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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

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

PREPARED BY

N Bennett Senior Administrator

APPROVED BY

M J Hardv

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

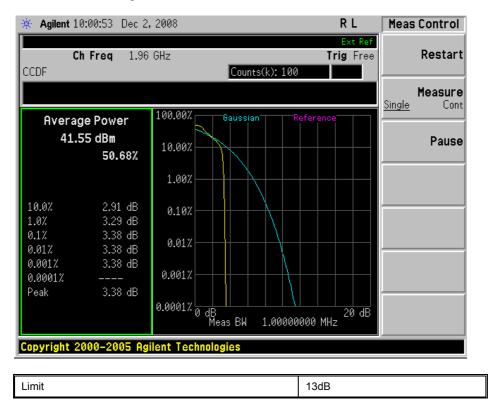
For the period of test the EUT met the requirements of FCC CFR 47 Part 24: 2007 Peak – Average Ratio.

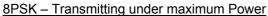
The test results are shown below.

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.

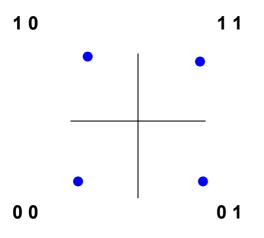
The modulation schemes used for the EUT are GMSK and 8PSK. The 8PSK modulation scheme is EDGE (Enhanced Date Rates for GSM Evolution).

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° (π 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 |

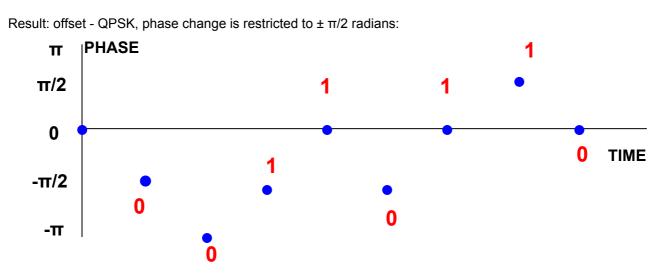
2. Modulate each stream with PSK (1 = 90° or $\pi/2$, 0 = -90° or - $\pi/2$ phase shift)

| 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 |



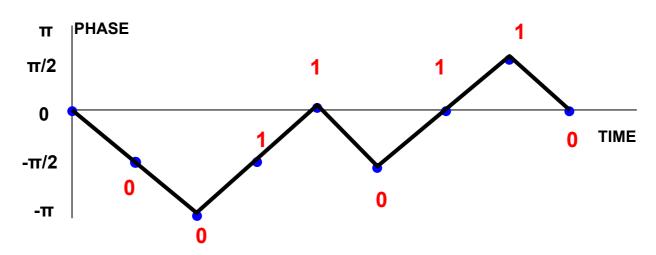
3. Combine (add) the two PSK signals:

| 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):





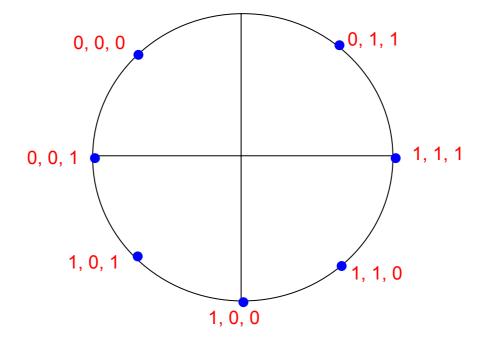
Gaussian Minimum Shift Keying

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% |

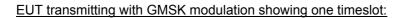
2.3.7 Test Result

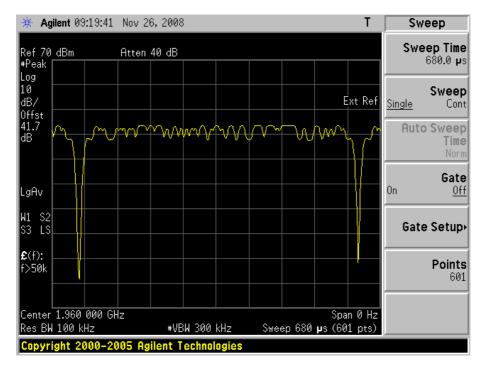
Four plots are shown on the following pages showing the EUT transmitting with the display in the time domain:

EUT transmitting with GMSK modulation showing all timeslots:

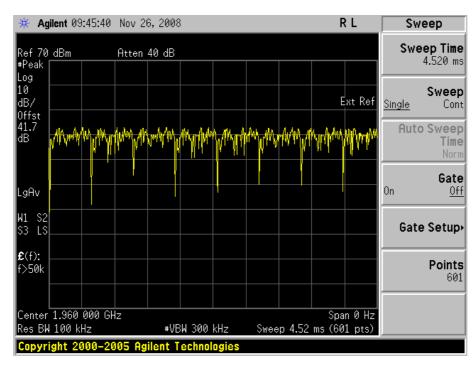
| 🔆 Agilent 09:14:12 | Nov 26, 2008 | | Т | Sweep |
|--------------------------------------|---------------------|-----------------------------|---------------------------|----------------------------|
| Ref 70 dBm #Peak | Atten 40 dB | | * | Sweep Time 4.520 ms |
| Log 10 dB/ Offst | | | Ext Ref | Sweep 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 | | | , |





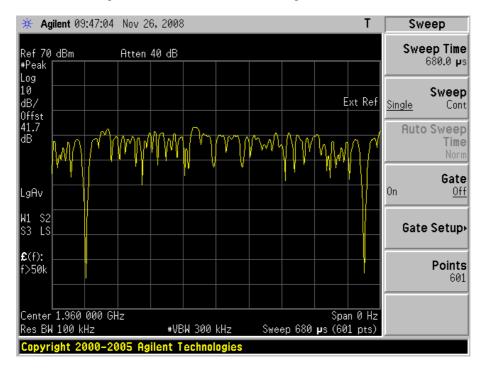


EUT transmitting with 8PSK modulation showing all timeslots:





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

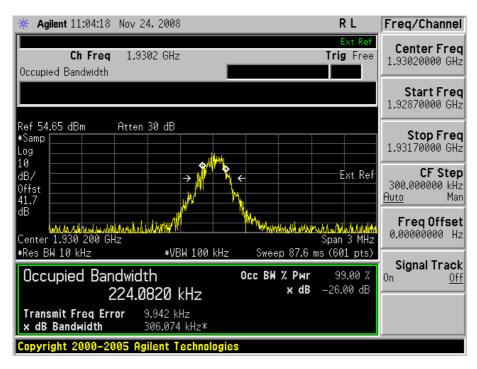
| | Frequency (MHz) | 99% Power bandwidth (kHz) |
|------|--------------------|---------------------------------|
| GMSK | 1989.8 | 231.4503 |
| 8PSK | 1989.8 | 234.8098 |



The plots of test results are shown below.

Configuration 1 - Mode 1

GMSK - Maximum Power



8PSK - Maximum Power

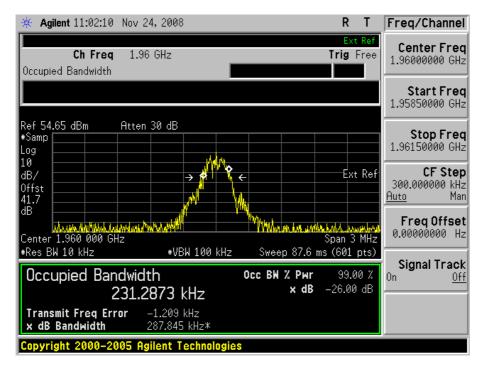
| 🔆 Agilent 11:03:46 | Nov 24, 2008 | | RL | Freq/Channel |
|--------------------------------------|----------------------------|-------------------|----------------------|---|
| Ch Freq Occupied Bandwidth | 1.9302 GHz | | Ext Ref Trig Free | Center Freq 1.93020000 GHz |
| | a aa 15 | | | Start Freq 1.92870000 GHz |
| Ref 54.65 dBm #Samp Log 10 | Atten 30 dB | | | Stop Freq 1.93170000 GHz |
| dB/ Offst 41.7 | → | | Ext Ref | CF Step 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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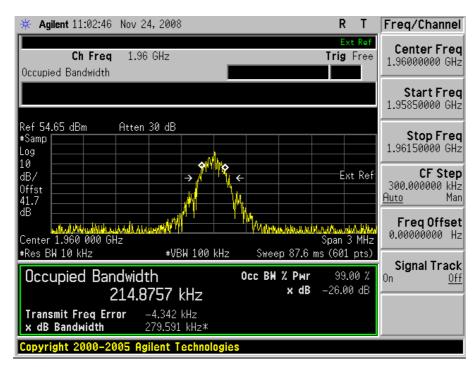


Configuration 1 - Mode 2

GMSK - Maximum Power



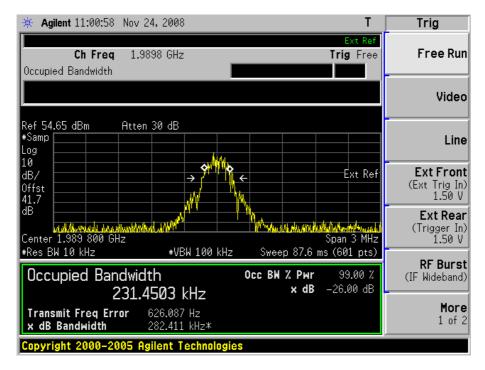
8PSK - Maximum Power





Configuration 1 - Mode 3

GMSK - Maximum Power



8PSK - Maximum Power

| 🔆 Agilent 10:58:41 Nov 24, 2008 | R L | Measure |
|--|---|------------------------|
| Ch Freq 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* | | More 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.

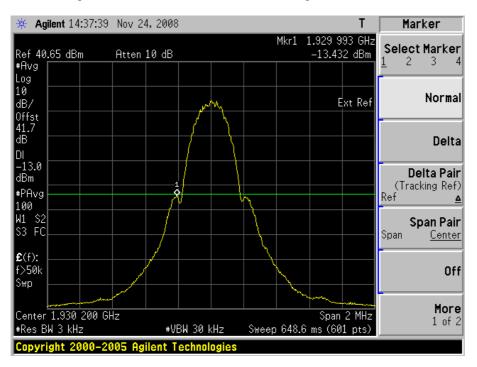
| Channel (MHz) | Edge Test with GMSK modulation Channel No./Frequencies | Edge Test with 8PSK modulation Channel No./Frequencies |
|------------------|---|---|
| Bottom 1930.2 | Channel: 512 Frequency: 1930MHz P1 Power level | Channel: 512 Frequency : 1930MHz P0 Power level |
| Top 1989.8 | Channel: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

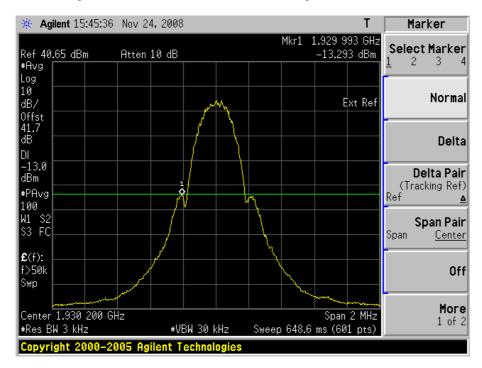
The channels outside of those shown in the table above were not tested at lower power levels to determine a level at which compliance would be achieved. Therefore, to maintain compliance, only the channels shown in the table above shall be used.

Configuration 1 - Mode 1

GMSK - Edge Measurement with EUT Transmitting on P1 Power Level



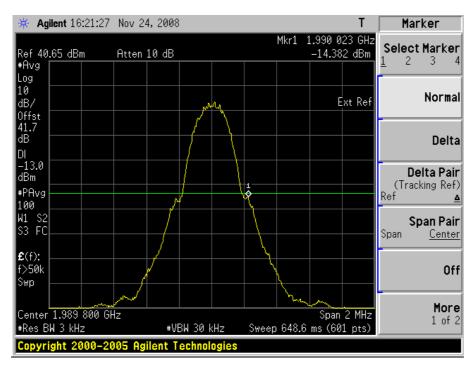




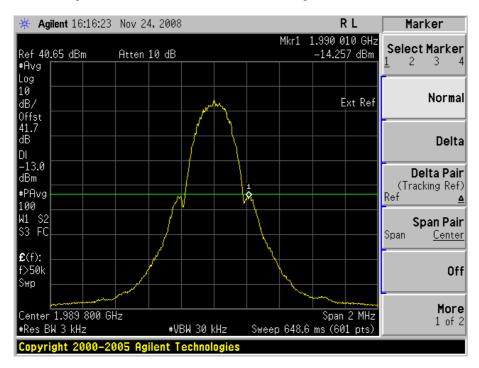
8PSK - Edge Measurement with EUT Transmitting on P0 Power Level

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_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 x 1.64x 20.045)^{0.5}/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.

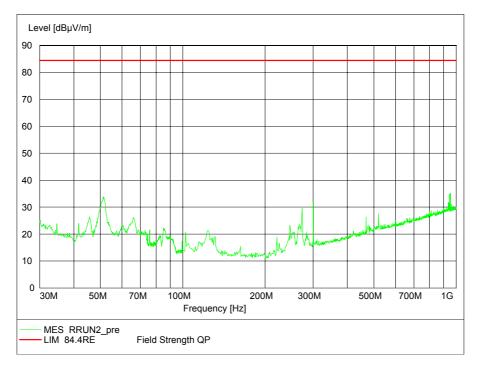
The test results are shown below.

Configuration 1 - Mode 1

No emissions were detected within 10dB of the limit.

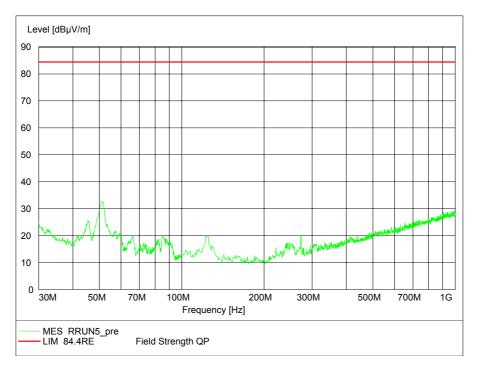
30MHz to 1GHz

<u>GMSK</u>



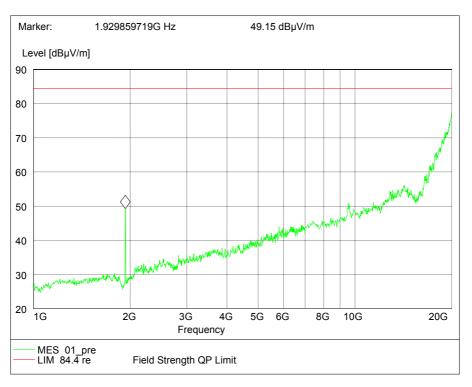






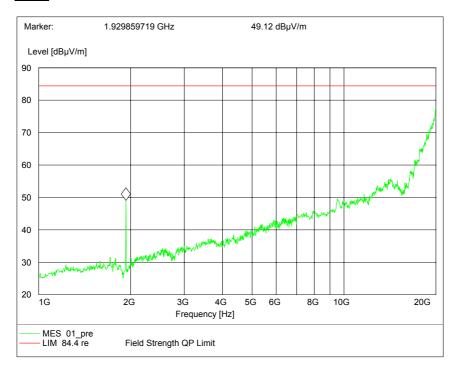
1GHz to 20GHz







8PSK

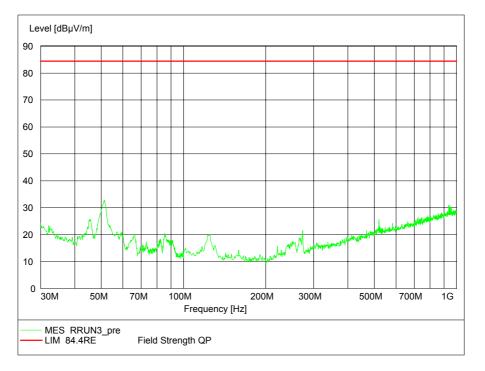


Configuration 1 - Mode 2

No emissions were detected within 10dB of the limit.

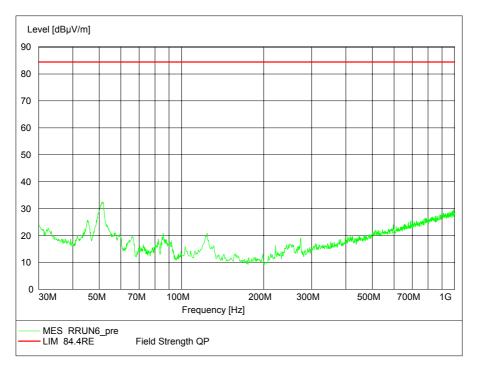
30MHz to 1GHz

<u>GMSK</u>



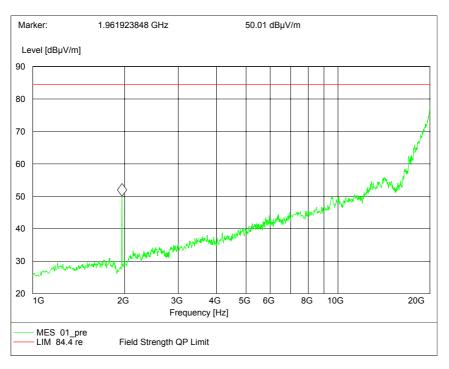






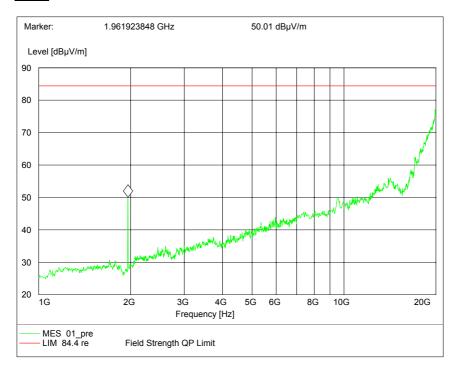
1GHz to 20GHz







8PSK

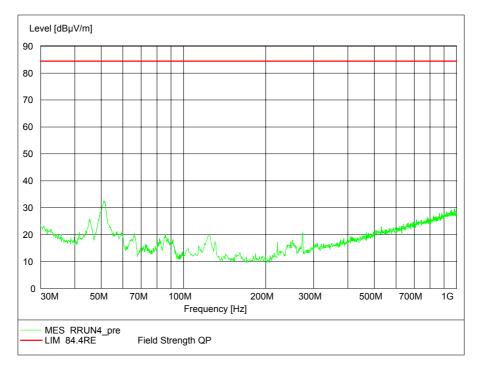


Configuration 1 - Mode 3

No emissions were detected within 10dB of the limit.

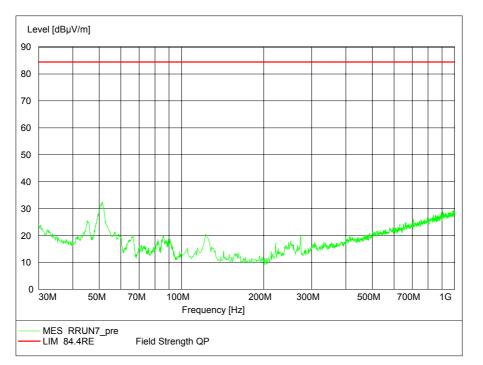
30MHz to 1GHz

<u>GMSK</u>



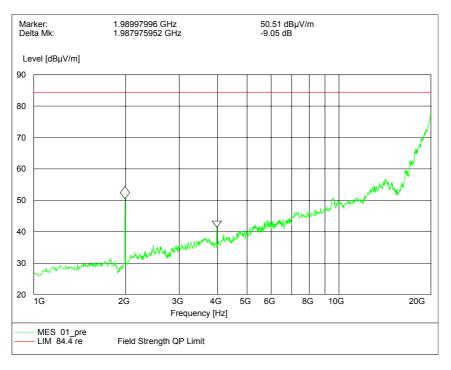






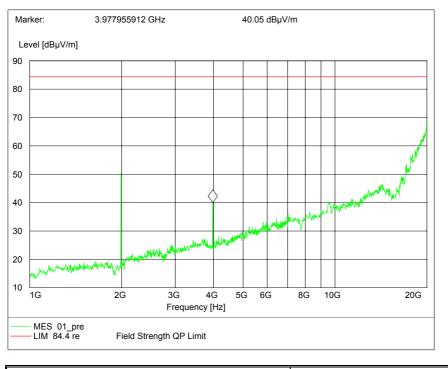
1GHz to 20GHz







<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 10th 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 |
| Delta Pair (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 | | | | | Delta Pair (Tracking Ref) Ref △ |
| 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 | Span Pair 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) | |

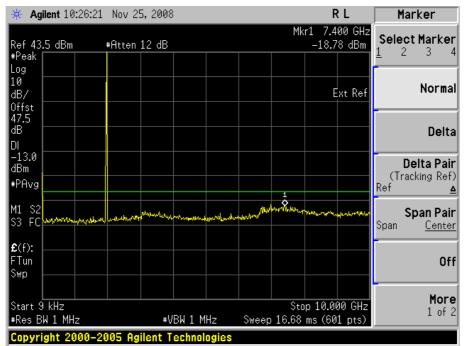


| 🔆 Agilent 10:18:23 | Nov 25, 2008 | | | Т | Marker |
|--|--|----------|-----------|---|---|
| Ref 45.6 dBm | #Atten 6 dB | | | 1 13.65 GHz -19.51 dBm | Select Marker |
| #Peak Log 10 | | | | | Normal |
| dB/ Offst 49.6 | | | | Ext Ref | |
| dB DI -13.0 | | | | | Delta |
| dBm #PAvg | | | | | Delta Pair (Tracking Ref) Ref <u>▲</u> |
| M1 S2 S3 FC | and the state of t | Ammunika | Manhandra | 16yn mar an | Span Pair 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 | Delta Pair (Tracking Ref) Ref ▲ |
| M1 S2 S3 FC | and the state of the | white have a second where where the | Span Pair 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 | Span Pair 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 | | | |

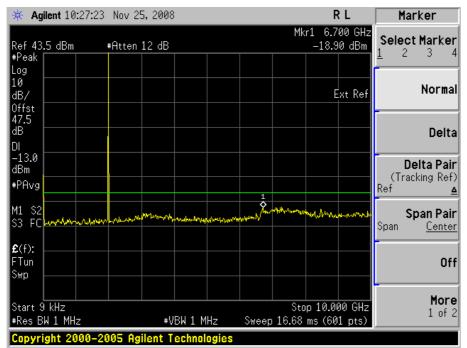


| 🔆 Agilent 10:23:00 | Nov 25, 2008 | | | RL | Marker |
|------------------------------------|------------------------|---------------------------------|-------------|---|--|
| Ref 45.6 dBm | #Atten 6 dB | | Mk | r1 17.23 GHz -21.01 dBm | Select Marker |
| #Peak Log | | | | | ± |
| 10 dB/ | | | | Ext Ref | Normal |
| 0ffst 49.6 dB | | | | | - Delta |
| DI -13.0 | | | | | |
| dBm | | | | | Delta Pair (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 | Span Pair 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 chnologies | 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 | | | | | Delta Pair (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 | Select Marker <u>1</u> 2 3 4 |
| Log 10 dB/ Offst | | | | Ext Ref | Normal |
| 49.6 dB | | | | | Delta |
| -13.0 dBm #PAvg | | | | | Delta Pair (Tracking Ref) Ref ∆ |
| 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 10th 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) | More 1 of 2 |
| Copyright 2000-20 | 05 Agilent T | echnologies | | | |



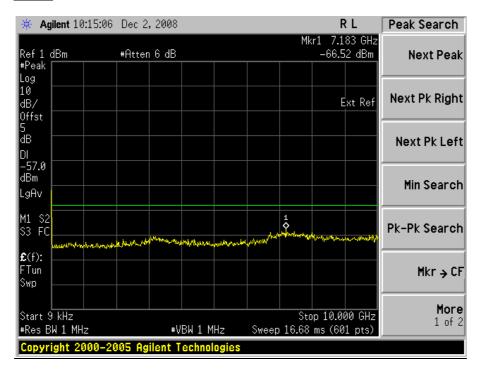
8PSK

| 🔆 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





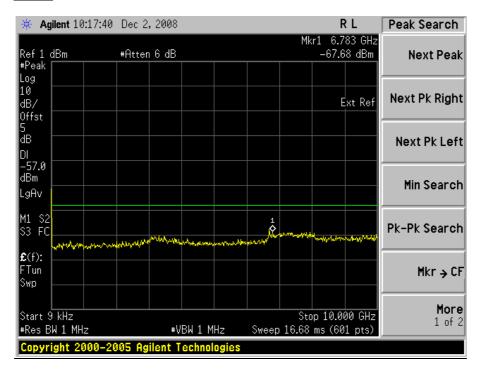
8PSK

| 🔆 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 3 (001 p (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 |
| £ (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) | More 1 of 2 |
| Copyright 2000-2 | 005 Agilent Te | chnologies | | | |

-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° C and $+50^{\circ}$ C in 10° 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.

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