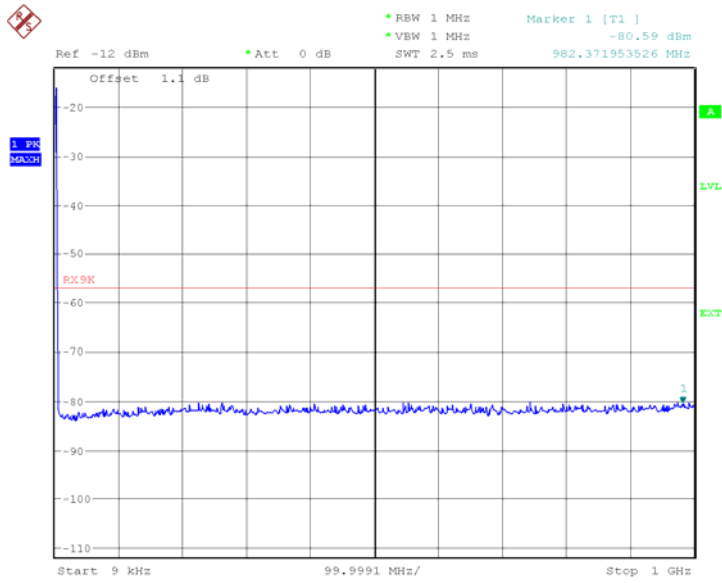
TM1



Date: 3.DEC.2008 09:56:37

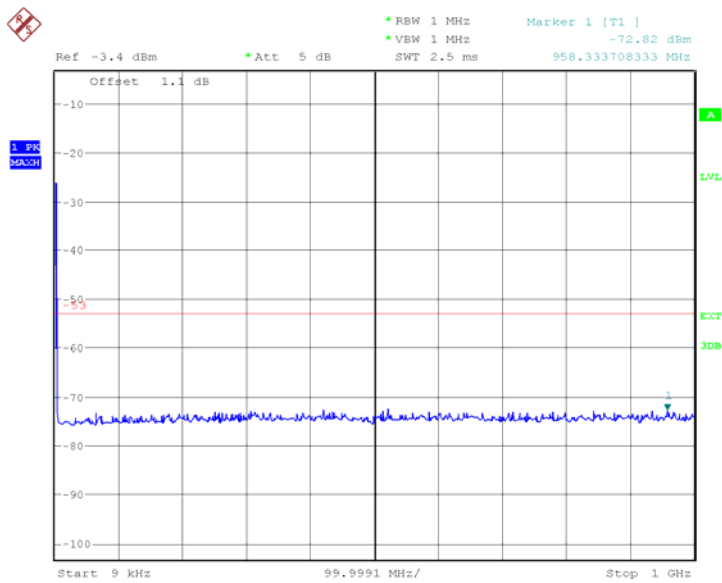


TM5



Date: 3.DEC.2008 09:26:46

TM6

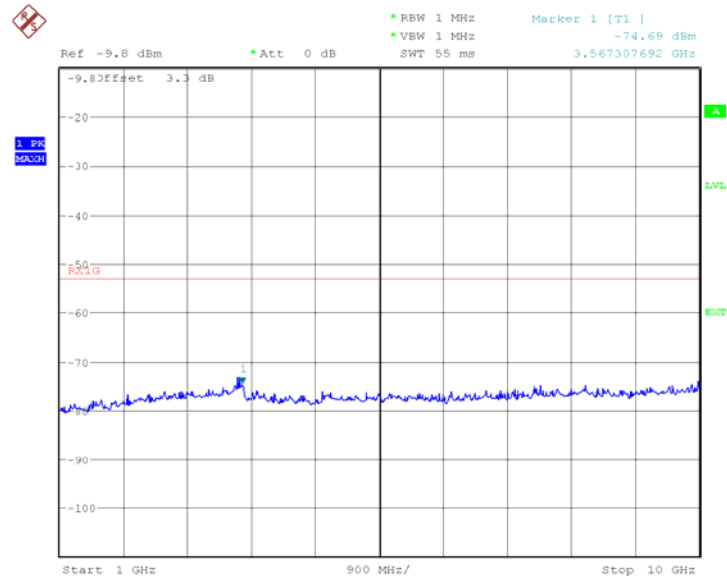


Date: 11.DEC.2008 04:29:39



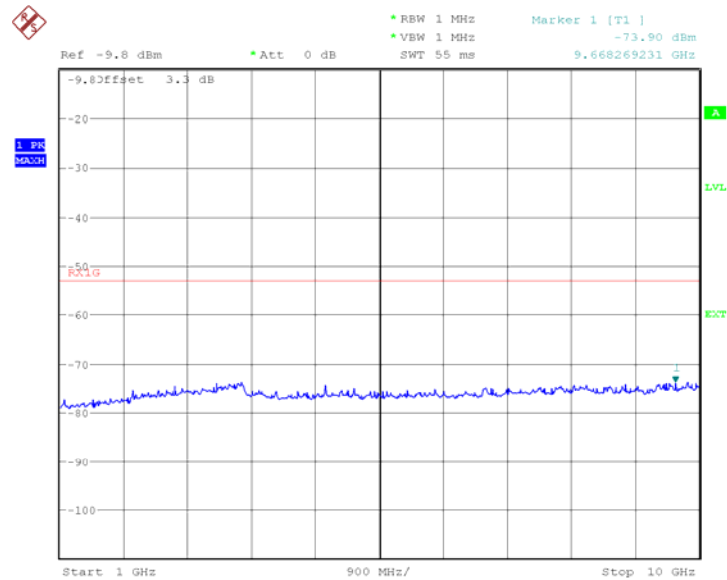
1GHz – 10GHz

TM1



Date: 3.DEC.2008 09:55:59

TM5

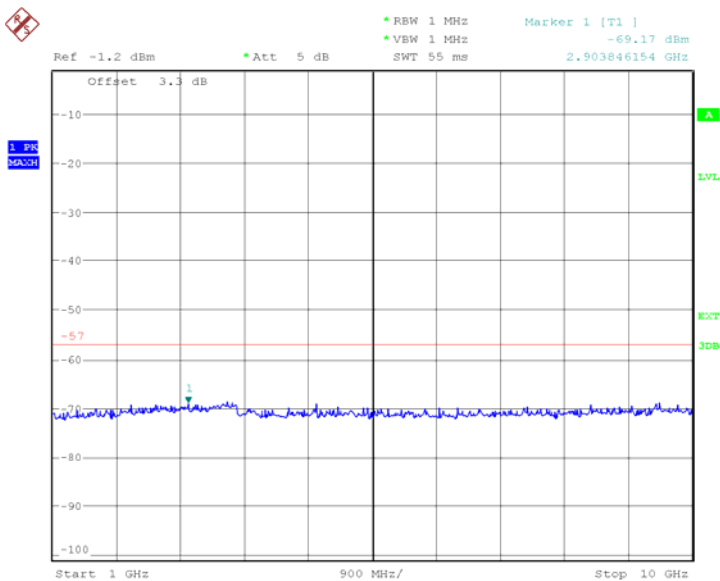


Date: 3.DEC.2008 09:31:53





TM6

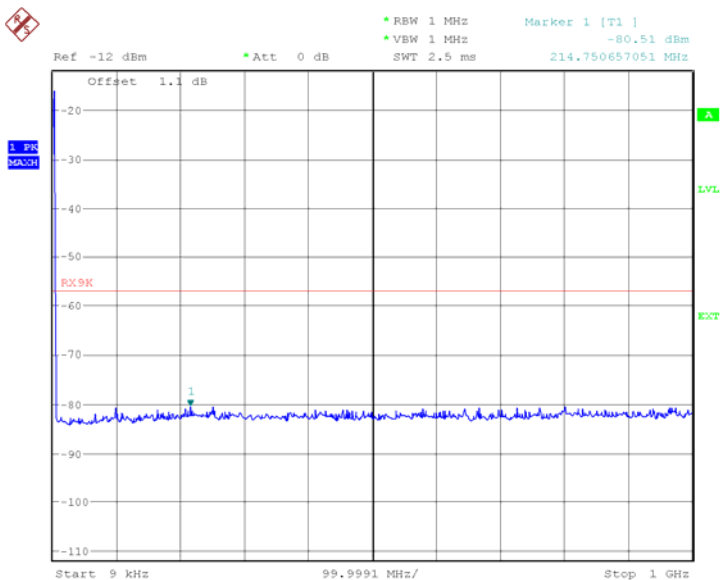


Date: 11.DEC.2008 04:30:09

Configuration 1 - Mode 3

9kHz to 1GHz

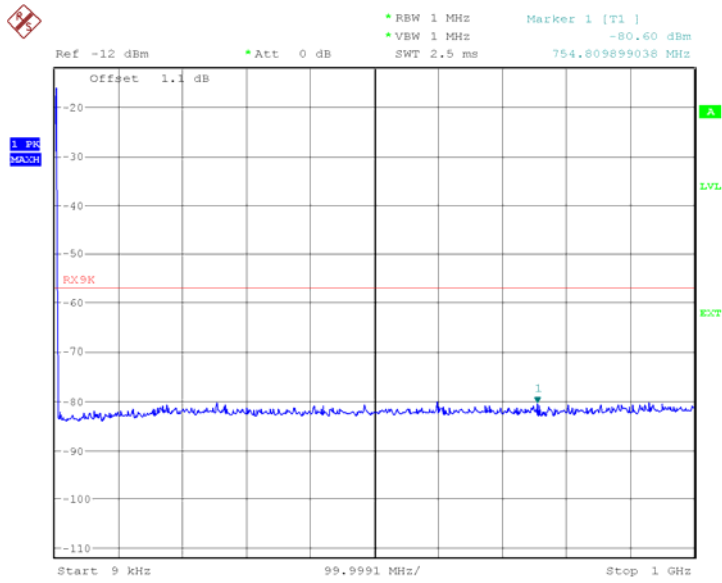
TM1



Date: 3.DEC.2008 09:44:30

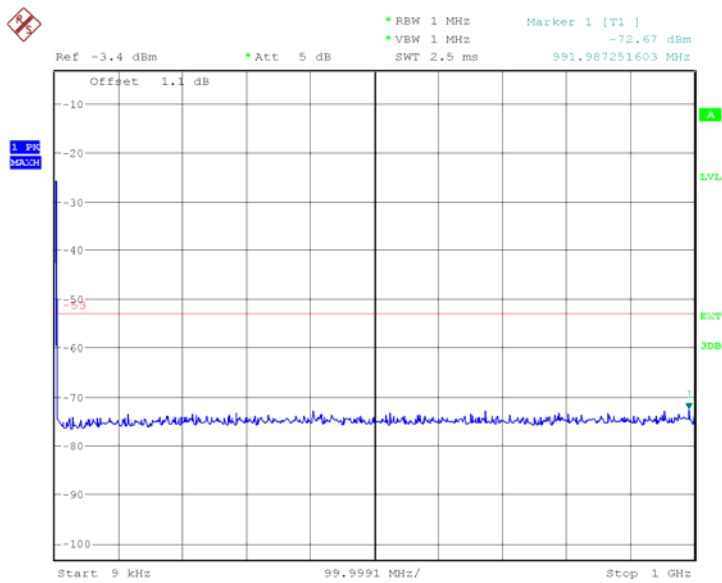


TM5



Date: 3.DEC.2008 09:48:58

TM6

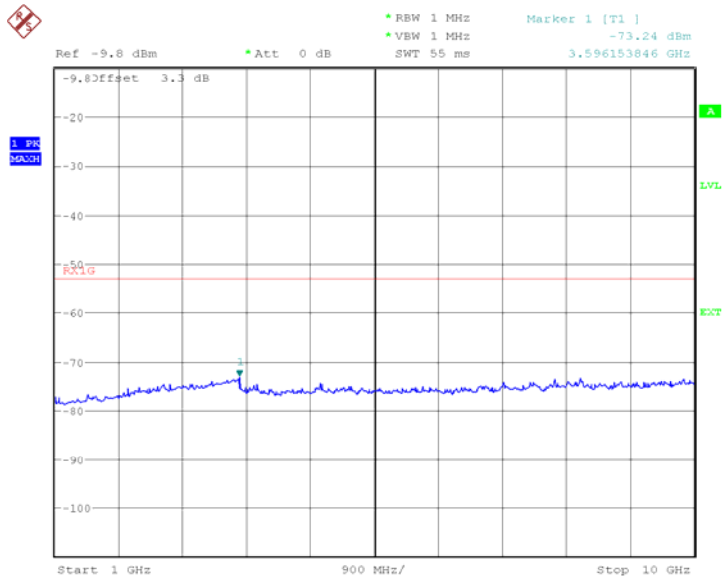


Date: 11.DEC.2008 04:42:38



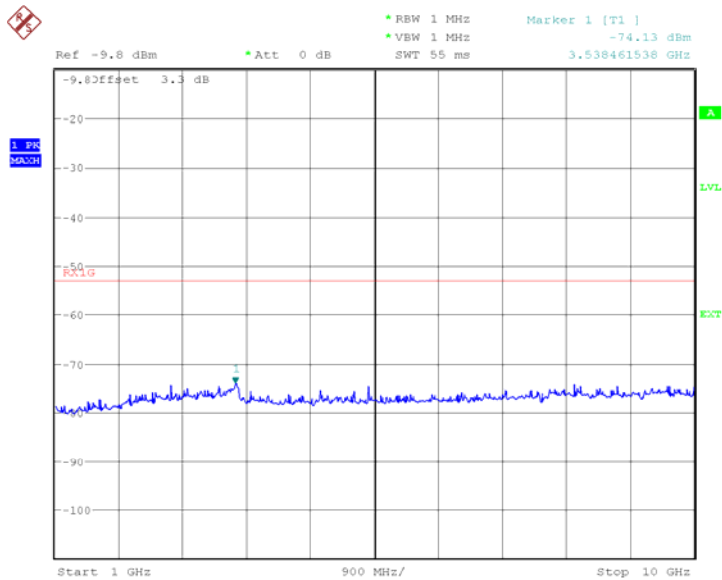
1GHz – 10GHz

TM1



Date: 3.DEC.2008 09:42:46

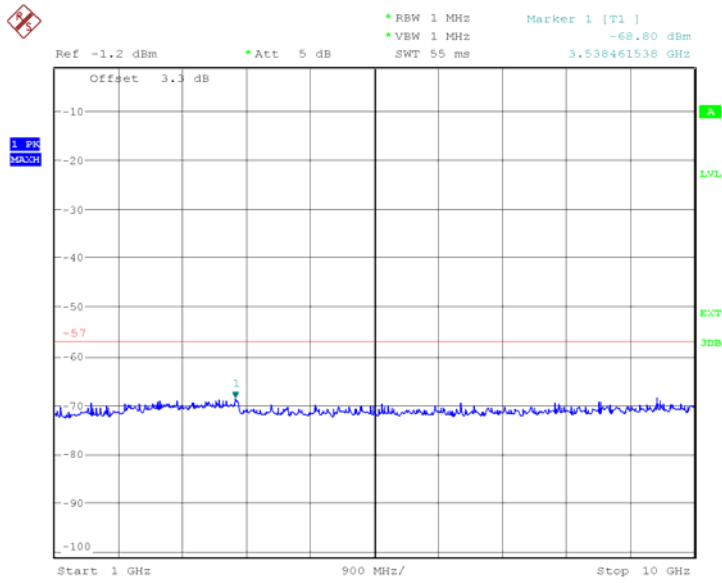
TM5



Date: 3.DEC.2008 09:49:35



TM6



Date: 11.DEC.2008 04:42:00

Limit	-57dBm(30MHz-1GHz) and -53dBm(above 1GHz)
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## 2.9 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

### 2.9.1 Specification Reference

FCC CFR 47 Part 24: 2007, Clause 2.1055, 24.235  
Industry Canada RSS 133:2008 Clause 6.3

### 2.9.2 Equipment Under Test

RRU22 1940 (KRC 161 134/2)

### 2.9.3 Date of Test and Modification State

01 to 02 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 24: 2007 and Industry Canada RSS 133:2008.

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  $10^{\circ}\text{C}$  steps as per 2.1055.

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

Configuration 1 - Mode 2

### 2.9.6 Environmental Conditions

	01 December 2008	02 December 2008
Ambient Temperature	24.1°C	22.4°C
Relative Humidity	22.4%	23.2%

### 2.9.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24: 2007 and Industry Canada RSS 133:2008 for Frequency Stability Under Temperature Variations.

The test results are shown below.

#### Configuration 1 - Mode 2

##### TM1

Temperature Interval (°C)	Deviation (Hz)
-30	22.81
-20	-21.39
-10	-23.93
0	26.12
+10	24.04
+20	23.14
+30	-33.20
+40	-15.41
+50	-21.33

##### TM5

Temperature Interval (°C)	Deviation (Hz)
-30	-20.25
-20	24.51
-10	-20.67
0	-29.00
+10	31.30
+20	31.36
+30	28.26
+40	25.24
+50	28.16

TM6

Temperature Interval (°C)	Deviation (Hz)
-30	-20.64
-20	-17.91
-10	-15.02
0	-21.84
+10	14.98
+20	17.96
+30	-15.10
+40	-17.05
+50	23.63

Limit	$\pm 1.0$ ppm or $\pm 1.9576$ kHz
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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 24: 2007, Clause 2.1055, 24.235  
Industry Canada RSS 133:2008 Clause 6.3

### **2.10.2 Equipment Under Test**

RRU22 1940 (KRC 161 134/2)

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

02 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 24: 2007 and Industry Canada RSS 133:2008.

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:

Configuration 1 - Mode 2

### **2.10.6 Environmental Conditions**

02 December 2008

Ambient Temperature 22.4°C

Relative Humidity 23.2%



### 2.10.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24: 2007 and Industry Canada RSS 133:2008 for Frequency Stability Under Voltage Variations.

The test results are shown below.

#### Configuration 1 - Mode 2

20°C

#### TM1

DC Voltage (V)	Deviation (Hz)
40.8	-24.62
48.0	23.14
55.2	-27.80

#### TM5

DC Voltage (V)	Deviation (Hz)
40.8	24.60
48.0	31.16
55.2	-24.02

#### TM6

DC Voltage (V)	Deviation (Hz)
40.8	33,39
48.0	17.96
55.2	-20.94

Limit	±1.0 ppm or ±1.9576 kHz
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**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
Digital Multimeter	FLUKE	179	91820401	2009/12/18
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×16.88m×9.60m	-	2010/09/23
Digital Multimeter	FLUKE	179	91820401	2009/12/18
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	2009/12/18
Thermo-hygrometer	AZ Instruments	8705	9151655	2009/12/16

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

### 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 20GHz Amplitude	2.6dB
Worst case error for both Time and Frequency measurement 12 parts in 106.		

\* In accordance with CISPR 16-4



**SECTION 4**

**ACCREDITATION, DISCLAIMERS AND COPYRIGHT**

**4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



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Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

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