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# Report On

FCC and Industry Canada Testing of the  
Ericsson (China) Communications Company Ltd.  
RRUN8-22 / KRC 161 170/4

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FCC ID: WODGKRC161170-4  
IC ID: 287AH-FG1611704

Document 75913963 Report 01 Issue 2

June 2011



Product Service

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COMMERCIAL-IN-CONFIDENCE

**REPORT ON**

FCC and Industry Canada Testing of the  
Ericsson (China) Communications Company Ltd.  
RRUN8-22 / KRC 161 170/4

Document 75913963 Report 01 Issue 2

June 2011

**PREPARED FOR**

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**PREPARED BY**

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Test Engineer

**APPROVED BY**

**M Jenkins**  
Authorised Signatory

**DATED**

27 June 2011

**This report has been up-issued to Issue 2 to correct typographical errors on page 11.**

**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 compliance with FCC CFR 47: Part 22 and Industry Canada RSS-132. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

**X Zhang**

**Q Li**





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## **SECTION 1**

### **REPORT SUMMARY**

FCC and Industry Canada Testing of the  
Ericsson (China) Communications Company Ltd.  
RRUN8-22 / KRC 161 170/4



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson (China) Communications Company Ltd. RRUN8-22 / KRC 161 170/4 to the requirements of FCC CFR 47 Part 22 and Industry Canada RSS-132.

Testing was carried out in support of an application for Grant of Equipment Authorisation in the name of RRUN8-22 / KRC 161 170/4.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Ericsson (China) Communications Company Ltd.
Product Name	RRUN8-22
Product Number	KRC 161 170/4
IC Model Number	FG1611704
Serial Number(s)	TD3G730111
Software Version	CXP1040007_05R31D
Hardware Version	R1F
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 22: 2010 Industry Canada RSS-132: 2005
Incoming Release Date	Declaration of Build Status 12 May 2011
Order Number Date	PTP 04 May2011
Start of Test	12 May 2011
Finish of Test	26 May 2011
Name of Engineer(s)	X Zhang Q Li
Related Document(s)	ANSI C63.4: 2009 FCC CFR 47 Part 2: 2010 Industry Canada RSS-GEN Issue 3: 2010



## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 22 and Industry Canada RSS-132, is shown below.

Configuration 1 – Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 22	RSS-132 and RSS-GEN					
	22.913 (a)	4.4	Effective Radiated Power	869.2MHz		N/A	No integral antenna.
				881.6MHz		N/A	
				893.8MHz		N/A	
2.1	2.1046, 22.913 (a)	4.4	Maximum Peak Output Power - Conducted	869.2MHz	0	Pass	
				881.6MHz	0	Pass	
				893.8MHz	0	Pass	
2.2	22.913 (a)	-	Peak – Average Ratio	869.2MHz	0	Pass	
				881.6MHz	0	Pass	
				893.8MHz	0	Pass	
2.3	2.1047 (d)	4.2	Modulation Characteristics	869.2MHz		N/A	
				881.6MHz	0	Pass	
				893.8MHz		N/A	
2.4	2.1049, 22.917 (b)	RSS-Gen 4.6.1	Occupied Bandwidth	869.2MHz	0	Pass	
				881.6MHz	0	Pass	
				893.8MHz	0	Pass	
2.5	2.1051, 22.917 (b)	4.5	Spurious Emissions at Antenna Terminals ( $\pm 1$ MHz)	869.4MHz	0	Pass	The channel adjacent to the lower and higher band-edge cannot be used. The lowest usable channel is 129 (869.4MHz), the highest usable channel is 250 (893.6MHz)
				881.6MHz		N/A	
				893.6MHz	0	Pass	
2.6	2.1053, 22.917 (a)	4.5	Radiated Spurious Emissions	869.2MHz	0	Pass	
				881.6MHz	0	Pass	
				893.8MHz	0	Pass	
2.7	2.1051, 22.917 (a)	4.5	Conducted Spurious Emissions	869.2MHz	0	Pass	
				881.6MHz	0	Pass	
				893.8MHz	0	Pass	
2.8	2.1055, 22.355	4.3	Frequency Stability Under Temperature Variations	869.2MHz		N/A	
				881.6MHz	0	Pass	
				893.8MHz		N/A	
2.9	2.1055, 22.355	4.3	Frequency Stability Under Voltage Variations	869.2MHz		N/A	
				881.6MHz	0	Pass	
				893.8MHz		N/A	
2.10	-	4.6	Receiver Spurious Emissions	869.2MHz	0	Pass	
				881.6MHz	0	Pass	
				893.8MHz	0	Pass	

N/A – Not Applicable



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## 1.3 DECLARATION OF BUILD STATUS

<b>MAIN EUT</b>		
<b>MANUFACTURING DESCRIPTION</b>	Radio Equipment	
<b>MANUFACTURER</b>	Ericsson (China) Communications Company Ltd.	
<b>PRODUCT NAME</b>	RRUN8-22	
<b>PRODUCT NUMBER</b>	KRC 161 170/4	
<b>IC Model NUMBER</b>	FG1611704	
<b>SERIAL NUMBER</b>	TD3G730111	
<b>HARDWARE VERSION</b>	R1F	
<b>SOFTWARE VERSION</b>	CXP1040007_05R31D	
<b>TRANSMITTER OPERATING RANGE</b>	TX: 869.4MHz - 893.6MHz RX: 824.4MHz - 848.6MHz	
<b>MODULATIONS</b>	GMSK, 8-PSK, 16QAM, 32QAM, AQPSK	
<b>INTERMEDIATE FREQUENCIES</b>	--	
<b>ITU DESIGNATION OF EMISSION</b>	250KGXW 250KG7W	
<b>OUTPUT POWER (RMS) (W or dBm)</b>	GMSK	43 .0dBm
	8PSK	39.7 dBm
	16QAM	38.3 dBm
	32QAM	37.9 dBm
	AQPSK	39.6 dBm
<b>OUTPUT POWER TOLERANCE</b>	±1dB	
<b>FCC ID</b>	WODGKRC161170-4	
<b>IC ID</b>	287AH-FG1611704	
<b>TECHNICAL DESCRIPTION (a brief description of the intended use and operation)</b>	The equipment is a Radio Unit of GSM Base Station.	

Signature

ECain Pan

Date

15 June 2011

D of B S Serial No

75913963/01

No responsibility will be accepted by TÜV SÜD Product Service Limited 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) RRUN8-22 / KRC 161 170/4 is an Ericsson (China) Communications Company Ltd. Radio Equipment working in the public mobile service 850MHz band which provides communication connections to GSM850 network. The RRUN8-22 / KRC 161 170/4 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 Manufacturer's documentation.



Equipment Under Test





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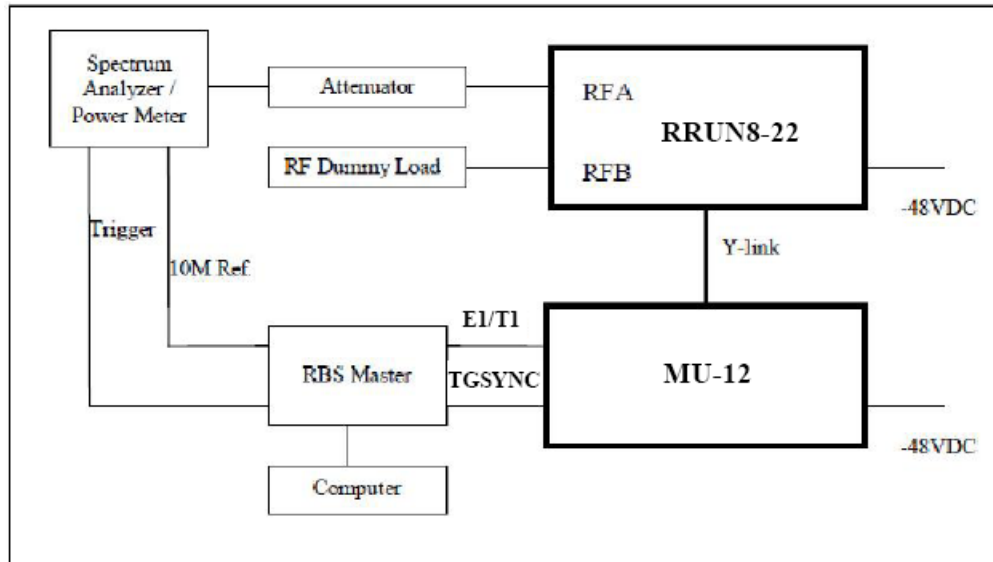
#### **1.4.2 Test Configuration**

##### Configuration 1 – Radio Equipment

The EUT was configured in accordance with FCC CFR 47 Part 22 and Industry Canada RSS-132.

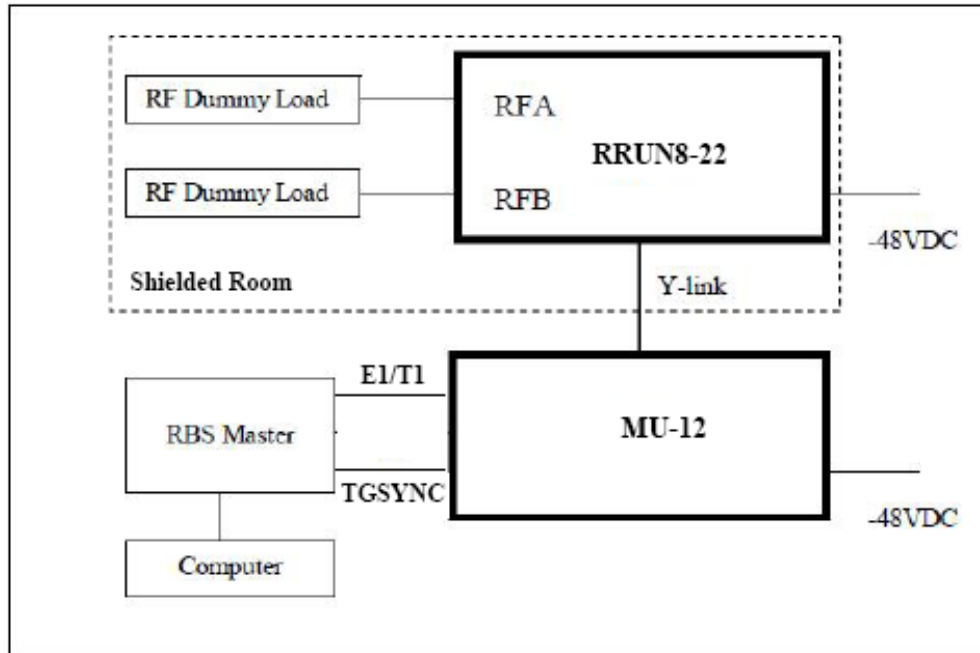
The RRUN8-22 / KRC 161 170/4 supports GMSK, 8-PSK, 16QAM, 32QAM and AQPSK modulations at 850MHz. Modulations GMS and 8-PSK were tested as the representative settings and the worst case.

The unit includes a maximum of two TRX's. All RF conducted TX tests were performed on one TRX RF output connector and the RX test was performed on the other TRX connector. The complete testing was performed with all modulation schemes at maximum RF power unless otherwise stated. The EUT was powered by a -48V DC Power supply.

**Test Setup, Conducted Measurement:**

Test Object	Part Number	Version	Serial Number
Radio Part	RRUN8-22 / KRC 161 170/4	R1F	TD3G730111

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP Compaq	--	CNG5390CH3
2	MU-12	BFE 899 101/2	R1B	CB4F899973
3	RBS Master	LPY 107 1007/3	R1C	T01E989827
4	Load	TF150-3	--	090323432
5	Power Supply	DH1716-5D	--	4001375
	Power Supply	DH1716A-14	--	--
6	Power Meter	NRP	--	102624
	Thermal Power Sensor	NRP-Z21	--	101644
	Spectrum Analyzer	FSQ26	--	200759

**Test Setup, Radiated Measurement:**

Test Object	Part Number	Version	Serial Number
Radio Part	RRUN8-22 / KRC 161 170/4	R1F	TD3G730111

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP Compaq	--	CNG5390CH3
2	MU-12	BFE 899 101/2	R1B	CB4F899973
3	RBS Master	LPY 107 1007/3	R1C	T01E989827
4	Load	TF100	--	09121626
	Load	TF100	--	08011710
5	Power Supply	DH1716-5D	--	2008040003
	Power Supply	DH1716A-10	--	1000303181



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### **1.4.3 Modes of Operation**

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

Mode 1 - ARFCN 128: 869.2 MHz (Bottom Channel)

Mode 2 - ARFCN 190: 881.6 MHz (Middle Channel)

Mode 3 - ARFCN 251: 893.8 MHz (Top Channel)

Mode 4 - ARFCN 129: 869.4 MHz

Mode 5 - ARFCN 250: 893.6 MHz

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



Product Service

## **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 a chamber as appropriate.

The EUT was powered from a -48V 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**

No modifications were made to the EUT during testing.

## **1.8 ALTERNATIVE TEST SITE**

Testing has been performed under the following site registrations:

FCC Accreditation 910917:

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

Industry Canada Accreditation 7308A:

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



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## **SECTION 2**

### **TEST DETAILS**

FCC and Industry Canada Testing of the  
Ericsson (China) Communications Company Ltd.  
RRUN8-22 / KRC 161 170/4



Product Service

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

### **2.1.1 Specification Reference**

FCC CFR 47 Part 2, Clause 2.1046  
FCC CFR 47 Part 22, Clause 22.913 (a)  
Industry Canada RSS-132, Clause 4.4

### **2.1.2 Equipment Under Test**

RRUN8-22 / KRC 161 170/4, S/N: TD3G730111

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

13 May 2011 – 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 2 and Part 22 and Industry Canada RSS-132.

Using a power meter and attenuator(s), the output power of the EUT was measured at the antenna terminal. The carrier power was measured with GMSK, 8-PSK, 16QAM, 32QAM and AQPSK using the test model described.

The path loss was 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**

13 May 2011

Ambient Temperature 24.9°C

Relative Humidity 38.9%



### 2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-132 for Maximum Peak Output Power.

The test results are shown below

#### **GMSK**

##### Configuration 1 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
Bottom	869.2	31.2	42.78	18.97
Middle	881.6	31.2	42.87	19.36
Top	893.8	31.2	42.87	19.36

#### **8PSK**

##### Configuration 1 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
Bottom	869.2	31.2	39.45	8.81
Middle	881.6	31.2	39.57	9.06
Top	893.8	31.2	39.56	9.04

#### **16QAM**

##### Configuration 1 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
Bottom	869.2	31.2	37.65	5.82
Middle	881.6	31.2	37.74	5.94
Top	893.8	31.2	37.72	5.92



**32QAM****Configuration 1 - Mode 1, 2 and 3**

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
Bottom	869.2	31.2	37.48	5.60
Middle	881.6	31.2	37.54	5.68
Top	893.8	31.2	37.57	5.71

**AQPSK****Configuration 1 - Mode 1, 2 and 3**

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
Bottom	869.2	31.2	38.98	7.91
Middle	881.6	31.2	39.09	8.11
Top	893.8	31.2	39.10	8.13

Limit	$\leq 500W$ or $\leq +57dBm$
-------	------------------------------

**Remarks**

The EUT does not exceed 500W or 57dBm at the measured frequencies.



Product Service

## **2.2 PEAK – AVERAGE RATIO**

### **2.2.1 Specification Reference**

FCC CFR 47 Part 22, Clause 22.913 (a)

### **2.2.2 Equipment Under Test**

RRUN8-22 / KRC 161 170/4, S/N: TD3G730111

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

13 and 16 May 2011 – 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 22.

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

The path loss is 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

### **2.2.6 Environmental Conditions**

	13 May 2011	16 May 2011
Ambient Temperature	24.9°C	25.1°C
Relative Humidity	38.9%	39.8%



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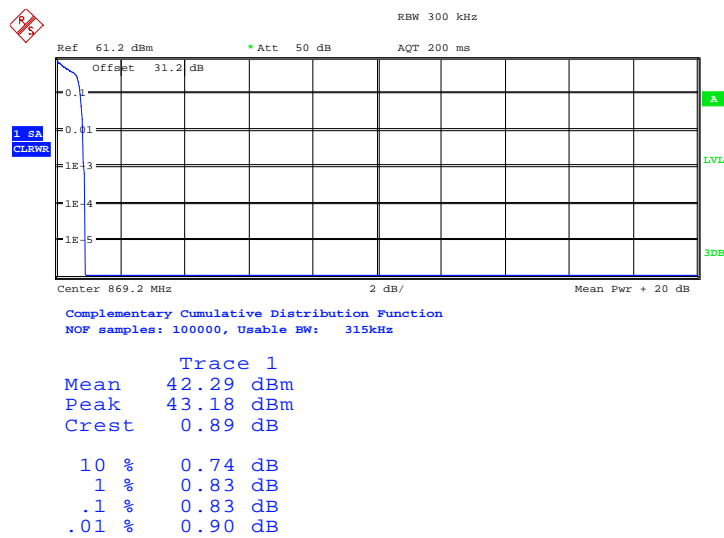
## 2.2.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 22 Peak – Average Ratio.

The test results are shown below.

### GMSK

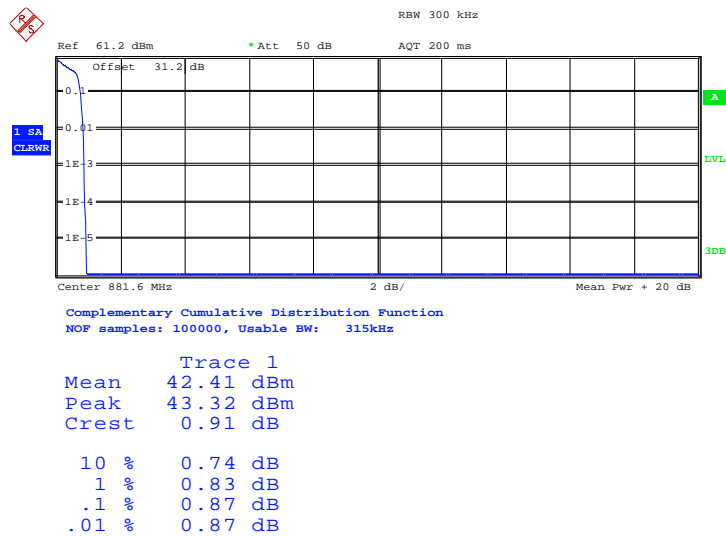
#### Configuration 1 - Mode 1



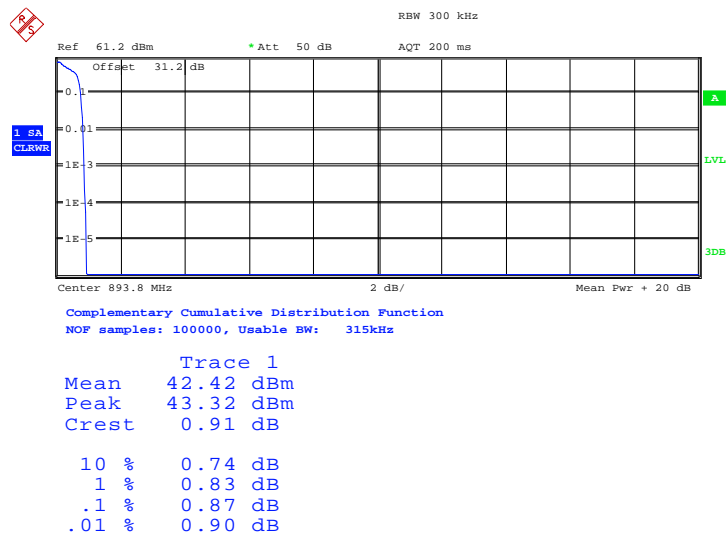
Date: 13.MAY.2011 08:49:37



Product Service

Configuration 1 - Mode 2

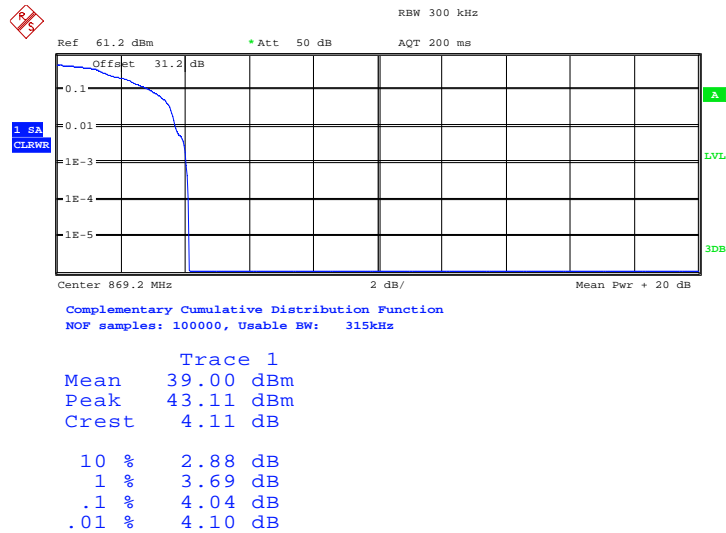
Date: 13.MAY.2011 08:59:41

Configuration 1 - Mode 3

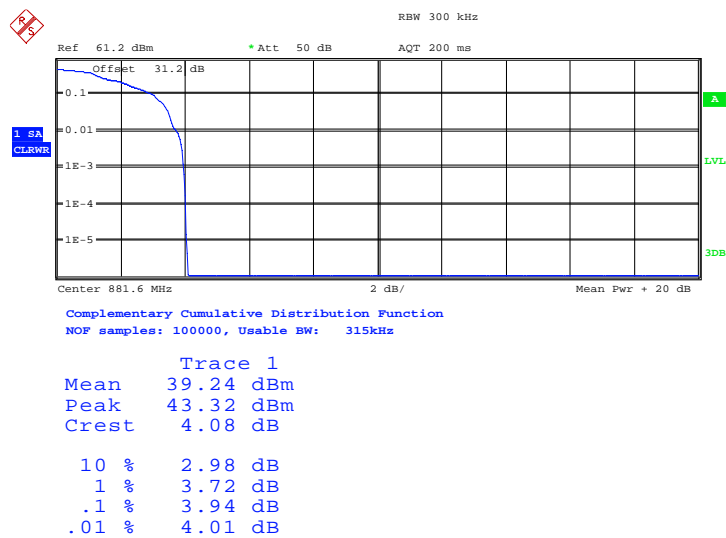
Date: 13.MAY.2011 09:00:36



Product Service

**8-PSK****Configuration 1 - Mode 1**

Date: 13.MAY.2011 08:54:48

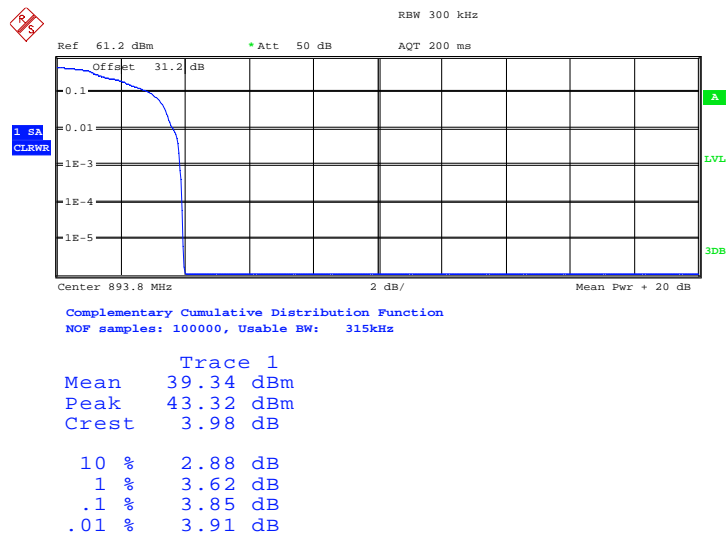
**Configuration 1 - Mode 2**

Date: 13.MAY.2011 08:58:58



Product Service

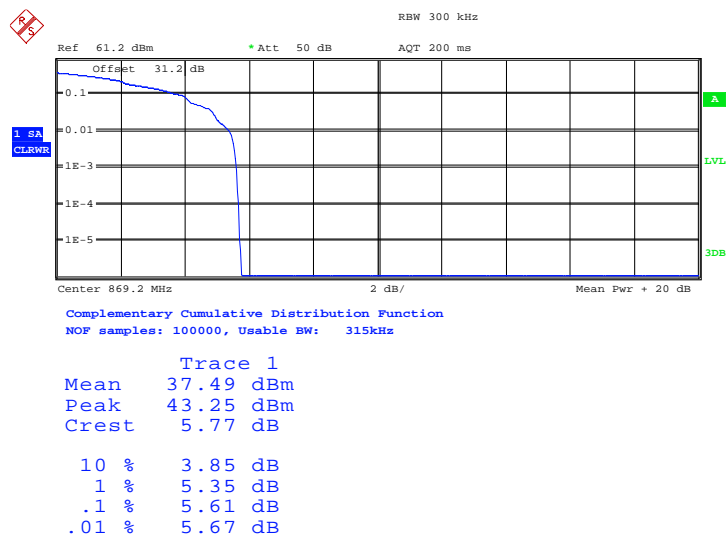
### Configuration 1 - Mode 3



Date: 13.MAY.2011 09:01:12

### 16QAM

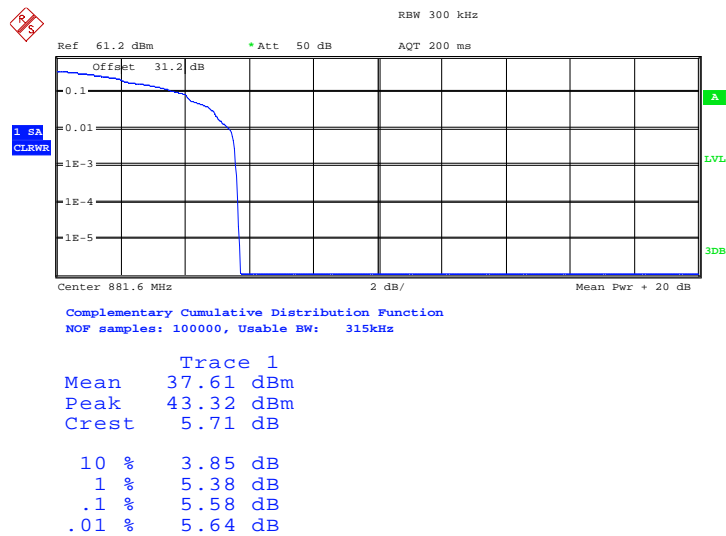
### Configuration 1 - Mode 1



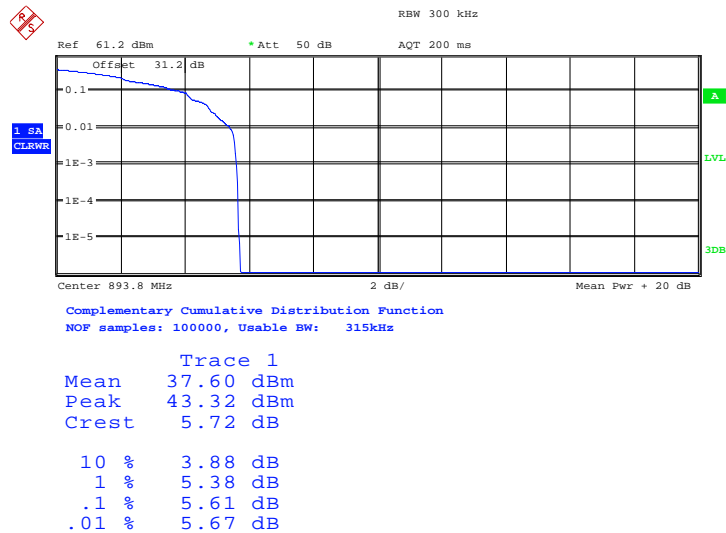
Date: 13.MAY.2011 08:53:54



Product Service

Configuration 1 - Mode 2

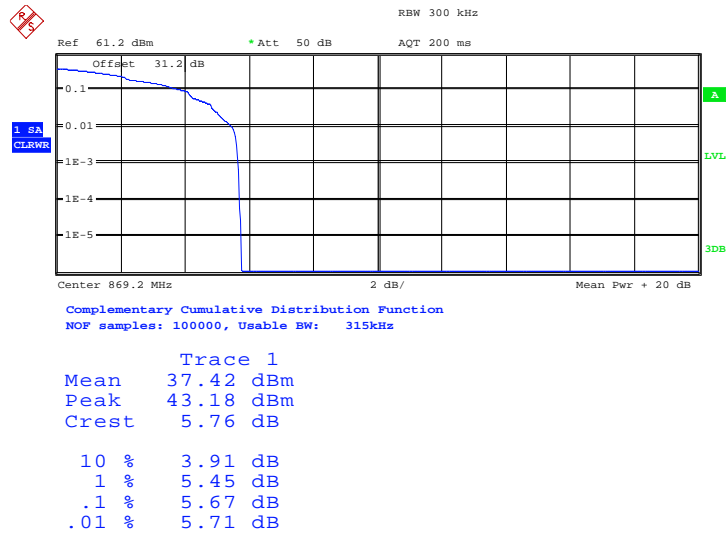
Date: 13.MAY.2011 08:56:57

Configuration 1 - Mode 3

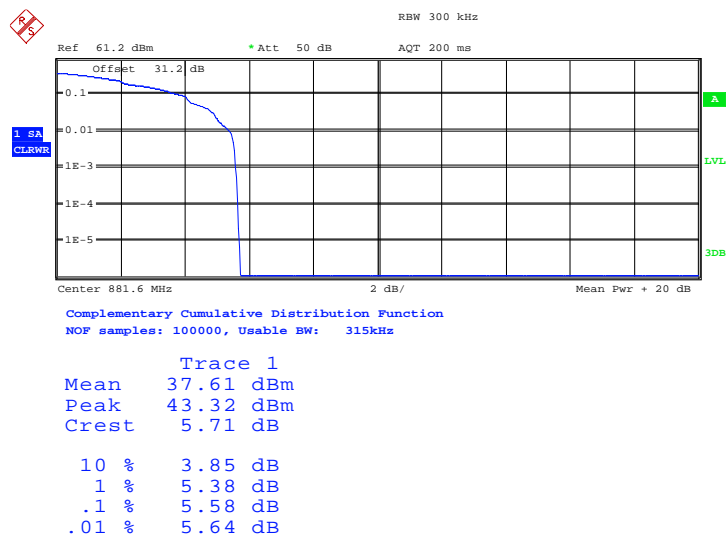
Date: 13.MAY.2011 09:02:23



Product Service

**32QAM****Configuration 1 - Mode 1**

Date: 13.MAY.2011 08:55:53

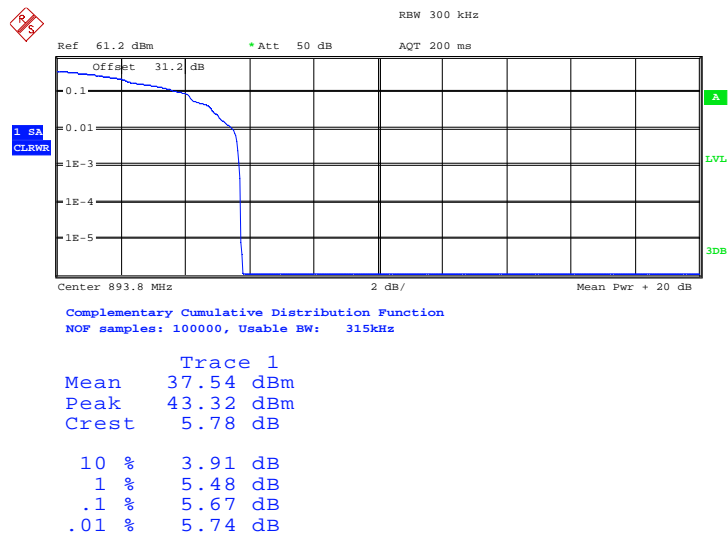
**Configuration 1 - Mode 2**

Date: 13.MAY.2011 08:56:57

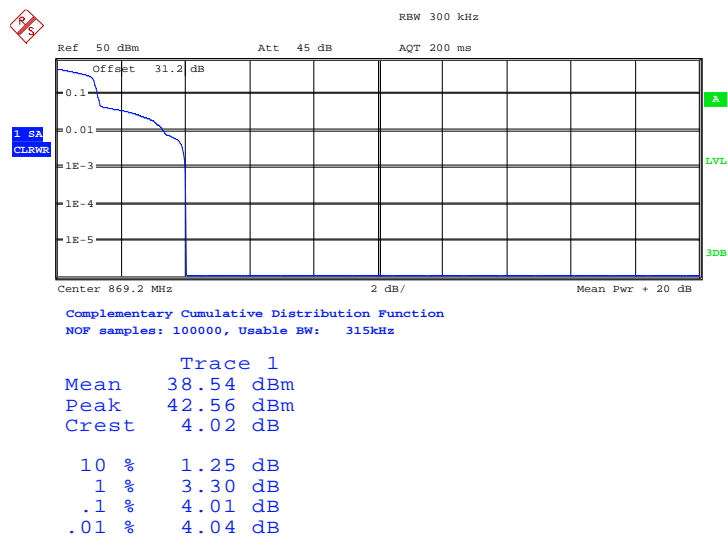




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Configuration 1 - Mode 3

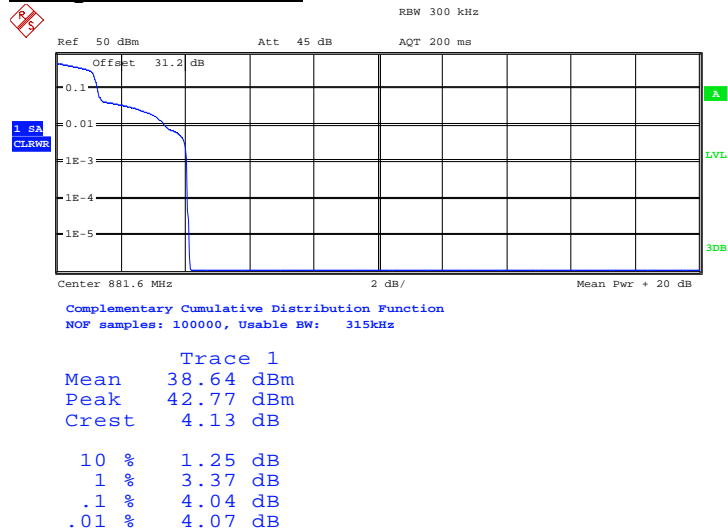
Date: 13.MAY.2011 09:03:15

AQPSKConfiguration 1 - Mode 1

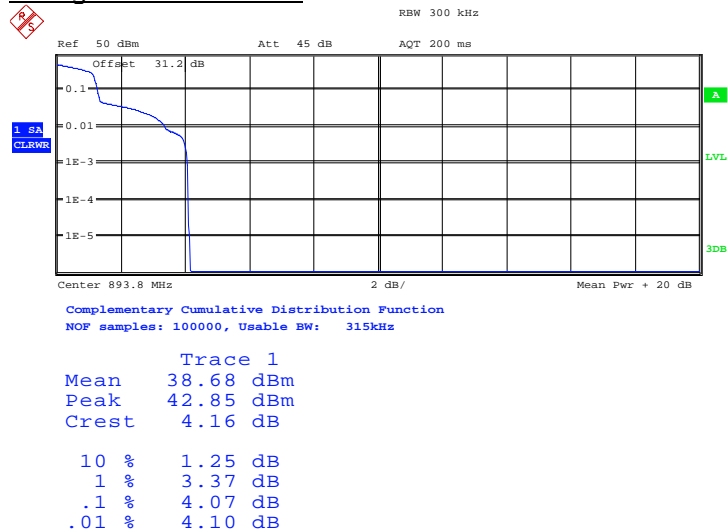
Date: 16.MAY.2011 08:52:04



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Configuration 1 - Mode 2

Date: 16.MAY.2011 08:51:07

Configuration 1 - Mode 3

Date: 16.MAY.2011 08:49:49

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

Remarks

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



Product Service

## 2.3 MODULATION CHARACTERISTICS

### 2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047 (d)  
Industry Canada RSS-132 Clause 4.2

### 2.3.2 Equipment Under Test

RRUN8-22 / KRC 161 170/4, S/N: TD3G730111

### 2.3.3 Date of Test and Modification State

13 and 17 May 2011 – Modification State 0

### 2.3.4 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Industry Canada RSS-132.

The EUT supports GMSK, 8-PSK, 16QAM, 32QAM and AQPSK modulations.

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

Configuration 1 - Mode 2

### 2.3.5 Environmental Conditions

	13 May 2011	17 May 2011
Ambient Temperature	24.9°C	25.2°C
Relative Humidity	38.9%	48.7%



### 2.3.6 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Industry Canada RSS-132 for Modulation Characteristics.

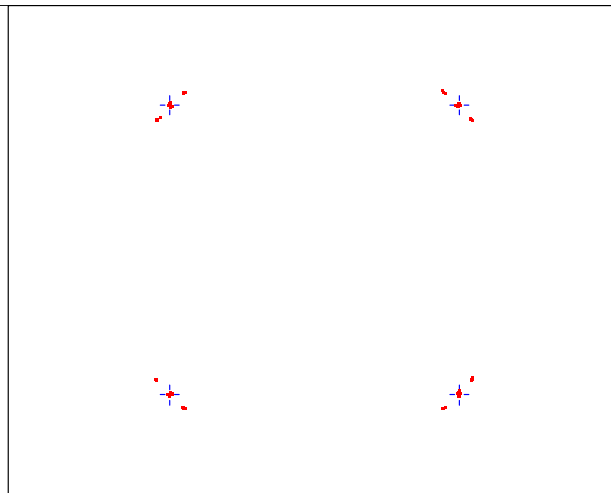
The test results are shown below

#### Configuration 1 - Mode 2

#### GMSK

GSM / EDGE / EDGE Evolution					
Frequency	ARFCN 128 (869.2 MHz)	Ref Level	15.1 dBm, Att 20 dB	External Att	0 dB
Device Type	BTS Normal, GSM 850	Trigger	Free Run	Slot	0 (NB, GMSK)

**A: Constellation: Graph**



**B: Constellation: Modulation Accuracy**

		Current	Unit
25/500	EVM RMS	1.21	%

Date: 13.MAY.2011 04:53:49

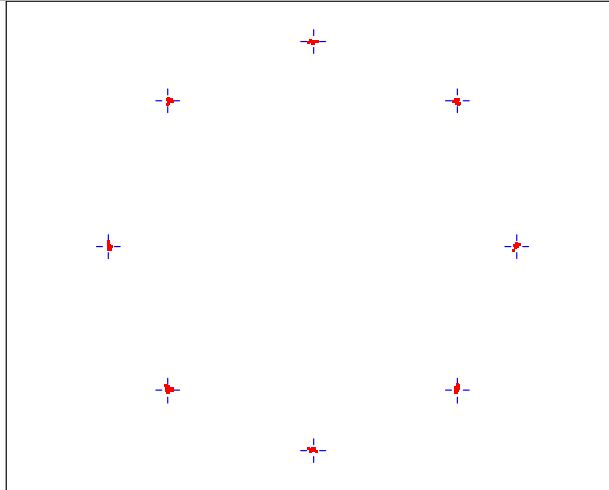
avg Error	RMS	0.70	%
	Peak	1.34	%
Phase Error	RMS	0.57	deg
	Peak	1.60	deg
Origin Offset Suppression		54.09	dB
IQ Offset		0.20	%
IQ Imbalance		0.16	%
Frequency Error		180.11	Hz
Burst Power		11.66	dBm
Amplitude Droop		0.01	dB



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**8-PSK**

GSM / EDGE / EDGE Evolution					
Frequency	ARFCN 128 (869.2 MHz)	Ref Level	14.8 dBm, Att 15 dB	External Att	0 dB
Device Type	BTS Normal, GSM 850	Trigger	Free Run	Slot	0 (NB, 8PSK)

**A: Constellation: Graph****B: Constellation: Modulation Accuracy**

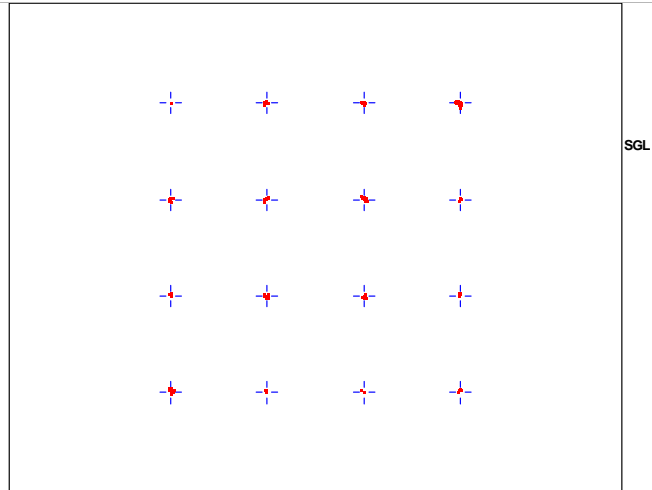
		Current	Unit
26/500	EVM RMS	0.86	%

Date: 13.MAY.2011 04:52:45

Mag Error	RMS	0.36	%
	Peak	- 1.50	%
Phase Error	RMS	0.78	deg
	Peak	4.48	deg
Origin Offset Suppression		53.53	dB
IQ Offset		0.21	%
IQ Imbalance		0.04	%
Frequency Error		180.88	Hz
Burst Power		8.28	dBm
Amplitude Droop		- 0.02	dB

16QAM

GSM / EDGE / EDGE Evolution					
Frequency	ARFCN 128 (869.2 MHz)	Ref Level	46.1 dBm, Att 20 dB	External Att	31 dB
Device Type	BTS Normal, GSM 850	Trigger	Ext, Offset 19.62 $\mu$ s	Slot	0 (NB, 16QAM)

**A: Constellation: Graph****B: Constellation: Modulation Accuracy**

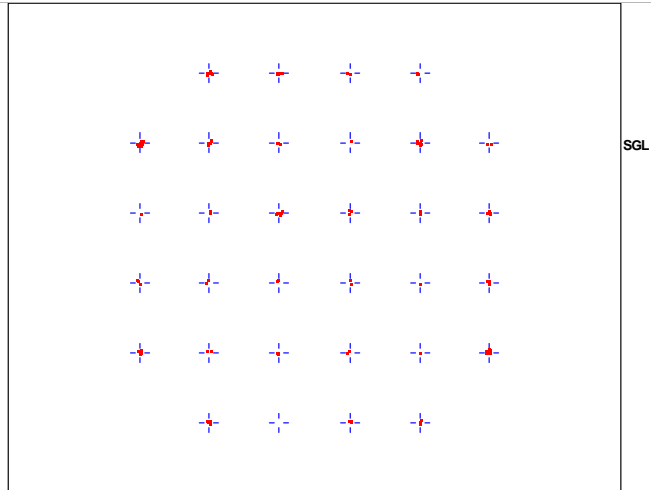
	Current	Unit
--	---------	------

Date: 13.MAY.2011 04:44:25

Mag Error	RMS	0.70	%
	Peak	1.92	%
Phase Error	RMS	0.73	deg
	Peak	3.41	deg
Origin Offset Suppression		55.14	dB
IQ Offset		0.18	%
IQ Imbalance		0.15	%
Frequency Error		181.19	Hz
Burst Power		36.77	dBm
Amplitude Droop		- 0.06	dB

32QAM

GSM / EDGE / EDGE Evolution					
Frequency	ARFCN 128 (869.2 MHz)	Ref Level	45.1 dBm, Att 20 dB	External Att	30 dB
Device Type	BTS Normal, GSM 850	Trigger	Ext, Offset 19.77 $\mu$ s	Slot	0 (NB, 32QAM)

**A: Constellation: Graph****B: Constellation: Modulation Accuracy**

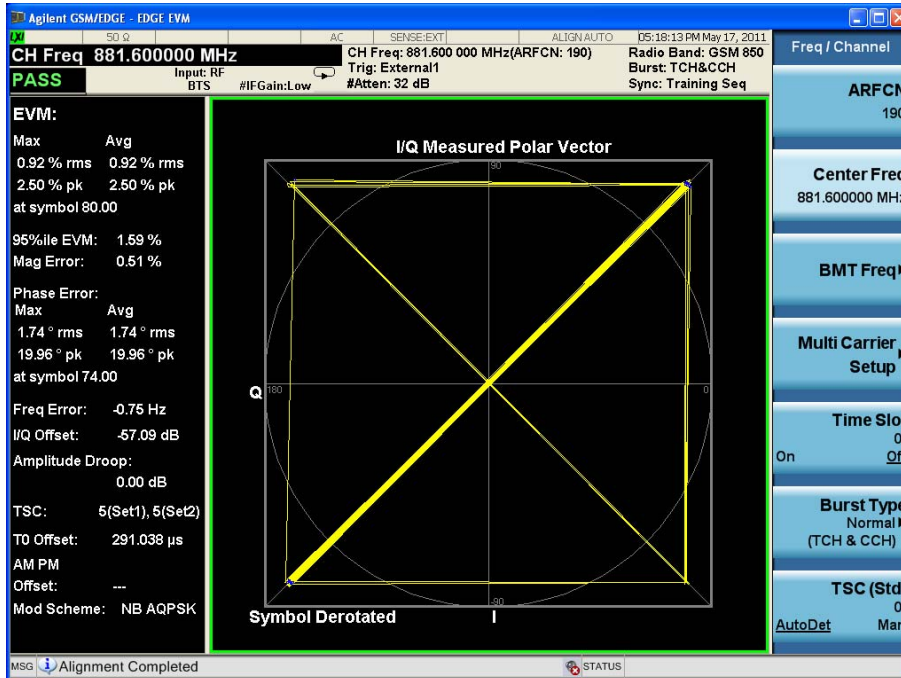
		Current	Unit
53/500	EVM RMS	1.03	%

Date: 13.MAY.2011 04:50:32

Mag Error	RMS	0.75	%
	Peak	1.87	%
Phase Error	RMS	0.71	deg
	Peak	- 3.13	deg
Origin Offset Suppression		52.94	dB
IQ Offset		0.23	%
IQ Imbalance		0.13	%
Frequency Error		179.68	Hz
Burst Power		36.21	dBm
Amplitude Droop		- 0.01	dB



Product Service

AQPSK





Product Service

## **2.4 OCCUPIED BANDWIDTH**

### **2.4.1 Specification Reference**

FCC CFR 47 Part 2, Clause 2.1049  
 FCC CFR 47 Part 22, Clause 22.917 (b)  
 Industry Canada RSS-GEN, Clause 4.6.1

### **2.4.2 Equipment Under Test**

RRUN8-22 / KRC 161 170/4, S/N: TD3G730111

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

13 and 16 May 2011 – 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 2 and Part 22 and Industry Canada RSS-GEN.

The EUT was transmitting at maximum power, modulated with all timeslots active. Using a resolution bandwidth of 3kHz and a video bandwidth of 30kHz. 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 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**

	13 May 2011	16 May 2011
Ambient Temperature	24.9°C	25.1°C
Relative Humidity	38.9%	39.8%



Product Service

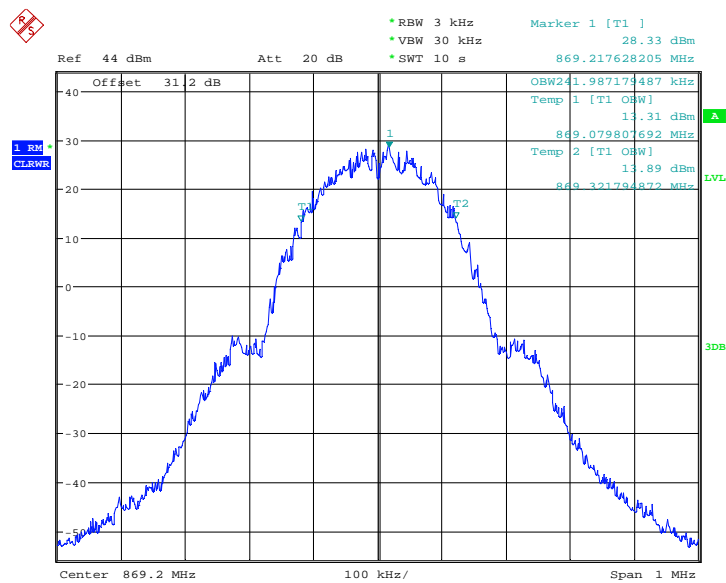
## 2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-GEN for Occupied Bandwidth.

The test results are shown below

### Configuration 1 - Mode 1

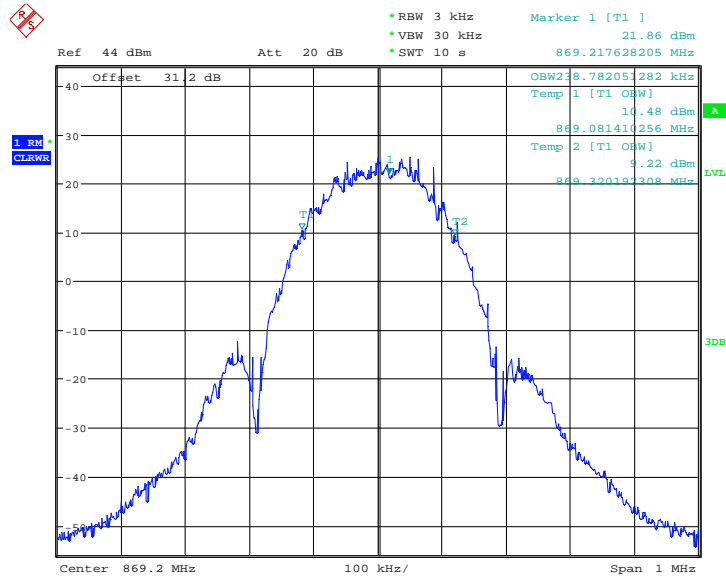
#### GMSK



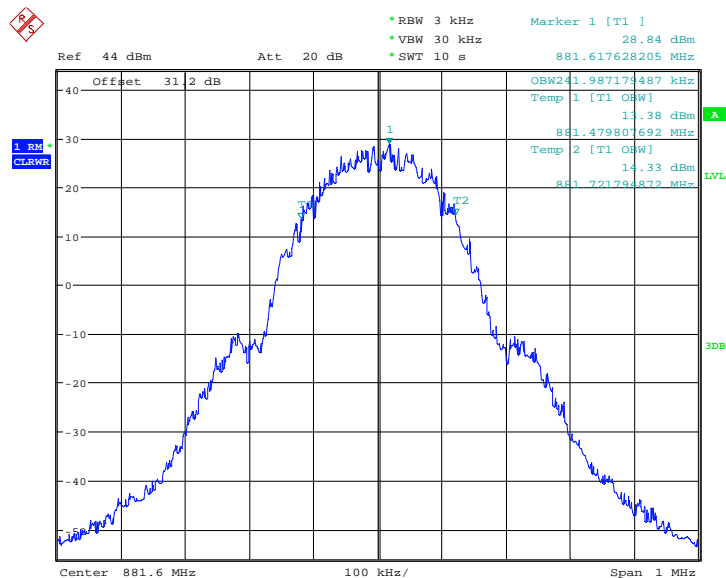
Date: 13.MAY.2011 05:39:00



Product Service

**8-PSK**

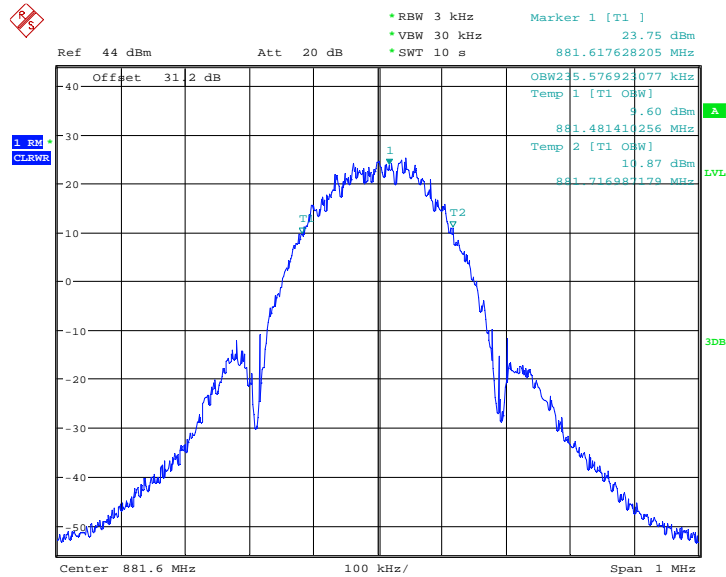
Date: 13.MAY.2011 05:40:32

**Configuration 1 - Mode 2****GMSK**

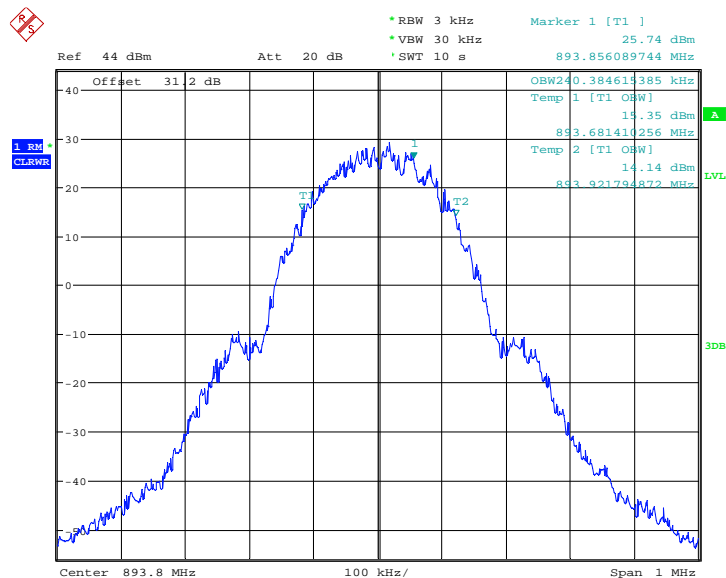
Date: 13.MAY.2011 05:32:12



Product Service

**8-PSK**

Date: 13.MAY.2011 05:34:01

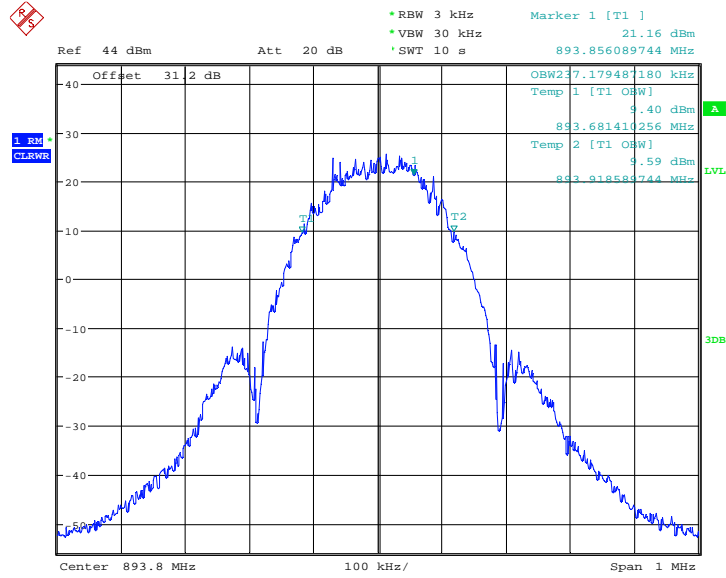
**Configuration 1 - Mode 3****GMSK**

Date: 13.MAY.2011 05:28:52



Product Service

# 8-PSK



Date: 13.MAY.2011 05:26:59



Product Service

**2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS ( $\pm 1$  MHz)****2.5.1 Specification Reference**

FCC CFR 47 Part 2, Clause 2.1051  
FCC CFR 47 Part 22, Clause 22.917 (b)  
Industry Canada RSS-132 Clause 4.5

**2.5.2 Equipment Under Test**

RRUN8-22 / KRC 161 170/4, S/N: TD3G730111

**2.5.3 Date of Test and Modification State**

16 May 2011 – 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 2 and Part 22 and Industry Canada RSS-132.

In accordance with 22.917 (b), at least 1% of the emission bandwidth was used for the resolution bandwidth up to 1 MHz away from the block edge. A resolution bandwidth of 50kHz was used between 1MHz to 5MHz away from the band edge. As the FCC rules specify a RBW of 1MHz for measurements of emissions > 1MHz away from the band edges, the limit was adjusted with -13dB to -26dBm to compensate for the reduced measurement bandwidth. Spectrum analyser detector was set as RMS.

The path loss measured and entered as a reference level offset.

The EUT was tested at its 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 4  
- Mode 5

**2.5.6 Environmental Conditions**

16 May 2011

Ambient Temperature 25.1°C

Relative Humidity 39.8%



### 2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-132 for Spurious Emissions Antenna Terminals ( $\pm 1$  MHz)

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

**Remark:**

The channel adjacent to the lower and higher band-edge cannot be used. The lowest usable channel is 129 (869.4 MHz), the highest usable channel is 250 (893.6 MHz)

#### **Configuration 1 - Mode 4 and 5**

Band Edge Frequency	Edge Test with GMSK modulation Channel No./Frequencies	Edge Test with 8-PSK modulation Channel No./Frequencies
Bottom 869 MHz	Channel: 129 Frequency: 869.4 MHz	Channel: 129 Frequency: 869.4 MHz
Top 894 MHz	Channel: 250 Frequency: 893.6 MHz	Channel: 250 Frequency: 893.6 MHz

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.

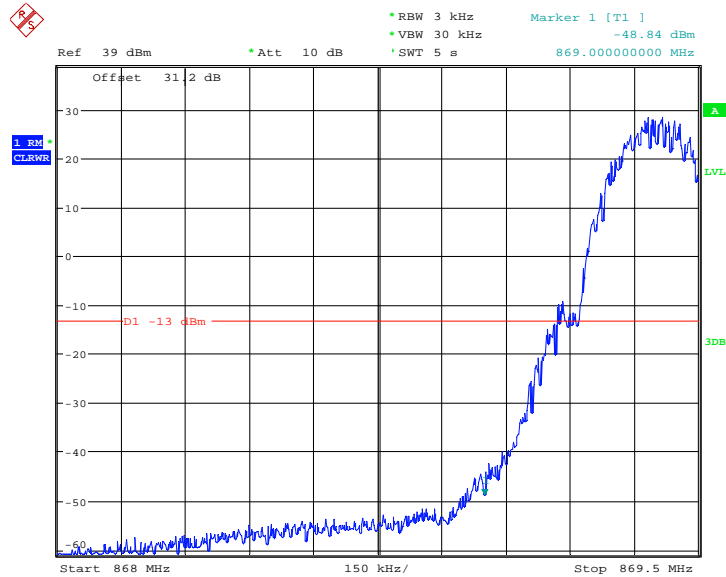


Product Service

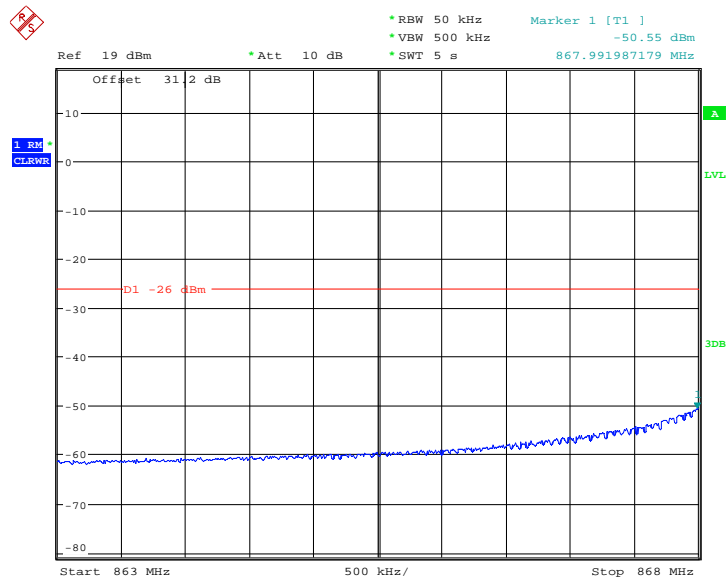
The test results are shown below

### Configuration 1 - Mode 4

### GMSK



Date: 16.MAY.2011 10:21:14



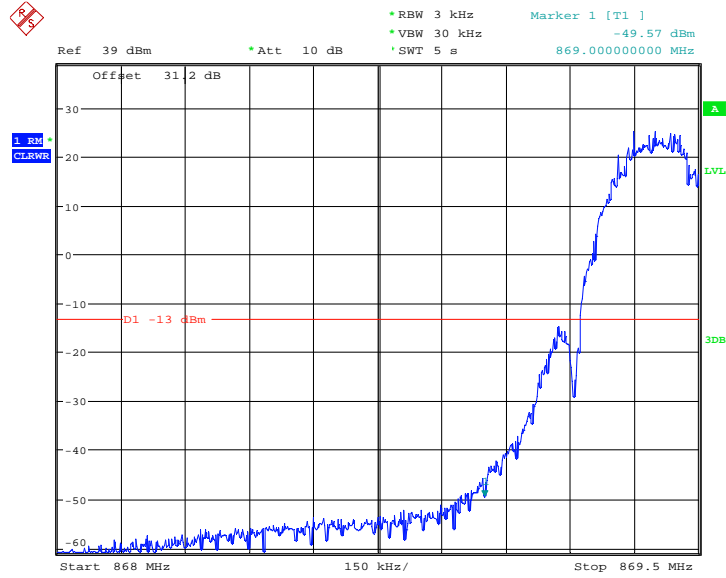
Date: 16.MAY.2011 10:40:15



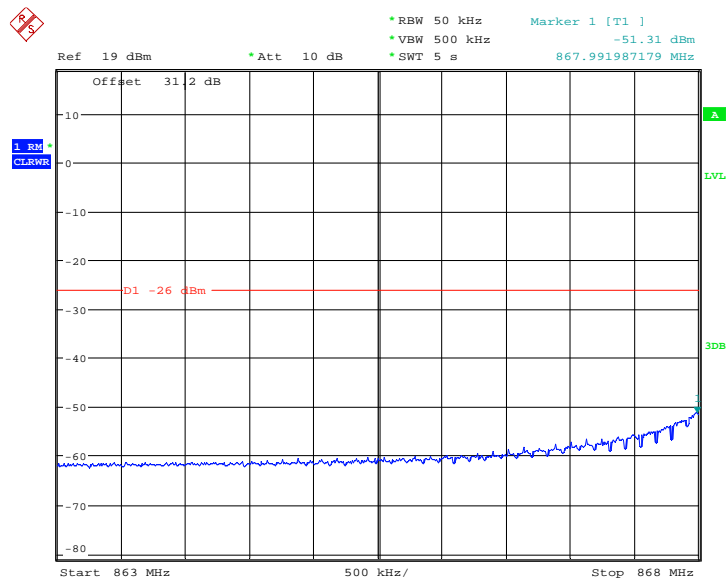


Product Service

# 8-PSK



Date: 16.MAY.2011 10:23:33



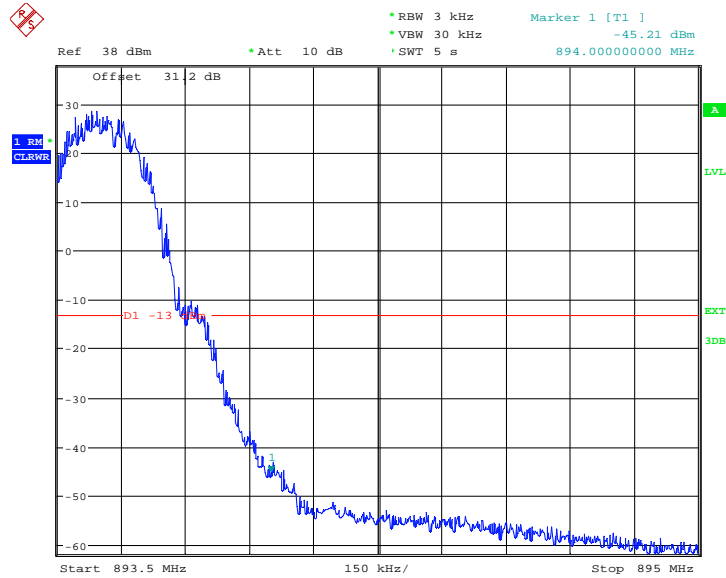
Date: 16.MAY.2011 10:38:59



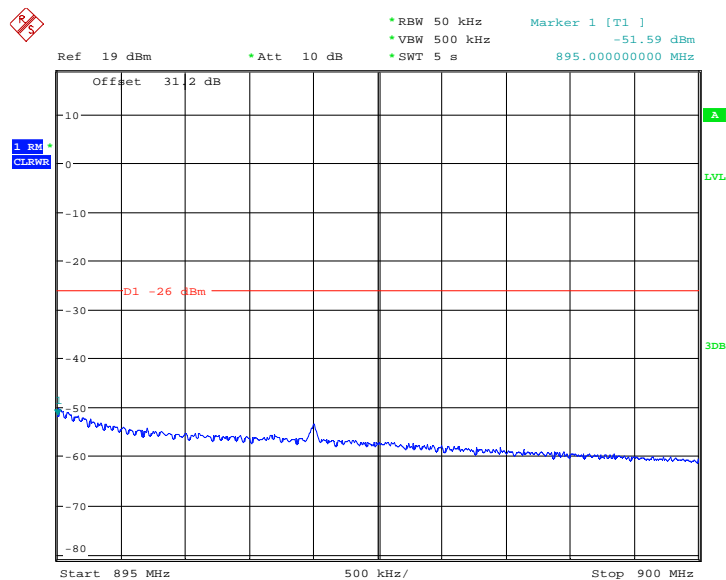
Product Service

## Configuration 1 - Mode 5

### GMSK



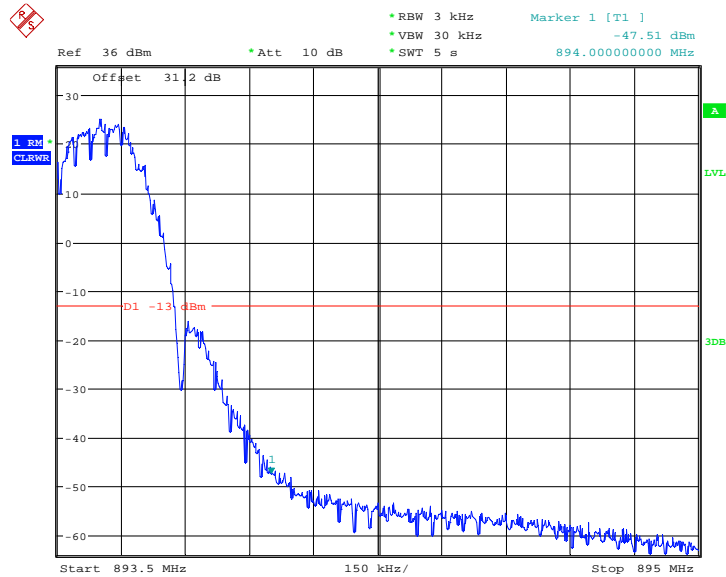
Date: 16.MAY.2011 12:01:38



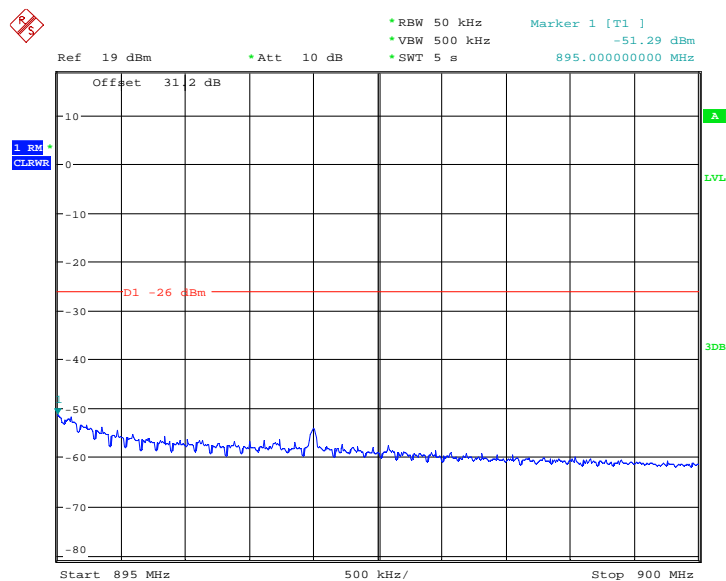
Date: 16.MAY.2011 10:42:46



Product Service

**8-PSK**

Date: 16.MAY.2011 10:52:31



Date: 16.MAY.2011 10:44:00

**Limit**

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least  $43 + 10\log P$  dB.



Product Service

## **2.6 RADIATED SPURIOUS EMISSIONS**

### **2.6.1 Specification Reference**

FCC CFR 47 Part 2, Clause 2.1053  
FCC CFR 47 Part 22, 22.917 (a)  
Industry Canada RSS-132, Clause 4.5

### **2.6.2 Equipment Under Test**

RRUN8-22 / KRC 161 170/4, S/N: TD3G730111

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

26 and 27 May 2011 – 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 2 and Part 22 and Industry Canada RSS-132.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations.

Emissions identified within the range 30MHz - 10GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz - 10GHz, the measurement was performed with a resolution bandwidth of 1MHz.

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 -  $(43 + 10\log(P))$  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:

$$E_{(v/m)} = (30 \times 1.64 \times 19.36)^{0.5} / 3 = 10.288V/m = 140.27dB\mu V/m$$

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

$$43 + 10\log(19.36) = 55.87dB$$

Therefore the limit at 3m measurement distance is:

$$140.27 - 55.87 = 84.4dB\mu V/m$$

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

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

Configuration 1 - Mode 1  
 - Mode 2  
 - Mode 3

### **2.6.6 Environmental Conditions**

	26 May 2011	27 May 2011
Ambient Temperature	26.1°C	27.0°C
Relative Humidity	51.0%	51.4%



## 2.6.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 & Part 22 and Industry Canada RSS-132 for Radiated Spurious Emissions.

The test results are shown below

### **Configuration 1 - Mode 1**

No emissions were detected within 20dB of the limit.

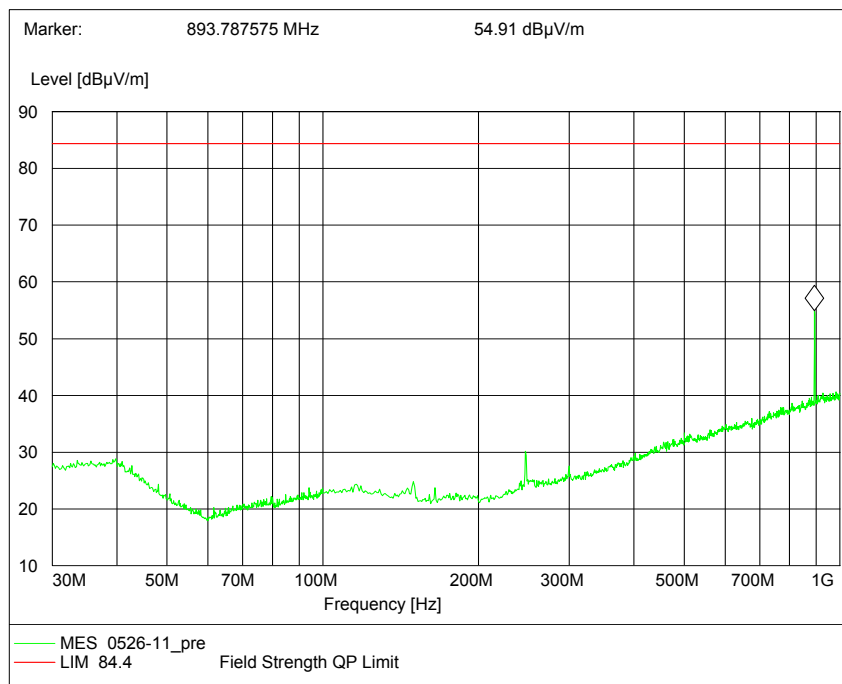
### **Configuration 1 - Mode 2**

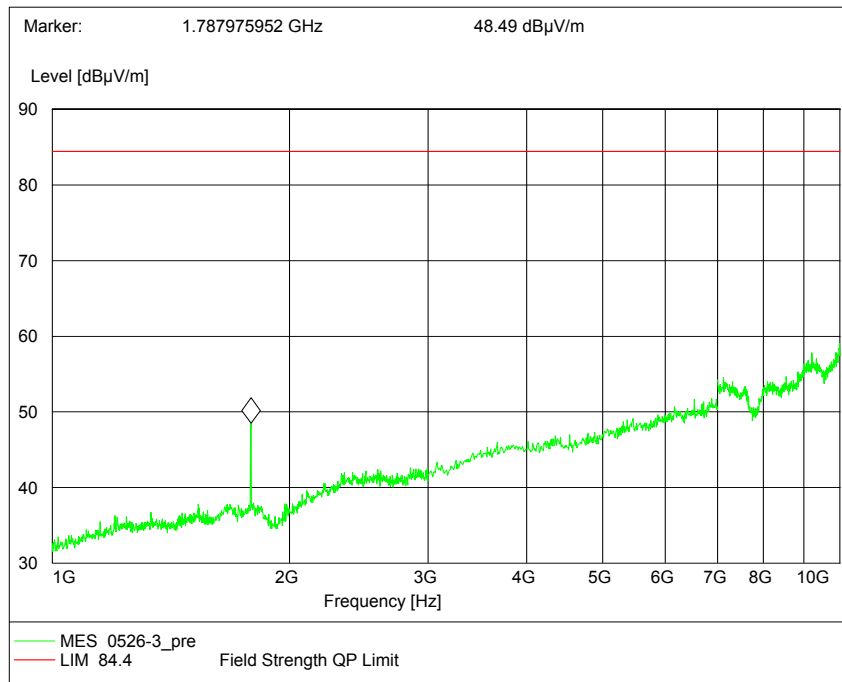
No emissions were detected within 20dB of the limit.

### **Configuration 1 - Mode 3**

GMSK

30MHz-1GHz



1GHz-10GHz8PSK

No emissions were detected within 20dB of the limit.

Limit	-13dBm / 84.4dBμV/m
-------	---------------------

Remarks

The EUT does not exceed -13dBm / 84.4dBμV/m at the measured frequencies.



Product Service

## **2.7 CONDUCTED SPURIOUS EMISSIONS**

### **2.7.1 Specification Reference**

FCC CFR 47 Part 2, Clause 2.1051  
FCC CFR 47 Part 22, Clause 22.917 (a)  
Industry Canada RSS-132, Clause 4.5

### **2.7.2 Equipment Under Test**

RRUN8-22 / KRC 161 170/4, S/N: TD3G730111

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

13 May 2011 – 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 2 and Part 22 and Industry Canada RSS-132.

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 9kHz to 10GHz. The EUT was set to transmit on maximum power. The resolution was set to 1MHz for 9kHz to 10GHz as the worst case thus meeting the requirements of Part 22.917 (b). The spectrum analyser detector was set to peak and trace was kept on Max Hold.

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





Product Service

## 2.7.6 Environmental Conditions

13 May 2011

Ambient Temperature 24.9°C

Relative Humidity 38.9%

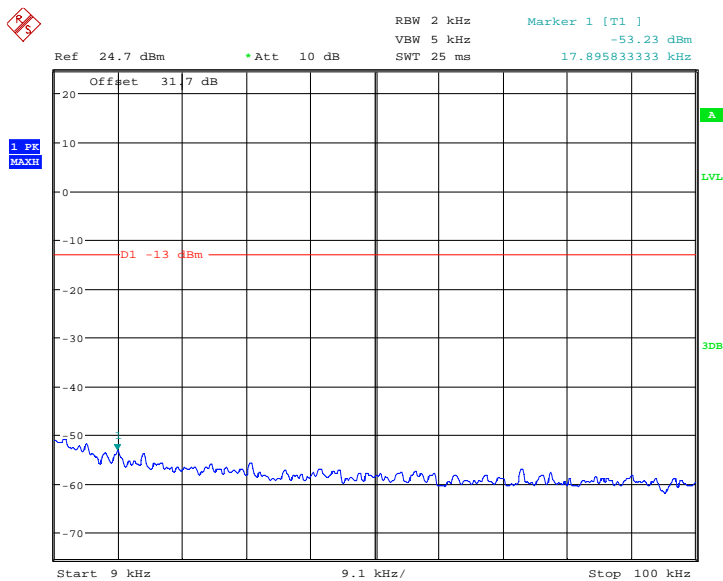
## 2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-132 for Conducted Spurious Emissions.

The test results are shown below

Remark:

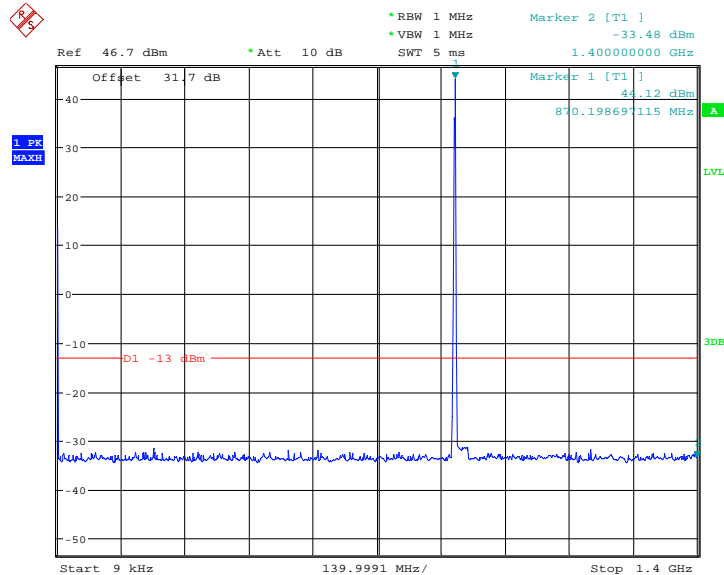
The emissions at 9kHz on the plots was not generated by the test object. A complementary measurement with a smaller Span showed that it was related to the LO feedthrough.



Date: 13.MAY.2011 10:18:22

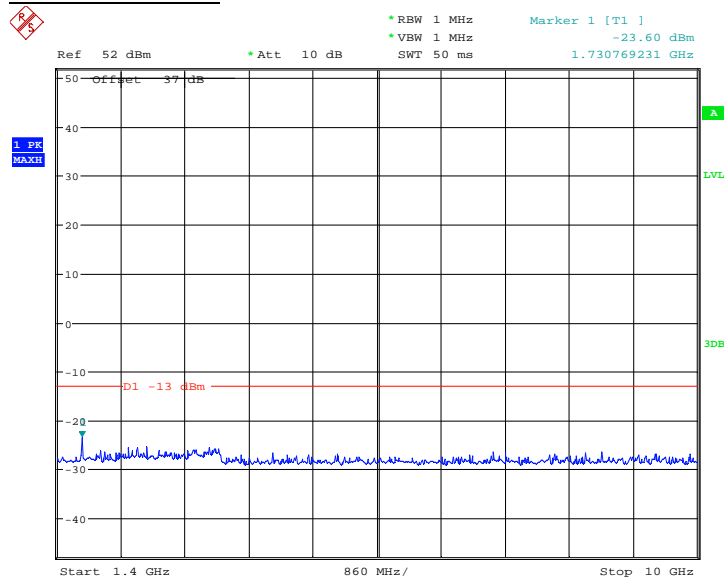


Product Service

**GMSK****Configuration 1 - Mode 1****9kHz to 1.4GHz**

Date: 13.MAY.2011 09:32:29

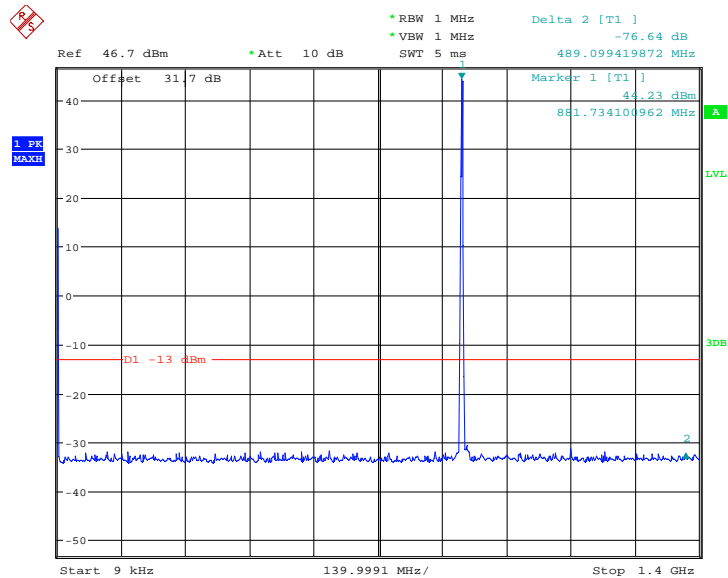
Note: The emission beyond the limit is the operating frequency.

**1.4GHz to 10GHz**

Date: 13.MAY.2011 09:59:06

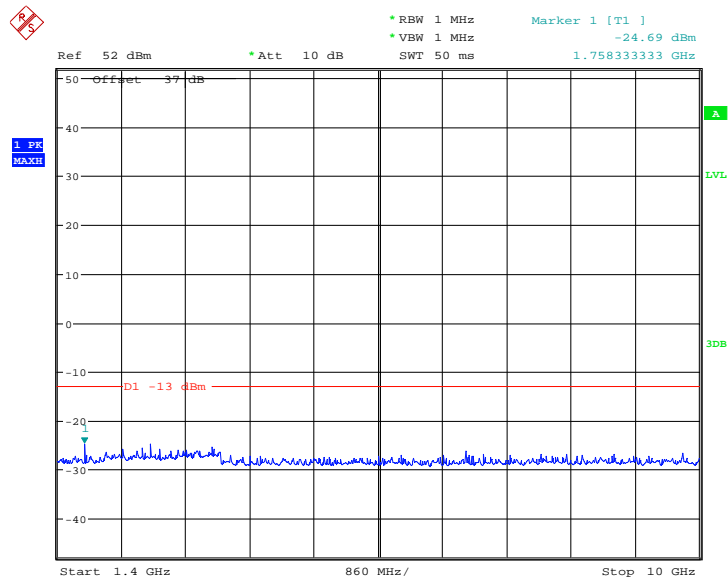


Product Service

Configuration 1 - Mode 29kHz to 1.4GHz

Date: 13.MAY.2011 09:38:04

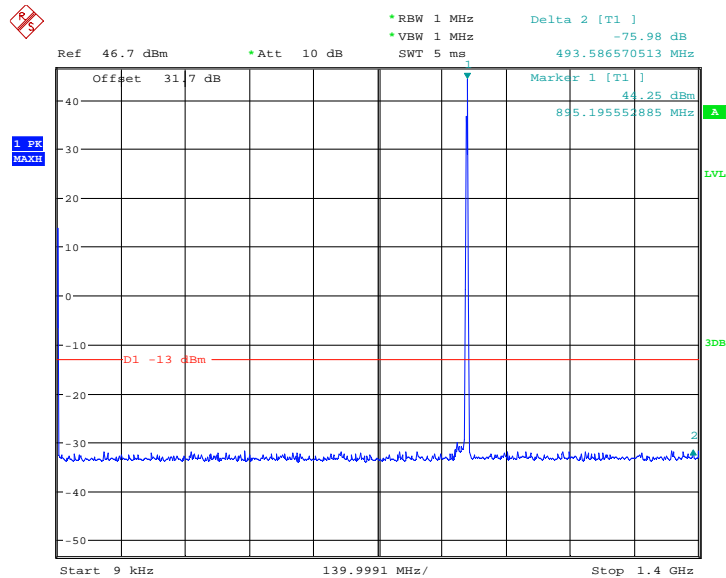
Note: The emission beyond the limit is the operating frequency.

1.4GHz to 10GHz

Date: 13.MAY.2011 10:01:13

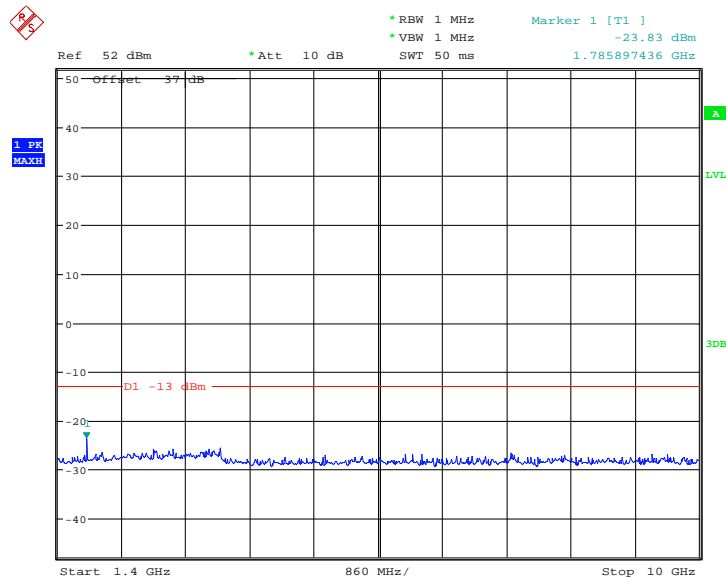


Product Service

Configuration 1 - Mode 39kHz to 1.4GHz

Date: 13.MAY.2011 09:45:00

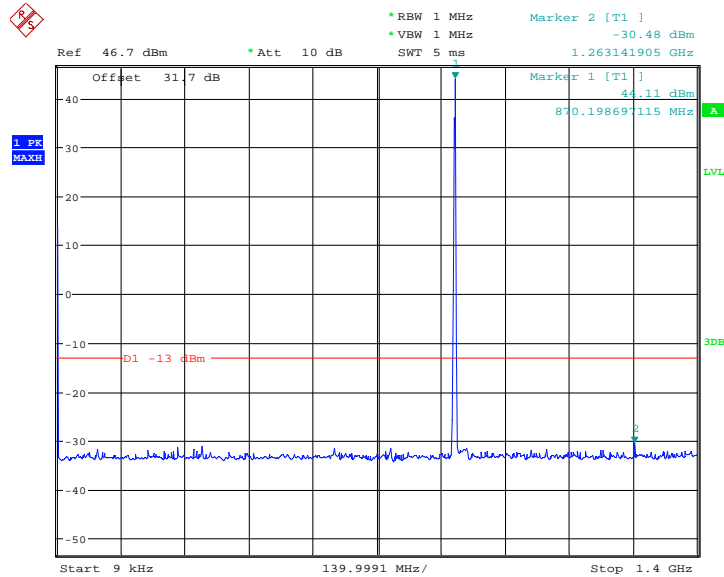
Note: The emission beyond the limit is the operating frequency.

1.4GHz to 10GHz

Date: 13.MAY.2011 10:04:18

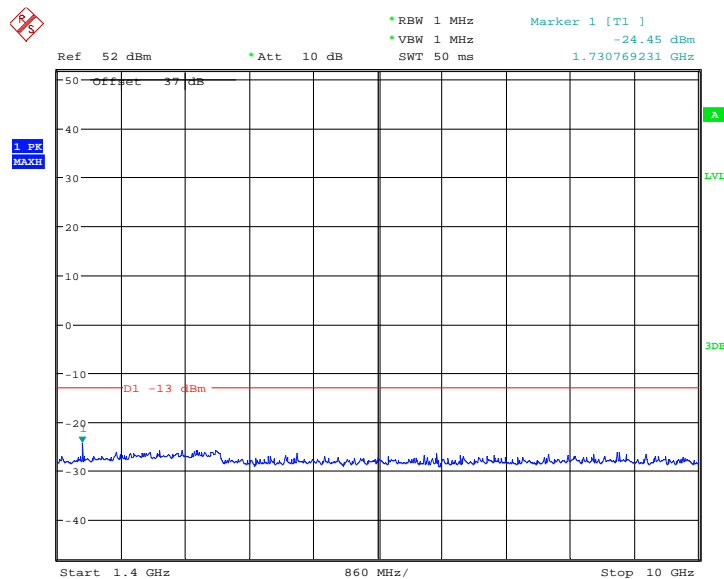


Product Service

**8-PSK****Configuration 1 - Mode 1****9kHz to 1.4GHz**

Date: 13.MAY.2011 09:34:48

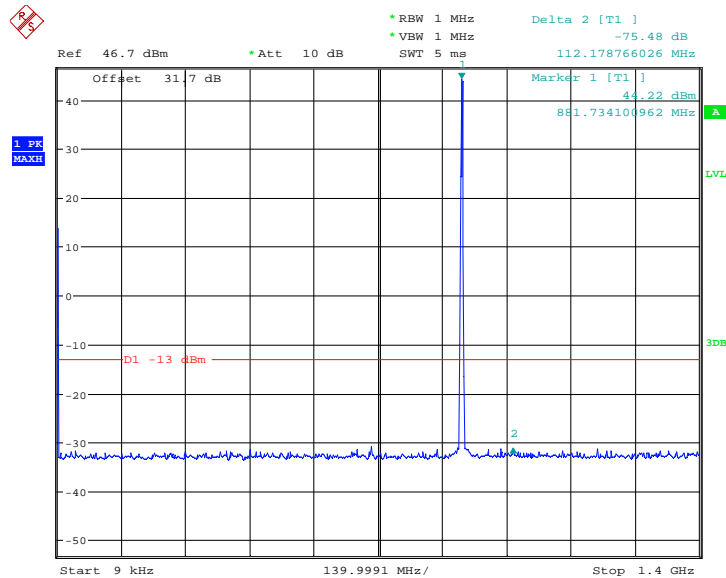
Note: The emission beyond the limit is the operating frequency.

**1.4GHz to 10GHz**

Date: 13.MAY.2011 10:00:23

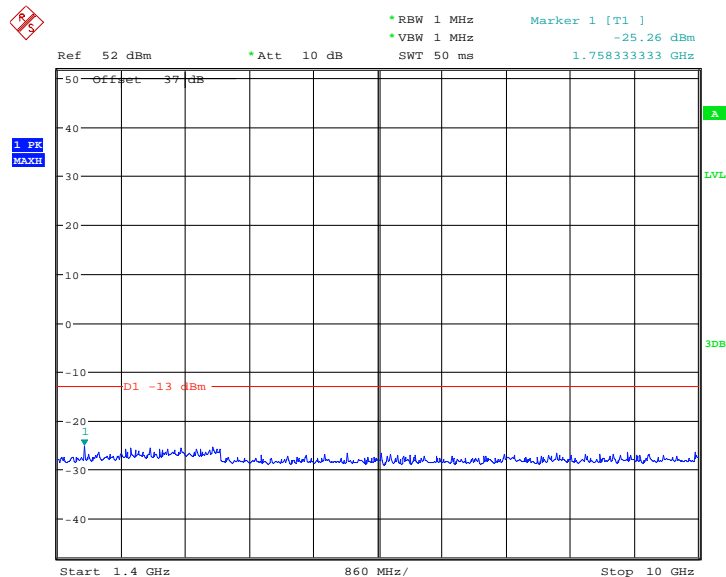


Product Service

Configuration 1 - Mode 29kHz to 1.4GHz

Date: 13.MAY.2011 09:41:25

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

1.4GHz to 10GHz

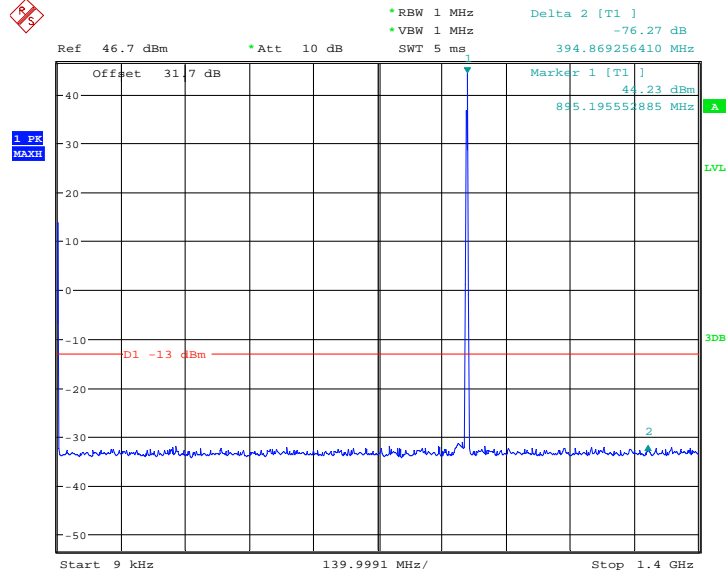
Date: 13.MAY.2011 10:01:54



Product Service

### Configuration 1 - Mode 3

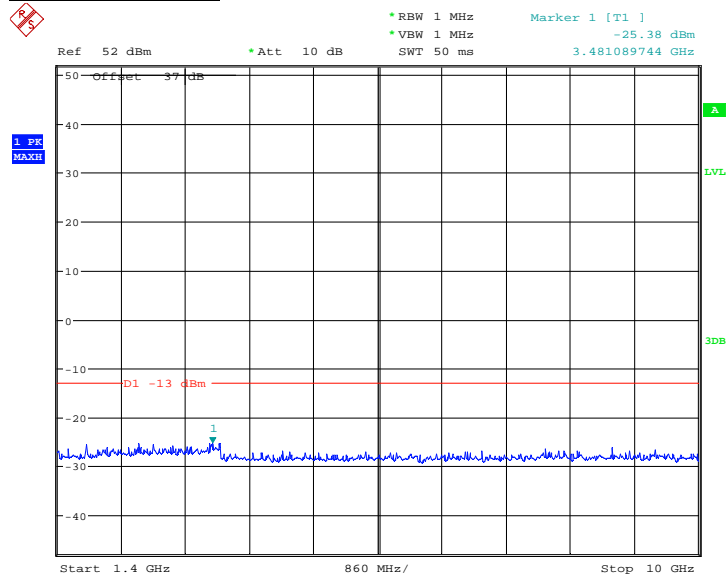
#### 9kHz to 1.4GHz



Date: 13.MAY.2011 09:45:55

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

#### 1.4GHz to 10GHz



Date: 13.MAY.2011 10:06:36

Limit	-13dBm
-------	--------

#### Remarks

The EUT does not exceed -13dBm at the frequency range of 9kHz to 10GHz.



Product Service

## **2.8 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS**

### **2.8.1 Specification Reference**

FCC CFR 47 Part 2, Clause 2.1055  
FCC CFR 47 Part 22, Clause 22.355  
Industry Canada RSS-132, Clause 4.3

### **2.8.2 Equipment Under Test**

RRUN8-22 / KRC 161 170/4, S/N: TD3G730111

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

17 May 2011 – 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 FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-132.

The EUT was set to transmit on maximum power. A Spectrum Analyser was used to measure the frequency error. The temperature was adjusted between -30°C and +50°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

### **2.8.6 Environmental Conditions**

	17 May 2011
Ambient Temperature	25.2°C
Relative Humidity	48.7%





## 2.8.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-132 for Frequency Stability Under Temperature Variations.

The test results are shown below

Power Supply: -48V DC

### Configuration 1 - Mode 2

#### GMSK

Temperature Interval (°C)	Deviation (Hz)
-30	-6.8
-20	3.91
-10	-3.13
0	-2.31
+10	-2.94
<b>+20</b>	<b>-2.07</b>
+30	-2.41
+40	-2.92
+50	-2.52

#### 8-PSK

Temperature Interval (°C)	Deviation (Hz)
-30	-8.61
-20	-4.81
-10	-3.69
0	-3.18
+10	-3.57
<b>+20</b>	<b>-2.41</b>
+30	-3.02
+40	-3.33
+50	-5.71

Limit	±1.5 ppm or ±1.322kHz
-------	-----------------------

#### 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.



Product Service

## **2.9 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS**

### **2.9.1 Specification Reference**

FCC CFR 47 Part 2, Clause 2.1055  
FCC CFR 47 Part 22, Clause 22.355  
Industry Canada RSS-132, Clause 4.3

### **2.9.2 Equipment Under Test**

RRUN8-22 / KRC 161 170/4, S/N: TD3G730111

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

17 May 2011 – 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 2 and Part 22 and Industry Canada RSS-132.

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

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

Configuration 1 - Mode 2

### **2.9.6 Environmental Conditions**

	17 May 2011
Ambient Temperature	25.2°C
Relative Humidity	48.7%



### 2.9.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-132 for Frequency Stability Under Voltage Variations.

The test results are shown below

Temperature: 20°C

#### Configuration 1 - Mode 2

##### GMSK

DC Voltage (V)	Deviation (Hz)
-40.8	-2.29
<b>-48.0</b>	<b>-2.07</b>
-55.2	-2.39

##### 8-PSK

DC Voltage (V)	Deviation (Hz)
-40.8	-3.59
<b>-48.0</b>	<b>-2.41</b>
-55.2	-3.64

Limit	±1.5 ppm or ±1.322kHz
-------	-----------------------

##### Remarks

The frequency stability of the EUT is sufficient to keep it within the authorised frequency ranges under voltage variations across the measured range.



## **2.10 RECEIVER SPURIOUS EMISSIONS**

### **2.10.1 Specification Reference**

FCC CFR 47 Part 15, Clause 15.111  
Industry Canada RSS-132, Clause 4.6

### **2.10.2 Equipment Under Test**

RRUN8-22 / KRC 161 170/4, S/N: TD3G730111

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

13 May 2011 – 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 15 and Canada RSS-132.

In accordance with RSS-Gen Clause 6.2, the receiver spurious emissions from the antenna terminal were measured. Measurements were performed on the receiver antenna connector Ant B. The EUT was set to transmitter mode on the TX connector Ant A and during the measurement the Ant A was terminated with match load, (50 Ohm).

The resolution was set to 1MHz in the frequency range 9kHz to 5GHz thus meeting the requirements of RSS-Gen Clause 4.10, the spectrum analyser detector was set to peak and trace was kept on Max Hold to give the worst case. The limit line was displayed, showing the -57dBm, 2 nanowatts in band 9kHz to 1GHz and above 1GHz, -53dBm, 5 nanowatts.

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

In addition, measurements were made from 9kHz up to the 5<sup>th</sup> harmonic of the fundamental.

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

Configuration 1 - Mode 1  
                          Mode 2  
                          Mode 3

### **2.10.6 Environmental Conditions**

13 May 2011

Ambient Temperature 24.9°C

Relative Humidity 38.9%



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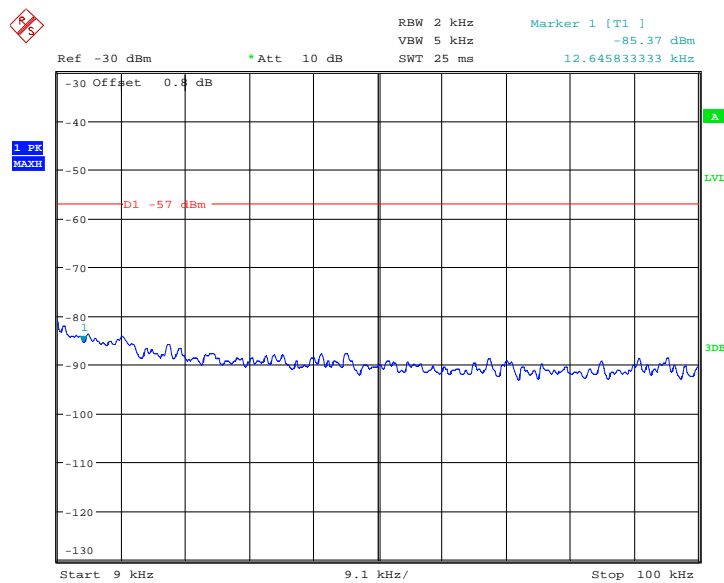
### 2.10.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-132 for Receiver Spurious Emissions.

The test results are shown below

Remark:

The emissions at 9kHz on the plots was not generated by the test object. A complementary measurement with a smaller Span showed that it was related to the LO feedthrough.



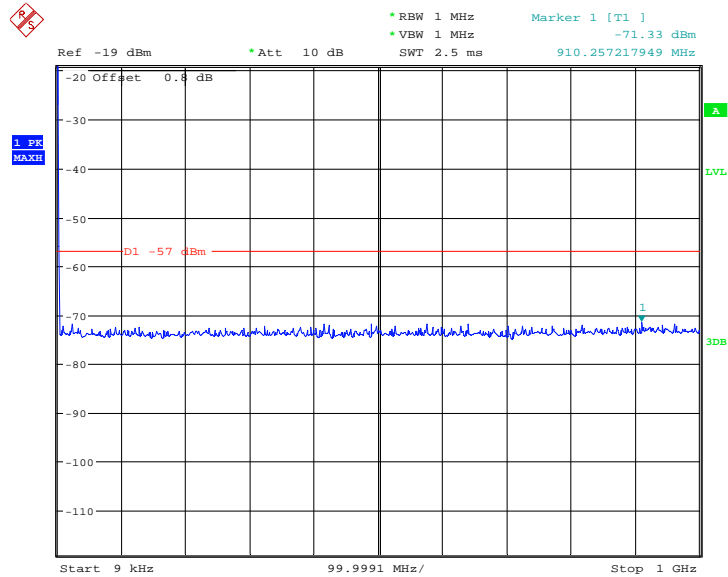
Date: 13.MAY.2011 10:57:50



**GMSK**

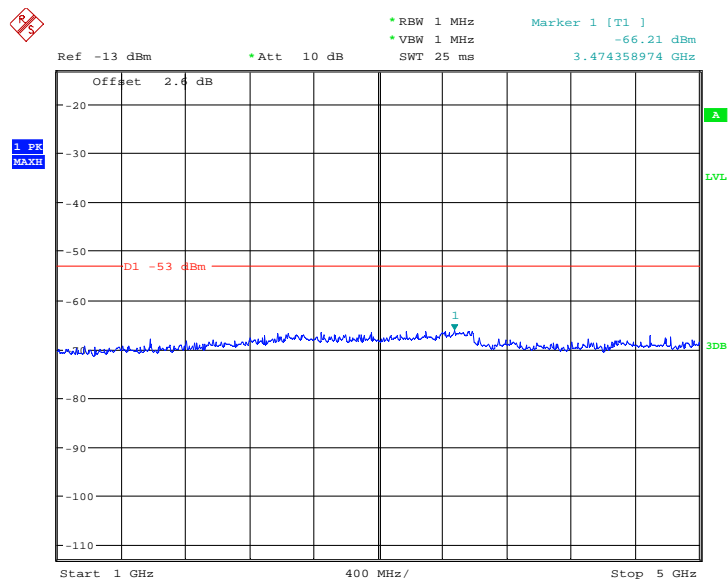
### Configuration 1 - Mode 1

9kHz to 1GHz

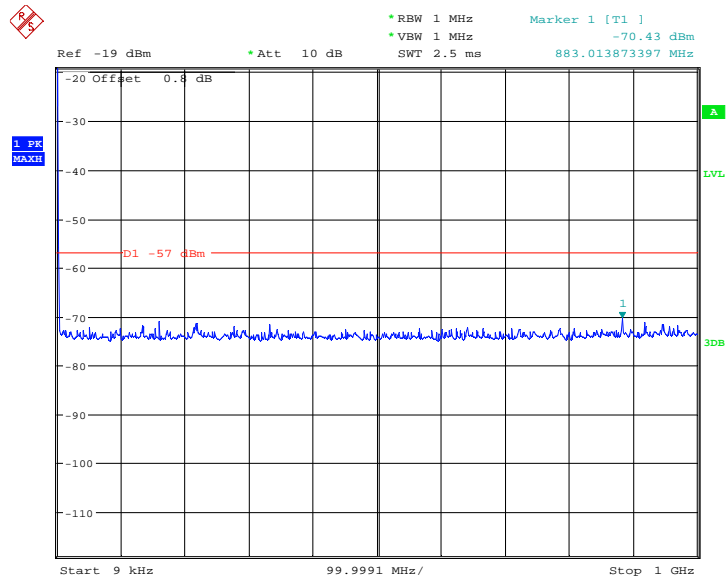


Date: 13.MAY.2011 10:34:08

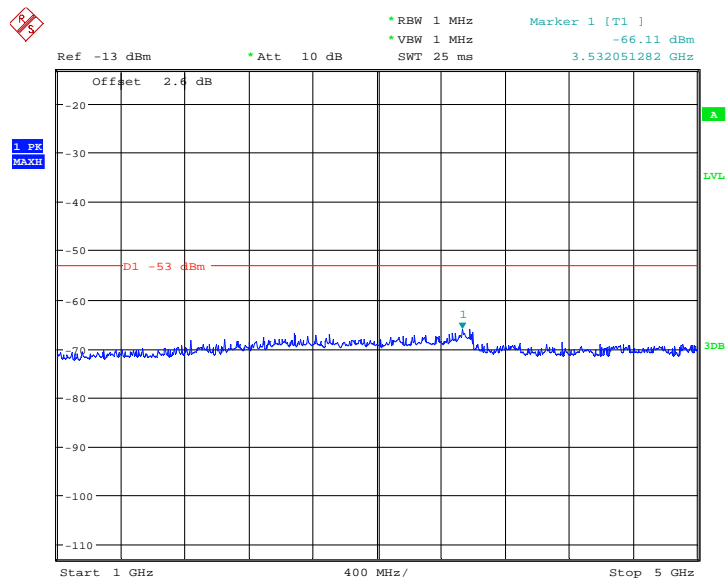
1GHz to 5GHz



Date: 13.MAY.2011 10:42:56

**Configuration 1 - Mode 2****9kHz to 1GHz**

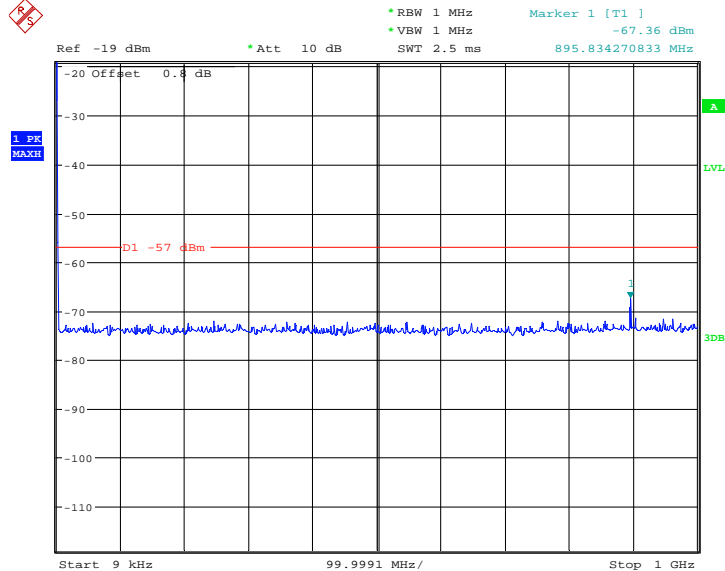
Date: 13.MAY.2011 10:35:49

**1GHz to 5GHz**

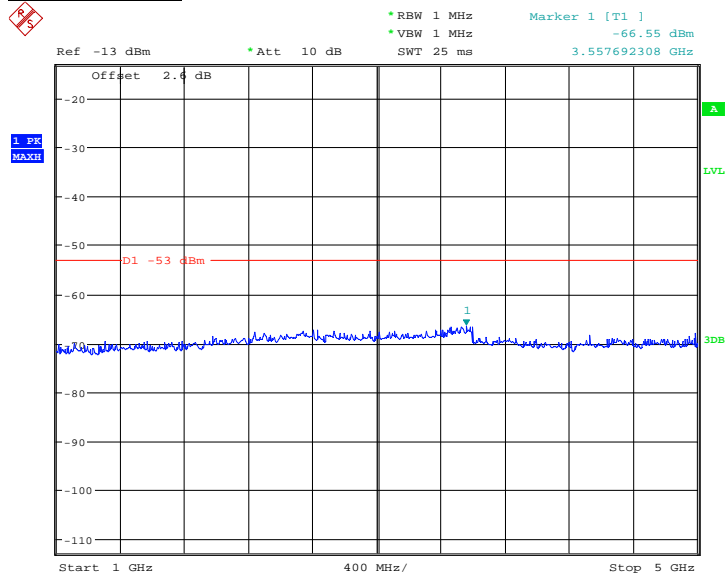
Date: 13.MAY.2011 10:40:25



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**Configuration 1 - Mode 3****9kHz to 1GHz**

Date: 13.MAY.2011 10:38:20

**1GHz to 5GHz**

Date: 13.MAY.2011 10:39:34

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

The EUT does not exceed -57dBm at the frequency range of 9kHz to 1GHz and does not exceed -53dBm at the frequency range of 1GHz to 5GHz.





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## **SECTION 3**

### **TEST EQUIPMENT USED**



### 3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
<b>Section 2.1, 2.2, 2.3, 2.4, 2.5, 2.7 and 2.10 – Maximum Conducted Output Power, Peak – Average Ratio, Modulation Characteristics, Occupied Bandwidth, Spurious Emissions at Antenna Terminals (<math>\pm 1</math> MHz), Conducted Spurious Emissions and Receiver Spurious Emissions.</b>					
Spectrum Analyser	Rohde & Schwarz	FSQ26	200759	12	27-Mar-2012
Singnal Analyser	Agilent	MXA N9020A	MY50200544	12	27-Mar-2012
Power Metre	Rohde & Schwarz	NRP	102624	12	27-Mar-2012
Thermal Power Sensor	Rohde & Schwarz	NRP-Z21	101644	12	27-Mar-2012
Network Analyzer	Agilent	8720D	US38431317	12	24-Aug-2011
30dB Attenuator	Lucas Weinschel	48-40-34	BA2851	-	O/P MON
High-pass Filter	K&L	FRGV-01	8	-	O/P MON
Load	Shanghai Huaxiang	TF150-3	090323432	-	O/P MON
Power Supply	Dahua	DH1716-5D	4001375	-	O/P MON
Power Supply	Dahua	DH1716A-14	-	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	03-Jan-2012
Thermo-hygrometer	AZ Instruments	8705	9151655	12	24-Aug-2011
<b>Section 2.6 – Radiated Spurious Emissions</b>					
Load	Shanghai Huaxiang	TF100	09121626	-	O/P MON
Load	Shanghai Huaxiang	TF100	08011710	-	O/P MON
EMI Receiver	Rohde & Schwarz	ESI 40	100015	12	19-Aug-2011
Ultra log test antenna	Rohde & Schwarz	HL 562	100167	12	19-Aug-2011
Double-Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2011
Antenna master	Frankonia	MA 260	-	12	19-Aug-2011
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18m×16.88m ×9.60m	-	12	19-Aug-2011
Power Supply	Dahua	DH1716-5D	2008040003	-	O/P MON
Power Supply	Dahua	DH1716A-10	1000303181	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	03-Jan-2012
Thermo-hygrometer	AZ Instruments	8705	9151655	12	24-Aug-2011
<b>Section 2.8 and 2.9 – Frequency Stability Under Temperature and Voltage Variations</b>					
Spectrum Analyser	Rohde & Schwarz	FSQ26	20-300934	12	28-Jul-2011
30dB Attenuator	Lucas Weinschel	48-40-34	BA2851	-	O/P MON
Load	Shanghai Huaxiang	TF150-3	090323432	-	O/P MON
Temperature Chamber	ZUNDAR	ZT100U	10080064	-	O/P MON
Power Supply	Dahua	DH1716-5D	4001375	-	O/P MON
Power Supply	Dahua	DH1716A-14	-	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	03-Jan-2012

N/A – Not Applicable

O/P MON - Output monitored with calibration equipment



### 3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30MHz to 10GHz Amplitude	0.5dB*
Conducted Emissions	30MHz to 40GHz Amplitude	3.0dB*
Frequency Stability	30MHz to 2GHz Amplitude	$<1 \times 10^{-7}$
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Worst case error for both Time and Frequency measurement 12 parts in $10^6$		

\* In accordance with CISPR 16-4



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## **SECTION 4**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



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#### 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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Results of tests not covered by our UKAS Accreditation Schedule are marked NUA  
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