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# Report On

FCC CFR 47 Part 24 and Industry Canada RSS 133 Testing of the Ericsson (China) Communications Company Ltd RRUN19-22 / KRC 161 170/5

COMMERCIAL-IN-CONFIDENCE

FCC ID: WODFKRC161170-5 IC: 287AH-FG1611705

Document 75905184 Report 01 Issue 1

December 2008



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COMMERCIAL-IN-CONFIDENCE

**REPORT ON** 

FCC CFR 47 Part 24 and Industry Canada RSS 133 Testing of the Ericsson (China) Communications Company Ltd RRUN19-22 / KRC 161 170/5

Document 75905184 Report 01 Issue 1

December 2008

PREPARED FOR

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Authorised Signatory

DATED

04 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 24 and Industry Canada RSS 133. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

Zhano





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# **SECTION 1**

# **REPORT SUMMARY**

# FCC CFR 47 Part 24 and Industry Canada RSS 133 Testing of the Ericsson (China) Communications Company Ltd RRUN19-22 / KRC 161 170/5



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson (China) Communications Company Ltd RRUN19-22 / KRC 161 170/5 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 in the name of Ericsson (China) Communications Company Ltd RRUN19-22 / KRC 161 170/5.

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)	RRUN19-22
Serial Number(s)	CB 47968839
Software Version	-
Hardware Version	R1B
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 October 2008
Order Number Date	4502682309 26 November 2008
Start of Test	24 November 2008
Finish of Test	02 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.

Configura	tion 1 - Base Statio	on							
Section	Spec Clause								
	FCC Part 24	Industry Canada RSS 133	Test Description	Mode	Mod State	Result	Comments		
				1930.2 MHz	0	N/A			
	24.232(a)	6.4	Effective Isotropically Radiated Power	1960 MHz	0	N/A	No integral antenna.		
				1989.8 MHz	0	N/A			
				1930.2 MHz	0	Pass			
.1	24.232 (a)	6.4	Maximum Peak Output Power - Conducted	1960 MHz	0	Pass	-		
				1989.8 MHz	0	Pass			
2.2	24.232(d)	-	Peak – Average Ratio	1960 MHz	0	Pass			
2.3	2.1047 (d)		Modulation Characteristics	1960 MHz	0	Pass	-		
						1930.2 MHz	0	Pass	
	2.1049,	1049, 4.238(b)         2.3         Occupied Bandwidth	Occupied Bandwidth	1960 MHz	0	Pass	-		
2.4 24.	24.238(D)		1989.8 MHz	0	Pass	1			
	0.4054			1930.2 MHz	0	Pass	-		
	2.1051,	6.5	Spurious Emissions at Antenna Terminals (±1MHz)	1960 MHz		N/A			
2.5	24.238(b)			1989.8 MHz	0	Pass			
	0.4050			0	Pass				
	2.1053,	6.5	Radiated Spurious Emissions	1960 MHz	0	Pass	-		
2.6	24.238(a)			1989.8 MHz	0	Pass			
	a=			1930.2 MHz	0	Pass			
. 7	2.1051,	6.5	Conducted Spurious Emissions	1960 MHz	0	Pass	-		
2.7	24.238(a)			1989.8 MHz	0	Pass			
				1930.2 MHz	0	Pass			
2.8	-	6.6	Receiver Spurious Emissions	1960 MHz	0	Pass			
				1989.8 MHz	0	Pass			
				1930.2 MHz		N/A			
2.9 2.1055, 2	2.1055, 24.235	6.3	Frequency Stability Under Temperature Variations	1960 MHz	0	Pass	-		
	,			1989.8 MHz		N/A			
				1930.2 MHz		N/A			
.10	2.1055, 24.235	6.3	Frequency Stability Under Voltage Variations	1960 MHz	0	Pass	-		
2.1000, 24.200				1989.8 MHz	-	N/A	-		

N/A – Not Applicable



# 1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Equipment
MANUFACTURER	Ericsson
ТҮРЕ	RRUN19-22
PART NUMBER	KRC 161 170/5
SERIAL NUMBER	CB 47968839
HARDWARE VERSION	R1B
SOFTWARE VERSION	
TRANSMITTER OPERATING RANGE	1930.2MHz - 1989.8MHz
RECEIVER OPERATING RANGE	1850.2MHz – 1909.8MHz
COUNTRY OF ORIGIN	P. R. China
INTERMEDIATE FREQUENCIES	
ITU DESIGNATION OF EMISSION	250KGXW 250KG7W
HIGHEST INTERNALLY GENERATED FREQUENCY	1989.8MHz
OUTPUT POWER (W or dBm)	43dBm(GMSK), 39.7dBm(8PSK)
FCC ID	WODFKRC161170-5
IC ID	287AH-FG1611705
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	RRUN19-22 is the radio part of a GSM Radio Base Station

## Signature

Date D of B S Serial No Jiang Xiaoying 07 November 2008 75905184/01

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) was an Ericsson (China) Communications Company Ltd RRUN19-22 / KRC 161 170/5 working in the public mobile service 1900MHz band which provides communication connections to GSM1900 network. The RRUN19-22 / KRC 161 170/5 operates from a -48V DC volt supply.

The Equipment Under Test (EUT) 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: Radio Equipment

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

The RRUN19-22 / KRC 161 170/5 supports both GMSK and 8PSK modulation at 1900MHz, the cabinet can house two TRX's. Testing was performed on one TRX RF output connector. The complete testing was performed with both modulation schemes at maximum RF power unless otherwise stated. The EUT was powered by a -48V DC Power supply.

## 1.4.3 Modes of Operation

Modes of operation of each EUT during testing were as follows:

Mode 1 - 1930.2 MHz (Bottom Channel)

Mode 2 - 1960 MHz (Middle Channel)

Mode 3 - 1989.8 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.

The EUT was powered from a -48 V DC supply.

## 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	CB47968839

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 2.5 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 CFR 47 Part 24 and Industry Canada RSS 133 Testing of the Ericsson (China) Communications Company Ltd RRUN19-22 / KRC 161 170/5



## 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

RRUN19-22 / KRC 161 170/5

## 2.1.3 Date of Test and Modification State

24 November 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 and attenuator(s), the output power of the EUT was measured at the antenna terminals. The EUT supports GMSK and 8PSK modulation schemes. The carrier power was measured with both modulations and all of the timeslots working.

The spectrum analyzer RBW and VBW were set to 1MHz and the path loss measured and entered as a reference level offset.

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

Configuration 1 - Mode 1 - Mode 2 - Mode 3

## 2.1.6 Environmental Conditions

24 November 2008

Ambient Temperature	21.4°C	
Relative Humidity	28.3%	



## 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)
GMSK	1930.2	41.65	43.44	22.080
8PSK	1930.2	41.65	43.39	21.827

Configuration 1 - Mode 2

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
GMSK	1960	41.65	43.29	21.330
8PSK	1960	41.65	43.28	21.281

## Configuration 1 - Mode 3

	Frequency (MHz)	Path Loss (dB)	Result (dBm)	Result (W)
GMSK	1989.8	41.65	43.02	20.045
8PSK	1989.8	41.65	43.03	20.091

Limit	≤100W or <+50dBm

<u>Remarks</u>

The EUT does not exceed 100W or +50dBm at the measured frequencies.



## 2.2 PEAK – AVERAGE RATIO

## 2.2.1 Specification Reference

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

## 2.2.2 Equipment Under Test

RRUN19-22 / KRC 161 170/5

## 2.2.3 Date of Test and Modification State

02 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 measurment is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determined 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 measurment bandwidth was set to 1MHz and the path loss measured and entered as a reference level offset.

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

Configuration 1 - Mode 2

#### 2.2.6 Environmental Conditions

02 December 2008

Ambient Temperature	24.2°C
Relative Humidity	22.4%



## 2.2.7 Test Results

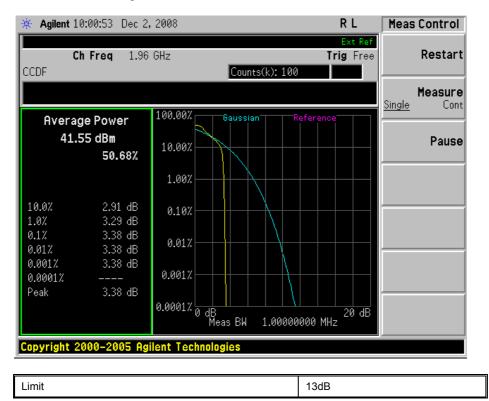
For the period of test the EUT met the requirements of FCC CFR 47 Part 24: 2007 Peak – Average Ratio.

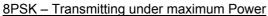
The test results are shown below.

GMSK – Transmitting under maximum Power

🔆 Agilent 09:56:54 Dec 2,	2008		R	Meas Control
Ch Freq 1.96 CCDF		ounts(k):100	Ext Ref Trig Free	Restart
				Measure Single Cont
Average Power	100.00% Gaus	sian Refere	nce	<u>omgio</u> cont
44.51 dBm 94.23%	10.00%			Pause
	1.00%	$\mathbb{A} \mapsto$		
10.0% 0.34 dB 1.0% 0.40 dB	0.10%			
0.1% 0.41 dB 0.01% 0.41 dB	0.01%	+		
0.001% 0.41 dB 0.0001%	0.001%			
	0.0001% dB Meas B	W 1.00000000	20 dB MHz	
Copyright 2000–2005 Agi				







## **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

RRUN19-22 / KRC 161 170/5

## 2.3.3 Date of Test and Modification State

26 November 2008 – Modification State 0

#### 2.3.4 Modulation Description

The modulation scheme used in GSM is called Gaussian Minimum Shift Keying (GMSK). GMSK facilitates the use of narrow bandwidth and allows for both coherent and non coherent detection capabilities. It is a scheme in which the transitions from One to Zero or Zero to One do not occur quickly, but over a period of time. If pulses are transmitted quickly harmonics are transmitted. The power spectrum for a square wave is rich in harmonics, and the power within the side lobes is wasted, and can be a cause of potential interference.

A method to reduce the harmonics is to round off the edges of the pulses thus lowering the spectral components of the signal. In GSM this is done by using a Gaussian pre-filter which typically has a bandwidth of 81.25kHz. The output from the Gaussian filter then phase modulates the carrier. As there are no dramatic phase transitions of the carrier this gives a constant envelope and low spectral component output from the transmitter.

The spectral efficiency is calculated by

bit rate / Channel bandwidth = 270.83333 kbit/s / 200 kHz = 1.354 bit/s/Hz.

The bandwidth product BT = Bandwidth x bit duration = 81.25 kHz x 3.6923 micros = 0.3

GMSK and 8PSK overview.

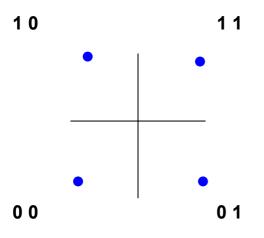
The modulation schemes used for the EUT are GMSK and 8PSK. The 8PSK modulation scheme is EDGE (Enhanced Date Rates for GSM Evolution).

A brief overview of how GMSK and 8PSK works is shown below.



## GMSK (Gaussian Minimum Shift Keying)

The fundamental principal behind GMSK is Phase shift keying. This splits a data stream into a series of 2digit phase shifts, using the following phase shifts to represent data pairs.



Therefore for the BIT sequence 0 0 1 1 1 0 0 1 The corresponding phase shift will be used

BIT SEQUENCE	00	11	10	01
PHASE	225°	45°	135°	315°

This is called QPSK (Quadratic Phase Shift Keying)

#### <u>However</u>

There is a problem with QPSK: transition from e.g. 00 to 11 gives phase shift of  $180^{\circ}$  ( $\pi$  radians). This has the effect of inverting the carrier waveform and this can lead to detection errors at the receiver.

Solution: restrict phase changes to ± 90°

1. Split bitstream into 2 streams e.g.

	0	0	1	1	0	1	1	0
I Stream	0		1		0		1	
Q stream		0		1		1		0

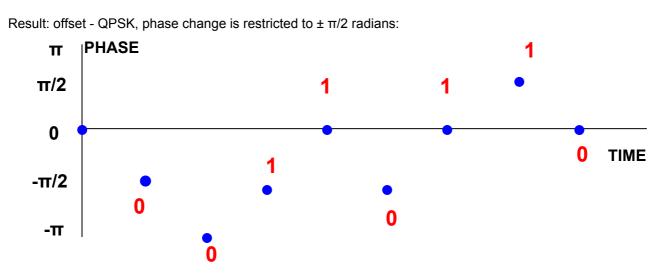
2. Modulate each stream with PSK (1 = 90° or  $\pi/2$ , 0 = -90° or -  $\pi/2$  phase shift)

I Stream	0		1		0		1	
	-π/2		-π/2		-π/2		π/2	
Q stream		0		1		1		0
		-π/2		π/2		π/2		-π/2



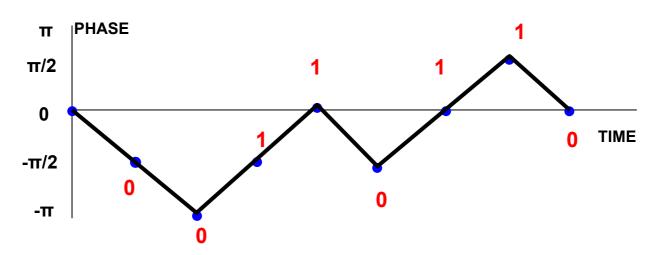
3. Combine (add) the two PSK signals:

Combined Phase	-π/2	-π	-π/2	0	-π/2	0	π/2	0



It would be preferable to have "gradual" changes in place between each pair of bits (Continuous-phase modulation). Replacing each "rectangular" shaped pulse (for 1 or 0) with a sinusoidal pulse can do this:

Result: Minimum Shift Keying (MSK):





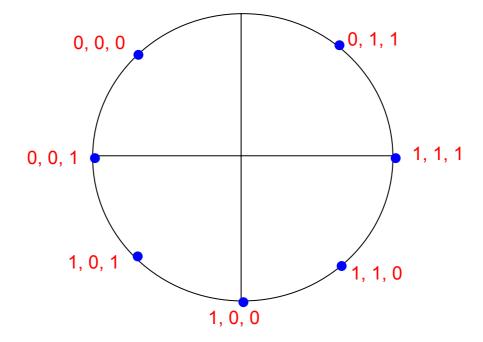
## Gaussian Minimum Shift Keying

MSK has high sidebands relative to the main lobes in the frequency domain - this can lead to interference with adjacent signals.

If the rectangular pulses corresponding to the bitstream are filtering using a Gaussian-shaped impulse response filter, we get Gaussian MSK (GMSK) - this has low sidelobes compared to MSK.

## 8-SK (8-Phase Shift Keying)

8PSK uses the same basic principle of phase shift modulation. The only difference being the increased number of vectors.



## 2.3.5 Test Method and Operating Modes

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

Using a spectrum analyzer and attenuator(s). The EUT supports GMSK and 8PSK modulation schemes. The EUT was transmitting with both modulations with the timeslots active as shown, the plots were captured in the time domain.

The spectrum analyzer RBW and VBW were set to 100/300kHz and the path loss measured and entered as a reference level offset.

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

Configuration 1 - Mode 2



## 2.3.6 Environmental Conditions

	26 November 2008
Ambient Temperature	21.4°C
Relative Humidity	28.3%

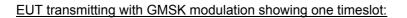
## 2.3.7 Test Result

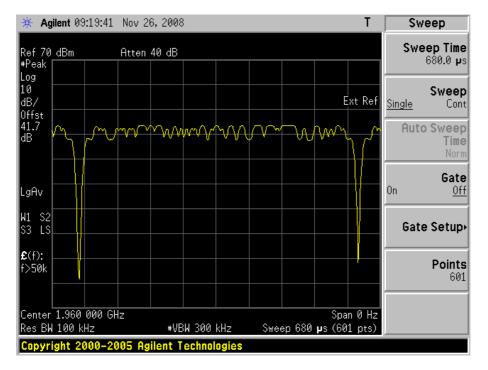
Four plots are shown on the following pages showing the EUT transmitting with the display in the time domain:

EUT transmitting with GMSK modulation showing all timeslots:

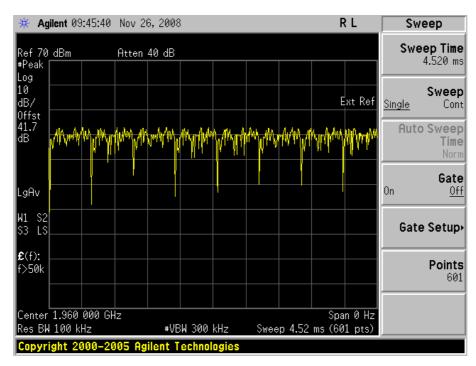
🔆 Agilent 09:14:12	Nov 26, 2008		Т	Sweep
Ref 70 dBm #Peak	Atten 40 dB		*	Sweep Time 4.520 ms
Log 10 dB/ Offst			Ext Ref	Sweep Single Cont
	Marth harmonth Ward	Yan mark ya kana maki ya ka	ur seer the harments	Auto Sweep Time Norm
LgAv				On <u>Off</u>
W1 S2 S3 LS				Gate Setup•
£(f): f>50k				Points 601
Center 1.960 000 G Res BW 100 kHz	Hz #VBW 300	kHz Sweep 4.52	Span 0 Hz ms (601 pts)	
	005 Agilent Technol			,





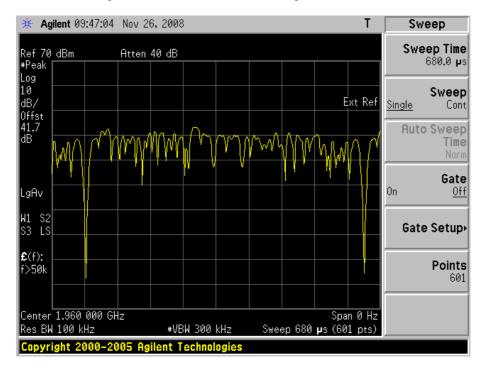


EUT transmitting with 8PSK modulation showing all timeslots:





EUT transmitting with 8PSK modulation showing one timeslot:





## 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

RRUN19-22 / KRC 161 170/5

## 2.4.3 Date of Test and Modification State

24 November 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, modulated with all timeslots active. Using a resolution bandwidth of 10 kHz and a video bandwidth of 100 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 –26dBc 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

24 November 2008

Ambient Temperature	21.4°C
Relative Humidity	28.3%



## 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 (kHz)
GMSK	1930.2	224.0820
8PSK	1930.2	221.3486

Configuration 1 - Mode 2

	Frequency (MHz)	99% Power bandwidth (kHz)
GMSK	1960	231.2873
8PSK	1960	214.8757

Configuration 1 - Mode 3

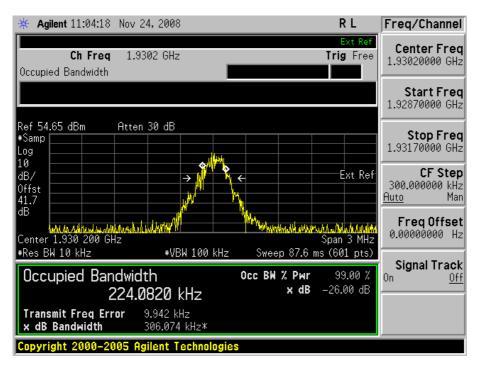
	Frequency (MHz)	99% Power bandwidth (kHz)
GMSK	1989.8	231.4503
8PSK	1989.8	234.8098



The plots of test results are shown below.

Configuration 1 - Mode 1

## **GMSK - Maximum Power**



#### 8PSK - Maximum Power

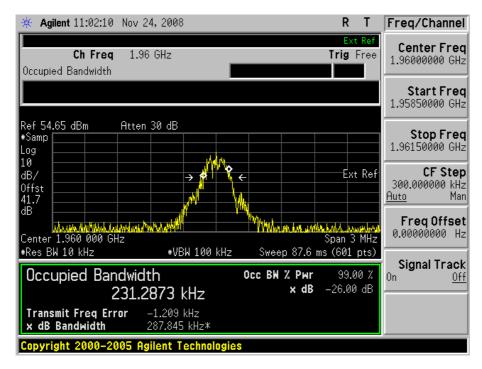
🔆 Agilent 11:03:46	Nov 24, 2008		RL	Freq/Channel
<b>Ch Freq</b> Occupied Bandwidth	1.9302 GHz		Ext Ref Trig Free	<b>Center Freq</b> 1.93020000 GHz
	a aa 15			<b>Start Freq</b> 1.92870000 GHz
Ref 54.65 dBm #Samp Log 10	Atten 30 dB			<b>Stop Freq</b> 1.93170000 GHz
dB/ Offst 41.7	→ 		Ext Ref	<b>CF Step</b> 300.000000 kHz <u>Auto</u> Man
dB <u> </u>	Iz		Span 3 MHz	FreqOffset 0.00000000 Hz
*Res BW 10 kHz		Occ BW % Pr		On <u>Off</u>
Transmit Freq Err × dB Bandwidth	or 4.545 kHz 278.921 kH	<mark>-</mark> ∠≭		
Copyright 2000-20	105 Agilent Tec	hnologies		

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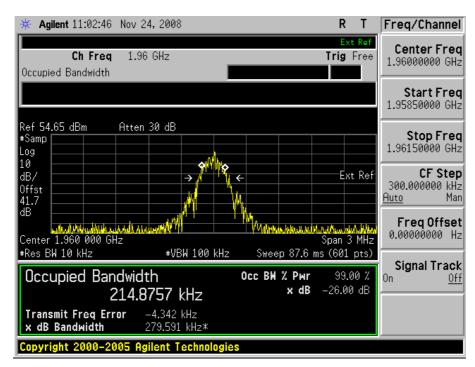


## Configuration 1 - Mode 2

## **GMSK - Maximum Power**



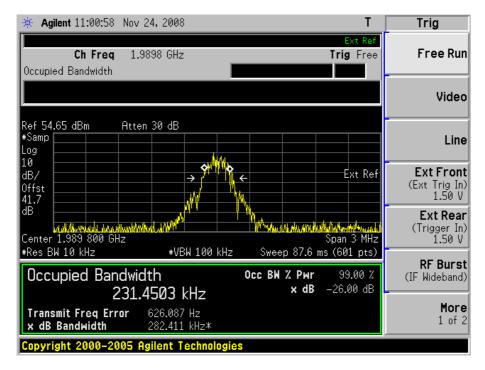
#### 8PSK - Maximum Power





## Configuration 1 - Mode 3

## **GMSK - Maximum Power**



## 8PSK - Maximum Power

🔆 Agilent 10:58:41 Nov 24, 2008	R L	Measure
<b>Ch Freq</b> 1.9898 GHz Occupied Bandwidth	Ext Ref Trig Free	Meas Off
		Channel Power
Ref 54.65 dBm Atten 30 dB #Samp Log 10	No.	Occupied BW
dB/ Offst 41.7 →	Ľ <mark>M ← E</mark> xt Ref	ACP
dB <u> </u>	Span 3 MHz KHz Sweep 9.76 ms (601 pts)	Multi Carrier Power
Occupied Bandwidth 234.8098 kHz	Осс ВЖ % Рыг 99.00 % х dB -26.00 dB	Power Stat CCDF
Transmit Freq Error3.560 kHz× dB Bandwidth283.159 kHz*		<b>More</b> 1 of 2
Copyright 2000–2005 Agilent Technology	igles	



## 2.5 SPURIOUS EMISSIONS AT TERMINALS (±1MHz)

## 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

RRUN19-22 / KRC 161 170/5

## 2.5.3 Date of Test and Modification State

24 November 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.

In accordance with 24.238(b), at least 1% of the 26dB bandwith was used for the resolution and video bandwidths up to 1 MHz away from the block edge. At greater than 1MHz the resolution and video bandwidths were increased to 1 MHz.

The reference power and path losses of all channels used for testing in each frequency block were measured. It was found that there was <0.5dB variation in all channels, thus the worst case reference level offset was used throughout. Having entered the reference level offset, the limit line was displayed, showing the -13dBm, (43+10log (P)), limit.

The EUT was tested at it's maximum power level with all timeslots active.

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

Configuration 1 - Mode 1 - Mode 3

## 2.5.6 Environmental Conditions

24 November 2008

Ambient Temperature	21.4°C
Relative Humidity	28.3%



## 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 (±1MHz)

#### The test results are shown below.

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

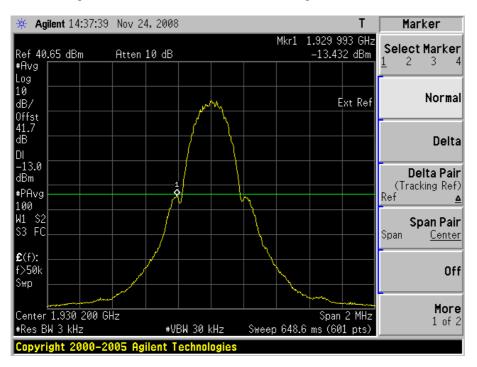
Channel (MHz)	Edge Test with GMSK modulation Channel No./Frequencies	Edge Test with 8PSK modulation Channel No./Frequencies
Bottom 1930.2	Channel: 512 Frequency: 1930MHz P1 Power level	Channel: 512 Frequency : 1930MHz P0 Power level
Top 1989.8	Channel: 810 Frequency : 1990MHz P2 Power level	Channel : 810 Frequency : 1990MHz P0 Power level

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. Channels used outside of those stated and power levels used beyond those stated in the table exceed the specification limits, thus they cannot be used.

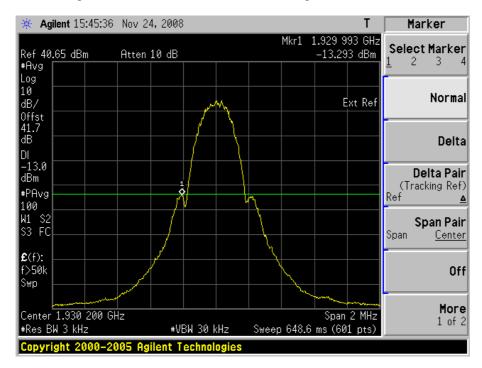
The channels outside of those shown in the table above were not tested at lower power levels to determine a level at which compliance would be achieved. Therefore, to maintain compliance, only the channels shown in the table above shall be used.

#### Configuration 1 - Mode 1

#### GMSK - Edge Measurement with EUT Transmitting on P1 Power Level



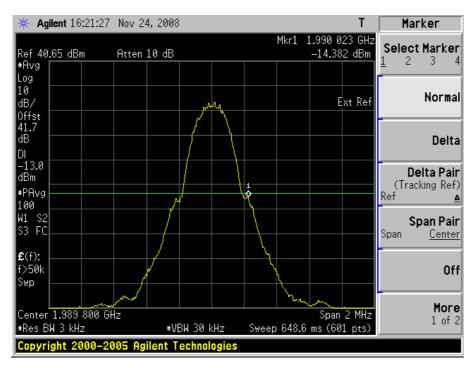




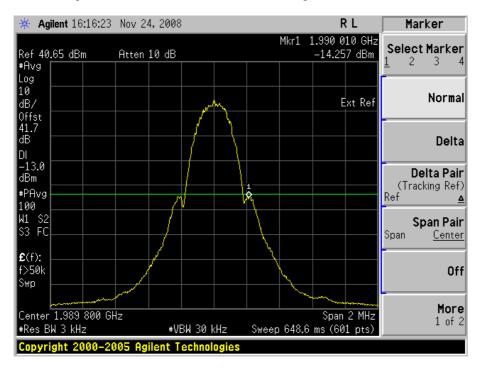
## 8PSK - Edge Measurement with EUT Transmitting on P0 Power Level

## Configuration 1 - Mode 3

GMSK - Edge Measurement with EUT Transmitting on P2 Power Level







## 8PSK - Edge Measurement with EUT Transmitting on P0 Power Level



## 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

RRUN19-22 / KRC 161 170/5

## 2.6.3 Date of Test and Modification State

27 November 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 Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, the list of emissions was then confirmed or updated under Anechoic Chamber (3 metres) conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz - 1GHz were then formally measured using a CISPR Quasi-Peak detector.

Emissions identified within the range 1GHz – 20GHz were then formally measured using Peak and Average Detectors, as appropriate.

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  $dB\mu V/m$  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<sub>i</sub> is the antenna gain of ideal half-wave dipoles,

 $\mathsf{P}_{\mathsf{o}}$  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 x 1.64x 20.045)<sup>0.5</sup>/3 = 10.468V/m = 140.4dBµV/m

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

43 + 10log(20.045) = 56.0dB

Therefore the limit at 3m measurement distance is:

140.4 - 56.0 = 84.4 dBµV/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 in the following configurations and modes of operation:

Configuration 1 - Mode 1 - Mode 2 - Mode 3

## 2.6.6 Environmental Conditions

	27 November 2008
Ambient Temperature	18.2°C
Relative Humidity	23.3%



## 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.

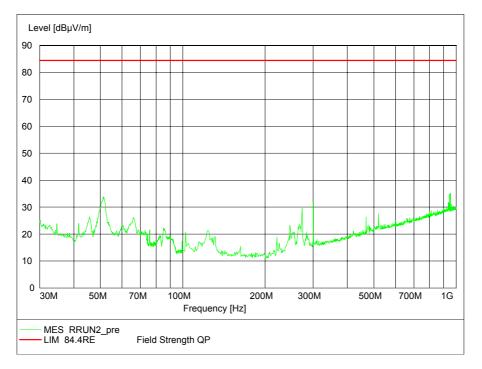
The test results are shown below.

Configuration 1 - Mode 1

No emissions were detected within 10dB of the limit.

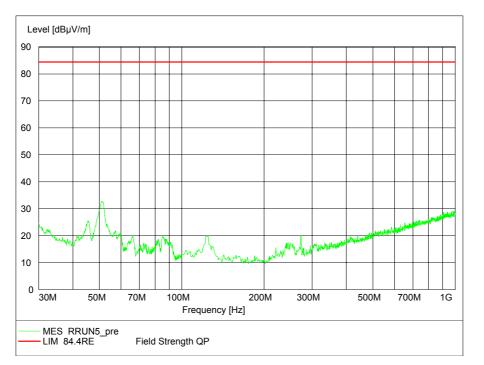
## 30MHz to 1GHz

## <u>GMSK</u>



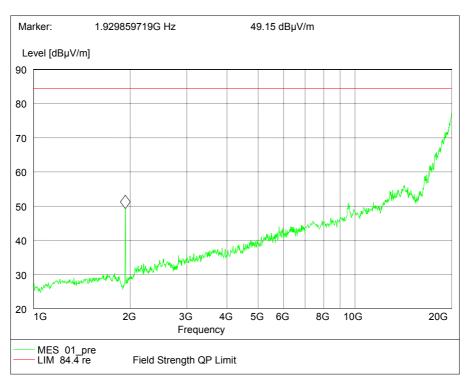






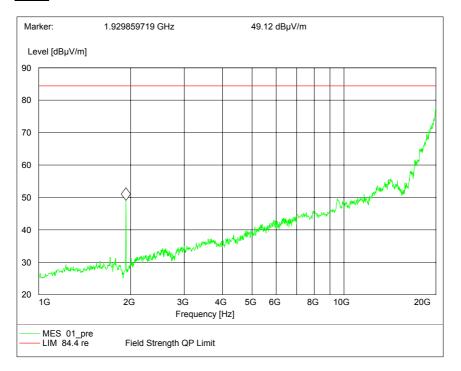
## 1GHz to 20GHz







#### 8PSK

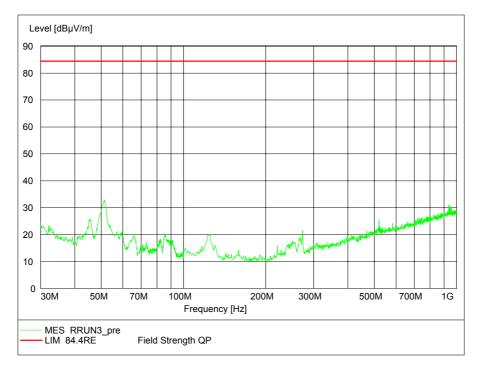


#### Configuration 1 - Mode 2

No emissions were detected within 10dB of the limit.

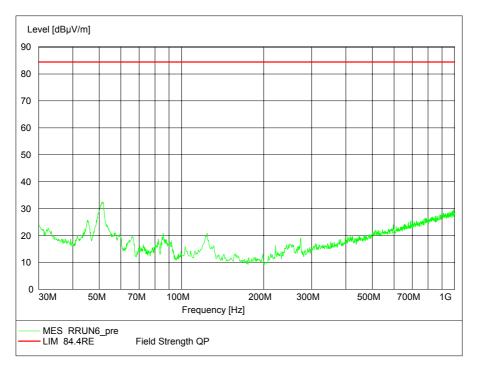
#### 30MHz to 1GHz

#### <u>GMSK</u>



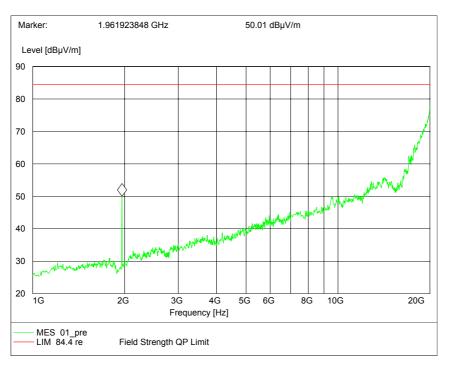






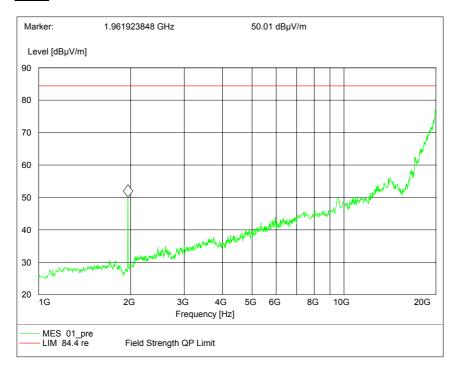
#### 1GHz to 20GHz







#### 8PSK

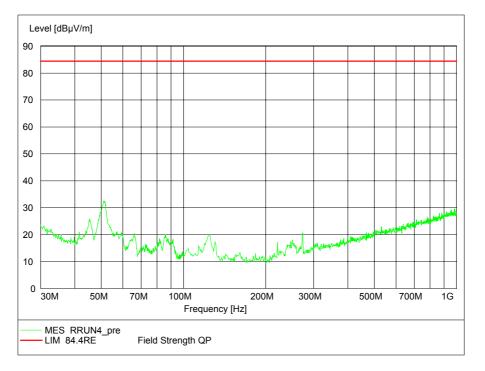


## Configuration 1 - Mode 3

No emissions were detected within 10dB of the limit.

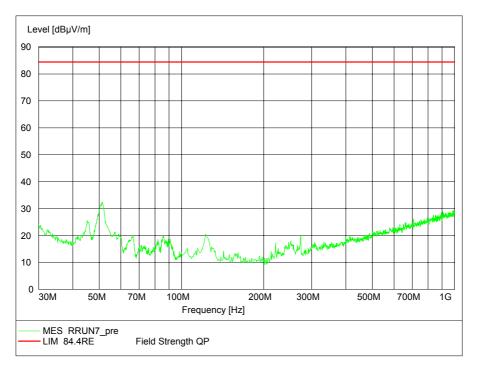
#### 30MHz to 1GHz

#### <u>GMSK</u>



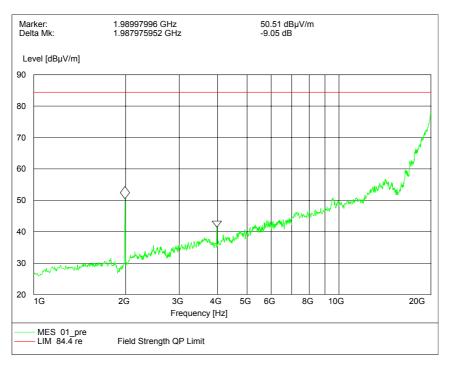






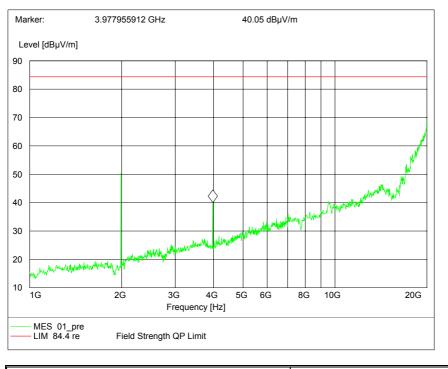
#### 1GHz to 20GHz







# <u>8PSK</u>



Limit

84.4dBµV/m.



## 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

RRUN19-22 / KRC 161 170/5

#### 2.7.3 Date of Test and Modification State

25 November 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 a attenuator and the frequency spectrum investigated from 9kHz to 20GHz. The EUT was set to transmit on full power. The EUT was tested on Bottom, Middle and Top channels for both power levels. The resolution 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 Max Hold. The limit line was displayed, showing the –13dBm, (43+10log (P)), limit.

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

## 2.7.6 Environmental Conditions

	25 November 2008
Ambient Temperature	21.4°C
Relative Humidity	23.8%



## 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

**GMSK - Maximum Power** 

Marker	Т				;	5,2008	Nov 2	10:15:19	Agilent
Select Marker	. 7.117 GHz -18.67 dBm	Mk				12 dB	#Atten	lBm	ef 43.52 · Peak 🔽
- Normal	Ext Ref								og 0 B/
Delta									ffst 7.5 B
<b>Delta Pair</b> (Tracking Ref)									l 13.0 Bm
Ref <u>▲</u> Span Pair Span <u>Center</u>	wangpong anton marked	1	nner M	monte	n-to-karalerited	phononina,	white all all all all all all all all all al	, not my and these	PAvg 11 S2 3 FC
- Off									:(f): Tun
	) )pan 10 GHz s (601 pts)	16.68	Swee	IHz	BW 1 M	#V			enter 5.0 Res BW 1
				ogies	echnol	ilent T	005 Ag	2000-2	opyright

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



🔆 Agilent 10:16:35	Nov 25, 2008			Т	Marker
Ref 43.52 dBm #Peak	#Atten 12 dB		Mkr	1 7.050 GHz -18.78 dBm	Select Marker 1 2 3 4
Log 10 dB/				Ext Ref	Normal
Offst 47.5 dB					Delta
DI -13.0 dBm #PAvg					<b>Delta Pair</b> (Tracking Ref) Ref <b>△</b>
M1 S2 S3 FC magna databand	www.wagdawalana.anganalanaka	val-mengelagetara	1 www.hushahayhayhayhayhayhayhayhayhayhayhayhayha	MAHMMANAMANA	Span Pair Span <u>Center</u>
£(f): FTun Swp					Off
Center 5.000 GHz #Res BW 1 MHz	#VBI	W 1 MHz S		Span 10 GHz ns (601 pts)	More 1 of 2
Copyright 2000-20					

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

## 10GHz to 20GHz

#### **GMSK - Maximum Power**

🔆 Agilent 10:19:07	Nov 25, 2008		RL	Marker
Ref 45.6 dBm #Peak	#Atten 6 dB		Mkr1 13.23 GHz -20.46 dBm	Select Marker <u>1</u> 234
Log 10 dB/			Ext Ref	Normal
Offst 49.6 dB				- Delta
DI -13.0 dBm				 Delta Pair
#PAvg	1			(Tracking Ref) Ref <u>▲</u>
S3 FC		where the second se	with the second second particular of the first of the first of the second second second second second second se	<b>Span Pair</b> Span <u>Center</u>
€(f): FTun Swp				Off
Start 10.00 GHz			Stop 20.00 GHz	- More 1 of 2
#Res BW 1 MHz Copyright 2000-20			əep 25 ms (601 pts)	

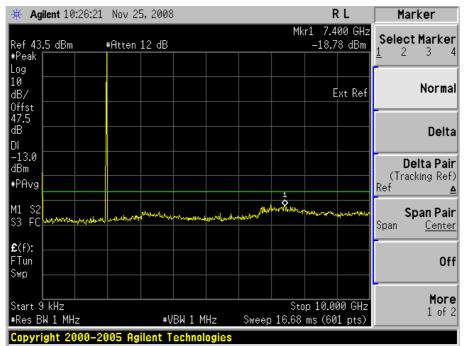


🔆 Agilent 10:18:23	Nov 25, 2008			Т	Marker
Ref 45.6 dBm	#Atten 6 dB			1 13.65 GHz -19.51 dBm	Select Marker
#Peak Log 10					Normal
dB/ Offst 49.6				Ext Ref	
dB DI -13.0					Delta
dBm #PAvg					<b>Delta Pair</b> (Tracking Ref) Ref <u>▲</u>
M1 S2 S3 FC	and the state of t	Ammunika	Manhandra	16yn mar an	<b>Span Pair</b> Span <u>Center</u>
£(f): FTun Swp					Off
Start 10.00 GHz #Res BW 1 MHz	#V	BW 1 MHz		p 20.00 GHz ns (601 pts)	More 1 of 2
Copyright 2000–2005 Agilent Technologies					

#### Configuration 1 - Mode 2

9kHz to 10GHz

#### **GMSK - Maximum Power**



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



🔆 Agilent 10:24:56 No	ov 25, 2008	Т	Marker
Ref 43.5 dBm #At #Peak	ten 12 dB	Mkr1 6.700 GHz -18.54 dBm	Select Marker 1 2 3 4
Log 10 dB/		Ext Ref	Normal
Offst 47.5 dB DI			_ Delta
-13.0 dBm #PAvg		1	<b>Delta Pair</b> (Tracking Ref) Ref ▲
M1 S2 S3 FC	and the state of the	white have a second where where the	<b>Span Pair</b> Span <u>Center</u>
£(f): FTun Swp			Off
Start 9 kHz #Res BW 1 MHz	#VBW 1 MHz	Stop 10.000 GHz Sweep 16.68 ms (601 pts)	More 1 of 2
Copyright 2000-2005	Agilent Technologies		

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

## 10GHz to 20GHz

#### **GMSK - Maximum Power**

🔆 Agilent 10:20:45	Nov 25, 2008			Т	Marker
Ref 45.6 dBm #Peak	#Atten 6 dB			13.62 GHz -20.17 dBm	Select Marker
Log 10				For Def	- Normal
dB/ Offst 49.6				Ext Ref	
dB DI -13.0					Delta
dBm #PAvg					Delta Pair (Tracking Ref) Ref
M1 S2 S3 FC	And the	nahanin yan kafan saya ya ang ya	and the second poly and and	herry for the party of the second	<b>Span Pair</b> Span <u>Center</u>
€(f): FTun Swp					Off
Start 10.00 GHz #Res BW 1 MHz	#V	BW 1 MHz	Stop Sweep 25 m	o 20.00 GHz s (601 pts)	More 1 of 2
Copyright 2000-20	005 Agilent T	echnologies			

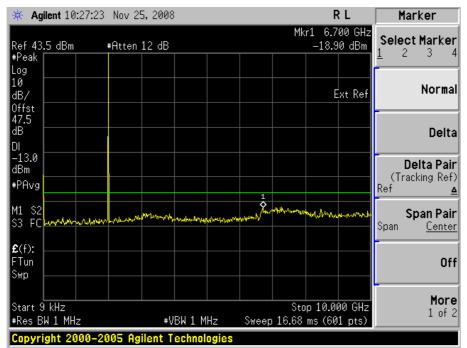


🔆 Agilent 10:23:00	Nov 25, 2008			RL	Marker
Ref 45.6 dBm	#Atten 6 dB		Mk	r1 17.23 GHz -21.01 dBm	Select Marker
#Peak Log					±
10 dB/				Ext Ref	Normal
0ffst 49.6 dB					- Delta
DI -13.0					
dBm					<b>Delta Pair</b> (Tracking Ref)
#PAvg					Ref 🛕
M1 S2 S3 FC Handhumlan/Manuel	Marilymour day of your	an halanna harala harana	Manun Manny	han marken far marken marken marken far som	<b>Span Pair</b> Span <u>Center</u>
£(f): FTun Swp					- Off
Center 15.00 GHz				Span 10 GHz	More 1 of 2
#Res BW 1 MHz Copyright 2000-20		3W 1 MHz e <b>chnologies</b>	Sweep 25	ms (601 pts)	

#### Configuration 1 - Mode 3

9kHz to 10GHz

#### **GMSK - Maximum Power**



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



🔆 Agilent 10:28:06	Nov 25, 2008	}		RL	Marker
Ref 43.5 dBm *	#Atten 12 dB		Mk	r1 7.433 GHz -19.00 dBm	Select Marker
Log 10					- Normal
dB/ Offst 47.5				Ext Ref	
dB DI					Delta
-13.0 dBm #PAvg					<b>Delta Pair</b> (Tracking Ref) Ref ▲
M1 S2 S3 FC	works-Marine	manter	An and a strand the state of th	him and a starting the start of	Span Pair Span <u>Center</u>
£(f): FTun Swp					Off
Start 9 kHz #Res BW 1 MHz	#\	BW 1 MHz		p 10.000 GHz ms (601 pts)	More 1 of 2
Copyright 2000-20	05 Agilent T	echnologies			

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

## 10GHz to 20GHz

#### **GMSK - Maximum Power**

🔆 Agilent 10:30:09	Nov 25, 2008			RL	Marker
Ref 45.6 dBm #Peak	#Atten 6 dB		Mk	r1 13.65 GHz -19.62 dBm	<b>Select Marker</b> <u>1</u> 2 3 4
Log 10 dB/ Offst				Ext Ref	Normal
49.6 dB					Delta
-13.0 dBm #PAvg					<b>Delta Pair</b> (Tracking Ref) Ref <b>∆</b>
M1 S2 S3 FC	ut when the the	ummunum	and the second and the second	and a second second second	Span Pair Span <u>Center</u>
£(f): FTun Swp					- Off
Start 10.00 GHz #Res BW 1 MHz	#V	BW 1 MHz		op 20.00 GHz ms (601 pts)	- More 1 of 2
Copyright 2000–2005 Agilent Technologies					



Limit

🔆 Agilent 10:29:13	Nov 25, 2008	T Marker
Ref 45.6 dBm	Mkr #Atten 6 dB	1 13.65 GHz -20.34 dBm 1 2 3 4
#Peak Log		
10 dB/		Ext Ref Normal
0ffst 49.6 dB DI		- Delta
-13.0 dBm #PAvg		Delta Pair (Tracking Ref) Ref ▲
M1 S2 S3 FC	The second se	Span Pair Span <u>Center</u>
£(f): FTun Swp		Off
Start 10.00 GHz #Res BW 1 MHz		p 20.00 GHz More ns (601 pts)
Copyright 2000-20	005 Agilent Technologies	

-13dBm



## 2.8 RECEIVER SPURIOUS EMISSIONS

## 2.8.1 Specification Reference

Industry Canada RSS 133:2008 Clause 6.6

### 2.8.2 Equipment Under Test

RRUN19-22 / KRC 161 170/5

#### 2.8.3 Date of Test and Modification State

02 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. The EUT was set to receiver mode. The EUT was tested on Middle channel for both modulations. 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 Max Hold. The limit line was displayed, showing the –57dBm, 2 nanowatts, limit.

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 – Mode 1 Mode 2 Mode 3

## 2.8.6 Environmental Conditions

	02 December 2008
Ambient Temperature	24.2°C
Relative Humidity	22.4%



## 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 10GHz

<u>GMSK</u>

🔆 Agilent 10:12:37	Dec 2, 2008			RL	Peak Search
Ref 1 dBm #Peak	#Atten 6 dB		Mk	(r1 7.100 GHz -67.29 dBm	Next Peak
Log 10 dB/ Offst				Ext Ref	Next Pk Right
5 dB DI					Next Pk Left
-57.0 dBm LgAv					Min Search
M1 S2 S3 FC	and a start and a start and a start	month and a start and a start a	and the second	Madahathathathathathathathathathathathathat	Pk-Pk Search
£(f): FTun Swp					Mkr → CF
Start 9 kHz #Res BW 1 MHz	#\	/BW 1 MHz		op 10.000 GHz ms (601 pts)	<b>More</b> 1 of 2
Copyright 2000-20	05 Agilent T	echnologies			



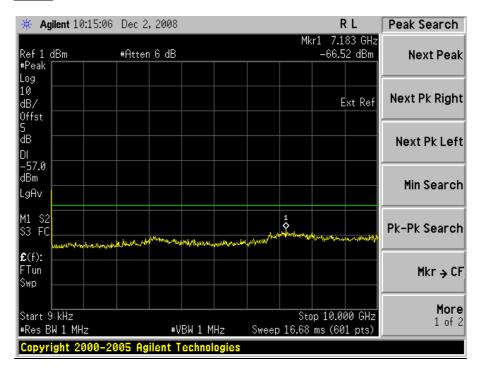
#### 8PSK

🔆 Agilent 10:11:12	Dec 2,2008			RL	Peak Search
Ref 1 dBm #Peak	#Atten 6 dB		Mł	<r1 6.667="" ghz<br="">-67.06 dBm</r1>	Next Peak
Log 10 dB/				Ext Ref	Next Pk Right
Offst 5 dB DI					Next Pk Left
-57.0 dBm LgAv					Min Search
M1 S2 S3 FC	and the second	Anapoly willing a polyability of the	1 Sullyman	an market at market a strategy	Pk-Pk Search
£(f): FTun Swp					Mkr → CF
Start 9 kHz #Res BW 1 MHz	#\	/BW 1 MHz		op 10.000 GHz ms (601 pts)	More 1 of 2
Copyright 2000-20					

## Configuration 1 - Mode 2

## 9kHz to 10GHz

#### **GMSK**





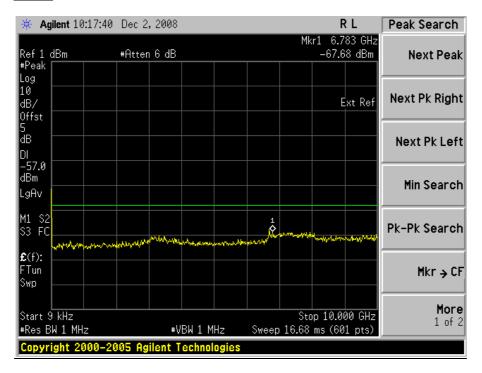
#### 8PSK

🔆 Agilent 10:15:57	Dec 2,2008			RL	Peak Search
Ref 1 dBm #Peak	#Atten 6 dB		Mk	r1 7.050 GHz -67.48 dBm	Next Peak
Log 10 dB/				Ext Ref	Next Pk Right
Offst 5 dB DI					Next Pk Left
-57.0 dBm LgAv					Min Search
M1 S2 S3 FC	and a subserve of plane of the second	the way was a way wa	1 Month March March	Contractions	Pk-Pk Search
£(f):					Mkr → CF
Start 9 kHz #Res BW 1 MHz		BW 1 MHz		op 10.000 GHz ms (601 pts)	More 1 of 2
Copyright 2000-20				m <del>3 (001 p</del> (3)	

## Configuration 1 - Mode 3

## 9kHz to 10GHz

#### **GMSK**





# <u>8PSK</u>

Limit

🔆 Agilent 10:16:57	Dec 2,2008			RL	Peak Search
Ref1 dBm	#Atten 6 dB			7.117 GHz 7.89 dBm	Next Peak
#Peak Log					
10 dB/				Ext Ref	Next Pk Right
Offst 5 dB DI					Next Pk Left
-57.0 dBm LgAv					Min Search
M1 S2 S3 FC	and the second second	hyterson garaget and get and	And Stramport	Monthe-Mayler-show	Pk-Pk Search
<b>£</b> (f): FTun Swp					Mkr → CF
Start 9 kHz #Res BW 1 MHz	#VB	d 1 MHz Swa	Stop 10 eep 16.68 ms	0.000 GHz (601 pts)	<b>More</b> 1 of 2
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-57dBm

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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

RRUN19-22 / KRC 161 170/5

#### 2.9.3 Date of Test and Modification State

25 to 26 November 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 all timeslots active. A Spectrum Analyser was used to measure the frequency error. The average result was taken over 200 bursts. The temperature was adjusted between  $-30^{\circ}$ C and  $+50^{\circ}$ C in  $10^{\circ}$  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

	25 November 2008	26 November 2008
Ambient Temperature	21.4°C	22.0°C
Relative Humidity	23.8%	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

#### <u>GMSK</u>

Temperature Interval (°C)	Deviation (Hz)
-30	1.99
-20	-1.31
-10	-2.04
0	-6.27
+10	0.06
+20	-4.97
+30	-8.67
+40	-1.40
+50	1.62

## <u>8PSK</u>

Temperature Interval (°C)	Deviation (Hz)
-30	0.97
-20	2.75
-10	0.83
0	-3.67
+10	1.06
+20	-2.97
+30	-3.04
+40	-3.02
+50	-0.99

Limit	±1.0 ppm or ±1.96 kHz
Limit	±1.0 ppm or ±1.96 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 24: 2007, Clause 2.1055, 24.235 Industry Canada RSS 133:2008 Clause 6.3

### 2.10.2 Equipment Under Test

RRUN19-22, S/N: CB 47968839

#### 2.10.3 Date of Test and Modification State

25 November 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 all timeslot active. A Spectrum Analyser was used to measure the frequency error. The average result was taken over 200 bursts. 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

	25 November 2008
Ambient Temperature	21.4°C
Relative Humidity	23.8%



## 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

<u>20°C</u>

<u>GMSK</u>

DC Voltage (V)	Deviation (Hz)
40.8	-2.73
48.0	-4.97
55.2	-1.78

## 8PSK

DC Voltage (V)	Deviation (Hz)
40.8	-7.76
48.0	-2.97
55.2	-0.81
Limit	±1.0 ppm or ±1.96 kHz



# **SECTION 3**

# **TEST EQUIPMENT USED**

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# 3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Туре No.	Serial No.	Calibration Due	
Section 2.1, 2.2, 2.3, 2.4 2.5, 2.7 and 2.8 – Maximum Conducted Output Power , Emission Limitations for Cellular Equipment/Occupied Bandwidth , Spurious Emissions at Antenna Terminals (±1MHz) and Spurious Emissions					
Spectrum Analyser	Agilent	E4440A	MY46186610	2009/07/04	
40dB Attenuator	Aeroflex Weinschel	48-40-43-LIM	BR5025	O/P MON	
Network Analyzer	Agilent	8720D	US38431317	2009/05/04	
Power Supply	Da Hua	DH1716-10	-	O/P MON	
Digital Multimeter	FLUKE	179	91820401	2009/01/04	
Thermo-hygrometer	AZ Instruments	8705	9151655	2008/12/20	
Section 2.6 – Radiated Spurious	Emissions				
EMI Receiver	Rohde & Schwarz	ESI 40	100015	2009/08/20	
Ultra log test antenna	Rohde & Schwarz	HL562	100167	2009/08/20	
Double-Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF 906	100029	2009/08/20	
Antenna master	Frankonia	MA 260	-	TU	
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	ΤU	
Signal generator	Rohde & Schwarz	SMR 20	100086	2009/08/20	
Semi- Anechoic Chamber	Frankonia	23.18m×16.88m×9.60m	-	2010/07/19	
Digital Multimeter	FLUKE	179	91820401	2009/01/04	
Thermo-hygrometer	AZ Instruments	8705	9151655	2008/12/20	
Section 2.9 and 2.10 – Frequence	y Stability Under Temp	perature and Voltage Varia	ations		
Spectrum Analyser	Agilent	E4440A	MY46186610	2009/07/04	
40dB Attenuator	Aeroflex Weinschel	48-40-43-LIM	BR5025	O/P MON	
Network Analyzer	Agilent	8720D	US38431317	2009/05/04	
Temperature Chamber	Zengda	GDW/SJ 6-16	200510203	O/P MON	
Power Supply	Da Hua	DH1716-10	-	O/P MON	
Digital Multimeter	FLUKE	179	91820401	2009/01/04	
Thermo-hygrometer	AZ Instruments	8705	9151655	2008/12/20	

TU Traceability Unscheduled

O/P MON Output monitored with 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



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

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

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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