

Report On

FCC and Industry Canada Testing of the
Ericsson AB
RRUS 01 B2 / KRC 118 74/1

COMMERCIAL-IN-CONFIDENCE

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IC ID: 287AB-AS118741

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March 2011





Product Service

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Ericsson AB
RRUS 01 B2 / KRC 118 74/1

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PREPARED BY


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APPROVED BY


M J Hardy
Authorised Signatory

DATED

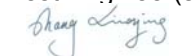
07 March 2011

This report has been up-issued to Issue 2 due to correct some typing errors.

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

Test Engineer(s);


X Zhang


C Zhang





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Product Service

SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Ericsson AB
RRUS 01 B2 / KRC 118 74/1



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson AB RRUS 01 B2 / KRC 118 74/1 to the requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133.

Testing was carried out in support of an application for Grant of Equipment Authorisation in the name of RRUS 01 B2 / KRC 118 74/1.

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 AB
Product Name	RRUS 01 B2
Part Number	KRC 118 74/1
IC Model Name	AS118741
Serial Number(s)	CB4G022478
Software Version	CXP1040007_04R29E
Hardware Version	R1A
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 24: 2009 Industry Canada RSS-133: 2009
Incoming Release Date	Declaration of Build Status 17 January 2011
Order Number Date	PTP 14 January 2011
Start of Test	17 January 2011
Finish of Test	15 February 2011
Name of Engineer(s)	X Zhang C Zhang
Related Document(s)	ANSI C63.4: 2009 FCC CFR 47 Part 2: 2009 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 24 and Industry Canada RSS-133, is shown below.

Configuration 1 – Base Station							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 24	RSS-133 and RSS-GEN					
	24.232 (a)	6.4	Effective Radiated Power	1930.2MHz		N/A	No integral antenna.
				1960.0MHz		N/A	
				1989.8MHz		N/A	
				1930.2MHz + 1945.0MHz		N/A	
				1960.0MHz + 1974.8MHz		N/A	
				1975.0MHz + 1989.8MHz		N/A	
				1930.2MHz + 1935.0MHz + 1940.0MHz + 1944.8MHz		N/A	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz		N/A	
				1975.2MHz + 1980.0MHz + 1985.0MHz + 1989.8MHz		N/A	
2.1	2.1046, 24.232 (a)	6.4	Maximum Peak Output Power - Conducted	1930.2MHz	0	Pass	-
				1960.0MHz	0	Pass	
				1989.8MHz	0	Pass	
				1930.2MHz + 1945.0MHz	0	Pass	
				1960.0MHz + 1974.8MHz	0	Pass	
				1975.0MHz + 1989.8MHz	0	Pass	
				1930.2MHz + 1935.0MHz + 1940.0MHz + 1944.8MHz	0	Pass	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz	0	Pass	
				1975.2MHz + 1980.0MHz + 1985.0MHz + 1989.8MHz	0	Pass	
2.2	24.232 (d)	-	Peak – Average Ratio	1930.2MHz	0	Pass	-
				1960.0MHz	0	Pass	
				1989.8MHz	0	Pass	
				1930.2MHz + 1945.0MHz	0	Pass	
				1960.0MHz + 1974.8MHz	0	Pass	
				1975.0MHz + 1989.8MHz	0	Pass	
				1930.2MHz + 1935.0MHz + 1940.0MHz + 1944.8MHz	0	Pass	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz	0	Pass	
				1975.2MHz + 1980.0MHz + 1985.0MHz + 1989.8MHz	0	Pass	



Configuration 1 – Base Station							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 24	RSS-133 and RSS-GEN					
2.3	2.1047 (d)	6.2	Modulation Characteristics	1930.2MHz		N/A	Technical description provided
				1960.0MHz	0	Pass	
				1989.8MHz		N/A	
				1930.2MHz + 1945.0MHz		N/A	
				1960.0MHz + 1974.8MHz		N/A	
				1975.0MHz + 1989.8MHz		N/A	
				1930.2MHz + 1935.0MHz + 1940.0MHz + 1944.8MHz		N/A	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz		N/A	
				1975.2MHz + 1980.0MHz + 1985.0MHz + 1989.8MHz		N/A	
2.4	2.1049, 24.238 (b)	RSS-Gen 4.6.1	Occupied Bandwidth	1930.2MHz	0	Pass	-
				1960.0MHz	0	Pass	
				1989.8MHz	0	Pass	
				1930.2MHz + 1945.0MHz		N/A	
				1960.0MHz + 1974.8MHz		N/A	
				1975.0MHz + 1989.8MHz		N/A	
				1930.2MHz + 1935.0MHz + 1940.0MHz + 1944.8MHz		N/A	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz		N/A	
				1975.2MHz + 1980.0MHz + 1985.0MHz + 1989.8MHz		N/A	
2.5	2.1051, 24.238 (b)	6.5	Spurious Emissions at Antenna Terminals (±1MHz)	1930.4MHz	0	Pass	The channel adjacent to the lower and higher band-edge cannot be used. The lowest usable channel is 513(1930.4MHz), the highest usable channel is 809(1989.6MHz)
				1960.0MHz		N/A	
				1989.6MHz	0	Pass	
				1930.4MHz + 1930.8MHz	0	Pass	
				1960.0MHz + 1974.8MHz		N/A	
				1989.2MHz + 1989.6MHz	0	Pass	
				1930.4MHz + 1930.8MHz + 1931.2MHz + 1931.6MHz	0	Pass	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz		N/A	
				1988.4MHz + 1988.8MHz + 1989.2MHz + 1989.6MHz	0	Pass	



Configuration 1 – Base Station							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 24	RSS-133 and RSS-GEN					
2.6	2.1053, 24.238 (a)	6.5	Radiated Spurious Emissions	1930.2MHz	0	Pass	-
				1960.0MHz	0	Pass	
				1989.8MHz	0	Pass	
				1930.2MHz + 1945.0MHz	0	Pass	
				1960.0MHz + 1974.8MHz	0	Pass	
				1975.0MHz + 1989.8MHz	0	Pass	
				1930.2MHz + 1935.0MHz + 1940.0MHz + 1944.8MHz		N/A	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz		N/A	
				1975.2MHz + 1980.0MHz + 1985.0MHz + 1989.8MHz		N/A	
2.7	2.1051, 24.238 (a)	6.5	Conducted Spurious Emissions	1930.2MHz	0	Pass	-
				1960.0MHz	0	Pass	
				1989.8MHz	0	Pass	
				1930.2MHz + 1945.0MHz	0	Pass	
				1960.0MHz + 1974.8MHz	0	Pass	
				1975.0MHz + 1989.8MHz	0	Pass	
				1930.2MHz + 1935.0MHz + 1940.0MHz + 1944.8MHz	0	Pass	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz	0	Pass	
				1975.2MHz + 1980.0MHz + 1985.0MHz + 1989.8MHz	0	Pass	
2.8	2.1055, 24.235	6.3	Frequency Stability Under Temperature Variations	1930.2MHz		N/A	-
				1960.0MHz	0	Pass	
				1989.8MHz		N/A	
				1930.2MHz + 1945.0MHz		N/A	
				1960.0MHz + 1974.8MHz		N/A	
				1975.0MHz + 1989.8MHz		N/A	
				1930.2MHz + 1935.0MHz + 1940.0MHz + 1944.8MHz		N/A	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz		N/A	
				1975.2MHz + 1980.0MHz + 1985.0MHz + 1989.8MHz		N/A	



Configuration 1 – Base Station							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 24	RSS-133 and RSS-GEN					
2.9	2.1055, 24.235	6.3	Frequency Stability Under Voltage Variations	1930.2MHz		N/A	-
				1960.0MHz	0	Pass	
				1989.8MHz		N/A	
				1930.2MHz + 1945.0MHz		N/A	
				1960.0MHz + 1974.8MHz		N/A	
				1975.0MHz + 1989.8MHz		N/A	
				1930.2MHz + 1935.0MHz + 1940.0MHz + 1944.8MHz		N/A	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz		N/A	
				1975.2MHz + 1980.0MHz + 1985.0MHz + 1989.8MHz		N/A	
2.10	-	6.6	Receiver Spurious Emissions	1930.2MHz	0	Pass	-
				1960.0MHz	0	Pass	
				1989.8MHz	0	Pass	
				1930.2MHz + 1945.0MHz		N/A	
				1960.0MHz + 1974.8MHz		N/A	
				1975.0MHz + 1989.8MHz		N/A	
				1930.2MHz + 1935.0MHz + 1940.0MHz + 1944.8MHz		N/A	
				1955.2MHz + 1960.0MHz + 1965.0MHz + 1969.8MHz		N/A	
				1975.2MHz + 1980.0MHz + 1985.0MHz + 1989.8MHz		N/A	

N/A – Not Applicable



Product Service

1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Equipment
MANUFACTURER	Ericsson AB
PRODUCT NAME	RRUS 01 B2
PART NUMBER	KRC 118 74/1
IC Model Name	AS118741
SERIAL NUMBER	CB4G022478
HARDWARE VERSION	R1A
SOFTWARE VERSION	CXP1040007_04R29E
TRANSMITTER OPERATING RANGE	TX: 1930.4MHz - 1989.6MHz RX: 1850.4MHz - 1909.6MHz
MODULATIONS	GMSK, 8-PSK
INTERMEDIATE FREQUENCIES	--
ITU DESIGNATION OF EMISSION	250KGXW 250KG7W
OUTPUT POWER (RMS) (W or dBm)	Single Carrier: 1 x 47.8dBm (1 x 60W) Multi Carrier (x 2): 2 x 44.8dBm (2 x 30W) Multi Carrier (x 4): 4 x 41.8dBm (4 x 15W)
FCC ID	TA8AKRC11874-1
IC ID	287AB-AS118741
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is the Radio Part of GSM Base Station.

Signature

Date

31 January 2011

D of B S Serial No

75912429 /01

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



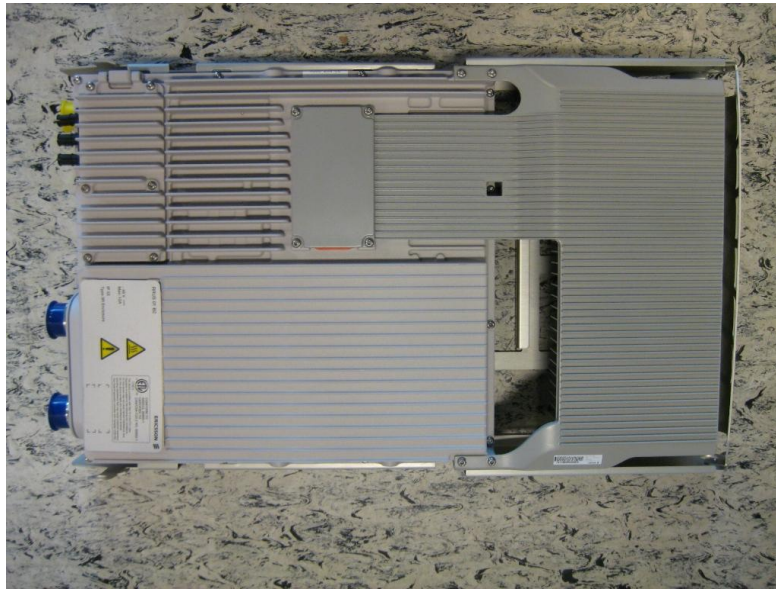
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1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) RRUS 01 B2 / KRC 118 74/1 is an Ericsson AB Radio Equipment working in the public mobile service 1900MHz band which provides communication connections to GSM1900 network. The RRUS 01 B2 / KRC 118 74/1 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



Product Service

1.4.2 Test Configuration

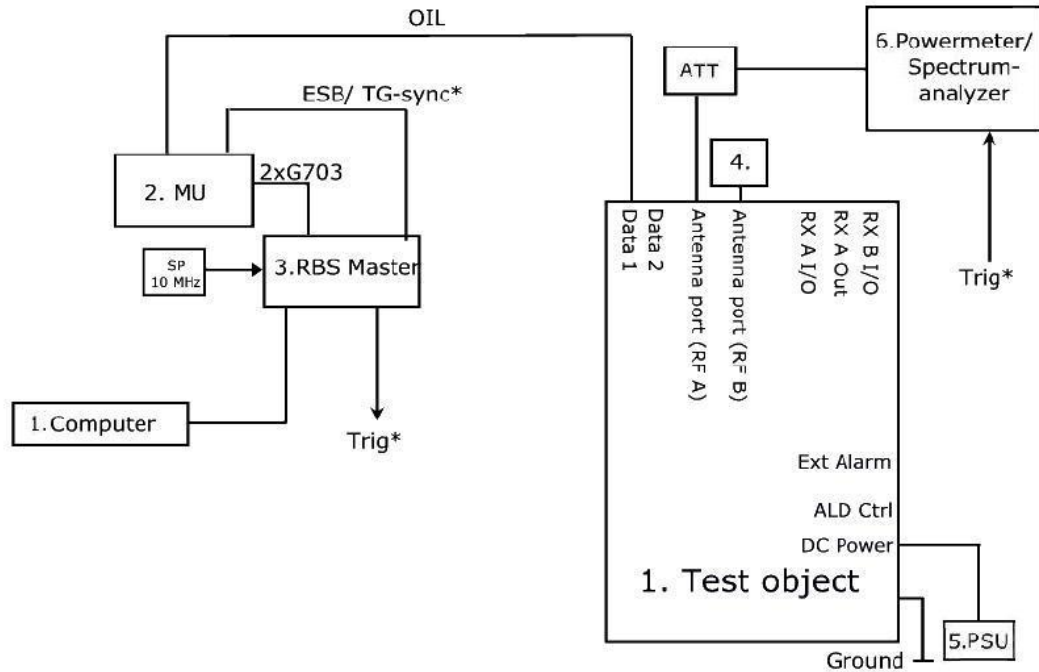
Configuration 1: Base Station

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

The RRUS 01 B2 / KRC 118 74/1 supports both GMSK and 8-PSK modulations at 1900MHz, the unit includes a TRX port and a RX port. All RF conducted TX tests were performed on the TRX RF output connector and the RX test was performed on the RX connector. The complete testing was performed with the test object transmitting pseudorandom data in all timeslots at maximum RF power unless otherwise stated. Both modulations GMSK and 8-PSK were tested. The EUT was powered by a -48V DC Power supply.

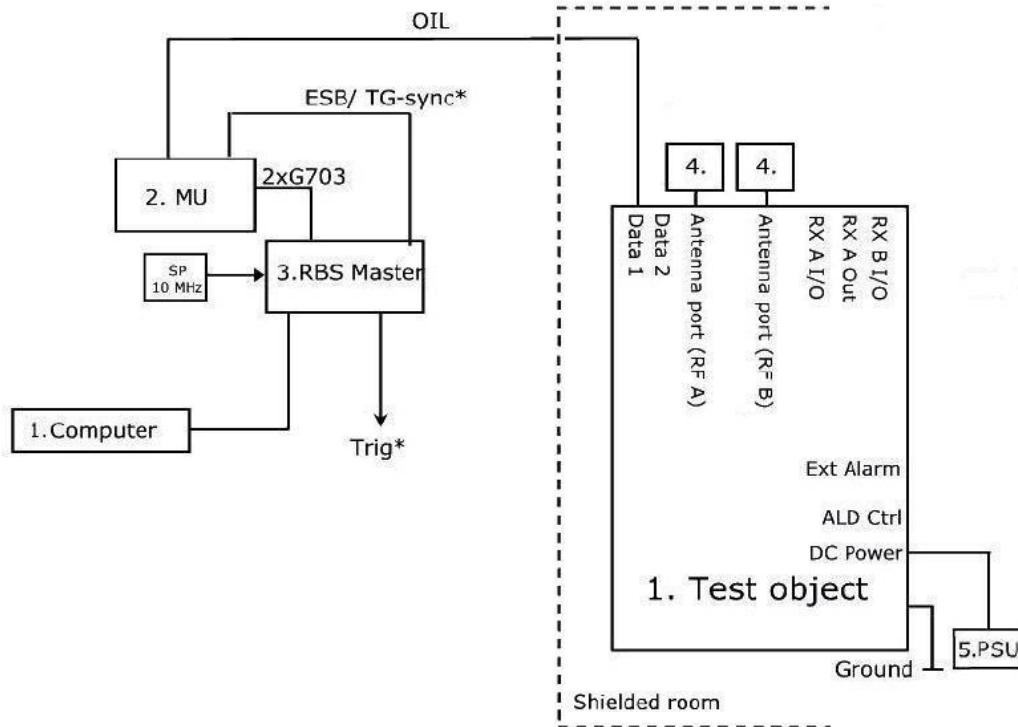


Product Service

Test Setup, Conducted Measurement:

Test Object	Part Number	Version	Serial Number
Radio Part	RRUS 01 B2 / KRC 118 74/1	R1A	CB4G022478

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	Sun Blade 1500	--	MT41130005
2	RBS 6601	BFL901009/1	--	--
	Main Unit DUG 2001	KDU137569/1	R2A	CB23659480
	Main Unit SUP 6601	1/BFL901009/1	R3A	BR80993662
3	RBS Master	LPY1071007/3	R1C	T01E050909
4	Load	TF150-3	--	090323436
5	Power Supply	DH1716-5D	--	2008040018
6	Power Metre	Rohde & Schwarz NRP	--	102431
7	Thermal Power Sensor	Rohde & Schwarz NRP-Z51	--	102126
	Spectrum Analyzer	FSQ26	--	200761

**Test Setup, Radiated Measurement:**

Test Object	Part Number	Version	Serial Number
Radio Part	RRUS 01 B2 / KRC 118 74/1	R1A	CB4G022478

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	Sun Blade 1500	--	MT41130005
2	RBS 6601	BFL901009/1	--	--
	Main Unit DUG 2001	KDU137569/1	R2A	CB23659480
	Main Unit SUP 6601	1/BFL901009/1	R3A	BR80993662
3	RBS Master	LPY1071007/3	R1C	T01E050909
4	Load	TF150-3	--	090323436
	Load	TF100	--	09121641
5	Power Supply	DH1716-5D	--	2008040018



1.4.3 Modes of Operation

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

For all test cases except Emissions at Antenna Terminals (± 1 MHz), the following modes of operation were used:

Mode 1 - ARFCN 512: 1930.2 MHz (Bottom Channel)

Mode 2 - ARFCN 661: 1960.0 MHz (Middle Channel)

Mode 3 - ARFCN 810: 1989.8 MHz (Top Channel)

Mode 4 - ARFCN 512 + 586: 1930.2 MHz + 1945.0 MHz (B and B+14.8 MHz)

Mode 5 - ARFCN 661 + 735: 1960.0 MHz + 1974.8 MHz (M and M+14.8 MHz)

Mode 6 - ARFCN 810 + 736: 1975.0 MHz + 1989.8 MHz (T and T-14.8 MHz)

Mode 7 - ARFCN 512 + 536 + 561 + 585:
1930.2 MHz + 1935.0 MHz + 1940.0 MHz + 1944.8 MHz (B, B+4.8 MHz, B+9.8 MHz and B+14.8 MHz)

Mode 8 - ARFCN 637 + 661 + 686 + 710:
1955.2 MHz + 1960.0 MHz + 1965.0 MHz + 1969.8 MHz (M-4.8 MHz, M, M+5.0 MHz and M+9.8 MHz)

Mode 9 - ARFCN 737 + 761 + 786 + 810 :
1975.2 MHz + 1980.0 MHz + 1985.0 MHz + 1989.8 MHz (T, T-4.8 MHz, T-9.8 MHz and T-14.8 MHz)

For test case Spurious Emissions at Antenna Terminals (± 1 MHz), the following modes of operation were used:

Mode 1' - ARFCN 513: 1930.4 MHz (B+1 Channel)

Mode 3' - ARFCN 810: 1989.6 MHz (T-1 Channel)

Mode 4' - ARFCN 513 + 515: 1930.4 MHz + 1930.8 MHz (B+1 and B+3 Channels)

Mode 6' - ARFCN 807 + 809: 1989.2 MHz + 1989.6 MHz (T-1 and T-3 Channels)

Mode 7' - ARFCN 513 + 515 + 517 + 519:
1930.4 MHz + 1930.8 MHz + 1931.2 MHz + 1931.6 MHz (B+1, B+3, B+5 and B+7 Channels)

Mode 9' - ARFCN 803 + 805 + 807 + 809:
1988.4 MHz + 1988.8 MHz + 1989.2 MHz + 1989.6 MHz (T-1, T-3, T-5 and T-7 Channels)

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 an open test area 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.



Product Service

SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
Ericsson AB
RRUS 01 B2 / KRC 118 74/1



Product Service

2.1 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2.1046
FCC CFR 47 Part 24, Clause 24.232 (a)
Industry Canada RSS-133, Clause 6.4

2.1.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/1, S/N: CB4G022478

2.1.3 Date of Test and Modification State

15 February 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 24 and Industry Canada RSS-133.

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 and 8-PSK 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
 - Mode 4
 - Mode 5
 - Mode 6
 - Mode 7
 - Mode 8
 - Mode 9

2.1.6 Environmental Conditions

15 February 2011

Ambient Temperature 20.5°C

Relative Humidity 27.8%



2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Maximum Peak Output Power.

The test results are shown below

Single Carrier: Rated output power level at RF A connector: 47.8dBm

Configuration 1 - Mode 1, 2 and 3

GMSK

UARFCN	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
512 (Bottom)	1930.2	28.0	47.60	57.54
661 (Middle)	1960.0	28.0	47.55	56.88
810 (Top)	1989.8	28.0	47.43	55.34

8-PSK

UARFCN	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
512 (Bottom)	1930.2	28.0	47.65	58.21
661 (Middle)	1960.0	28.0	47.60	57.54
810 (Top)	1989.8	28.0	47.48	55.98



Multi Carrier (1x2): Rated output power level at RF A connector: 44.8dBm/carrier

Configuration 1 - Mode 4, 5 and 6

GMSK

UARFCN	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
512 (Bottom)	1930.2	28.0	44.60	28.84
661 (Middle)	1960.0	28.0	44.56	28.58
810 (Top)	1989.8	28.0	44.43	27.73

8-PSK

UARFCN	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
512 (Bottom)	1930.2	28.0	44.69	29.44
661 (Middle)	1960.0	28.0	44.56	28.58
810 (Top)	1989.8	28.0	44.45	27.86



Multi Carrier (1x4): Rated output power level at RF A connector: 41.8dBm/carrier

Configuration 1 - Mode 7, 8 and 9

GMSK

UARFCN	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
512 (Bottom)	1930.2	28.0	41.57	14.35
661 (Middle)	1960.0	28.0	41.49	14.09
810 (Top)	1989.8	28.0	41.41	13.84

8-PSK

UARFCN	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
512 (Bottom)	1930.2	28.0	39.70	9.33
661 (Middle)	1960.0	28.0	39.49	8.89
810 (Top)	1989.8	28.0	39.60	9.12

Limit	$\leq 100\text{W}$ or $\leq +50\text{dBm}$
-------	--

Remarks

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



Product Service

2.2 PEAK – AVERAGE RATIO

2.2.1 Specification Reference

FCC CFR 47 Part 24, Clause 24.232 (d)

2.2.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/1, S/N: CB4G022478

2.2.3 Date of Test and Modification State

19 to 21 January and 15 February 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 24.

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

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

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

Configuration 1 - Mode 1
 - Mode 2
 - Mode 3
 - Mode 4
 - Mode 5
 - Mode 6
 - Mode 7
 - Mode 8
 - Mode 9

2.2.6 Environmental Conditions

	19 Jan. 2011	20 Jan. 2011	21 Jan. 2011	15 Feb. 2011
Ambient Temperature	23.0°C	23.0°C	23.0°C	20.5°C
Relative Humidity	24.0%	22.0%	21.0%	27.8%



Product Service

2.2.7 Test Results

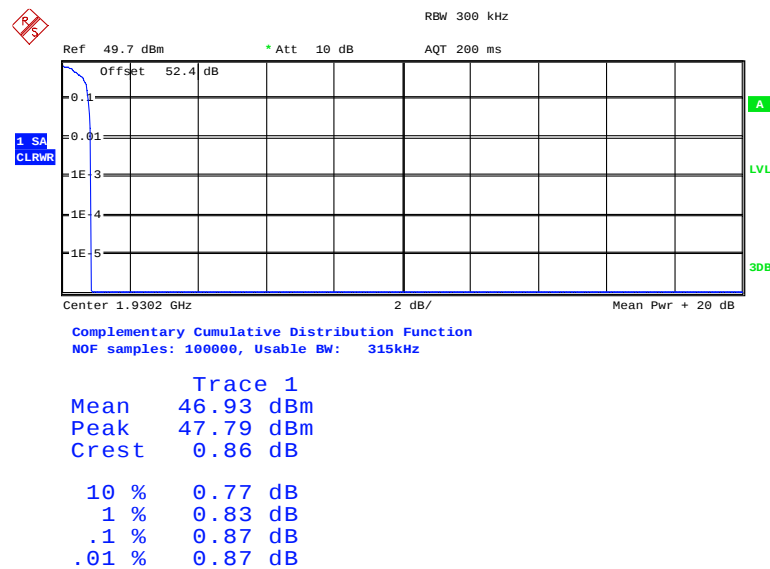
For the period of test the EUT met the requirements of FCC CFR 47 Part 24 Peak – Average Ratio.

The test results are shown below.

Single Carrier

Configuration 1 - Mode 1

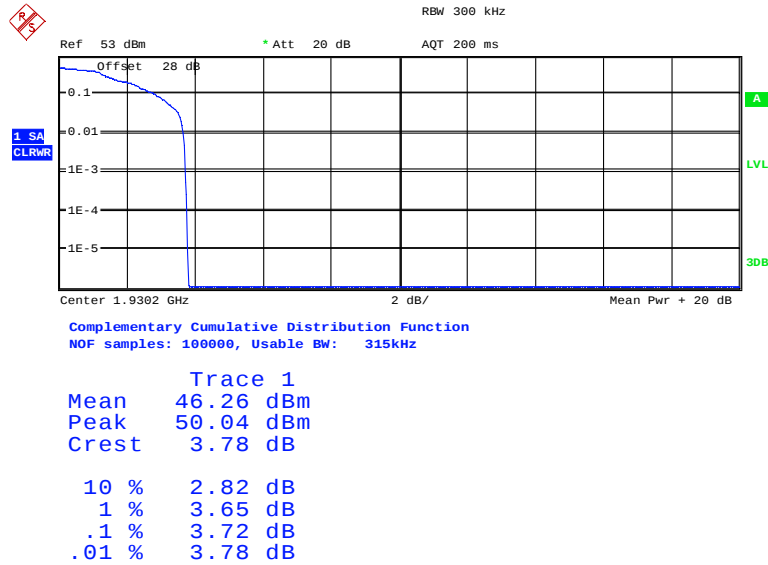
GMSK



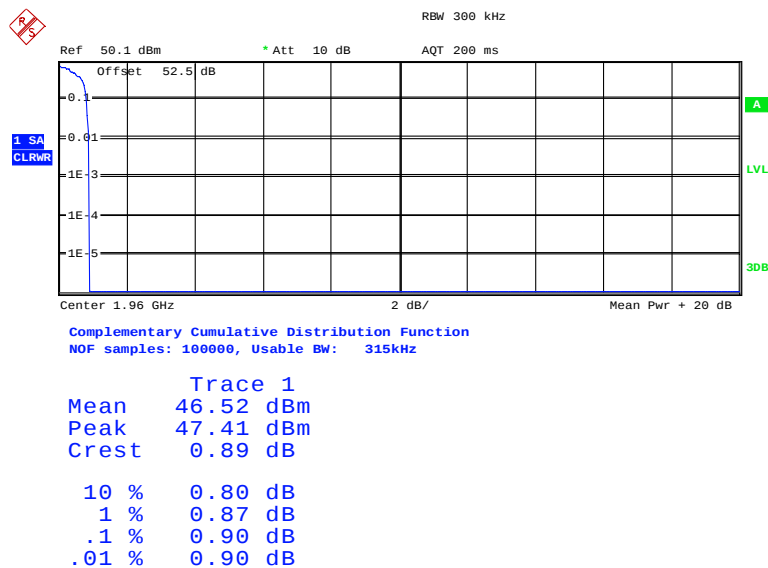
Date: 20.JAN.2011 09:57:13



Product Service

8-PSK

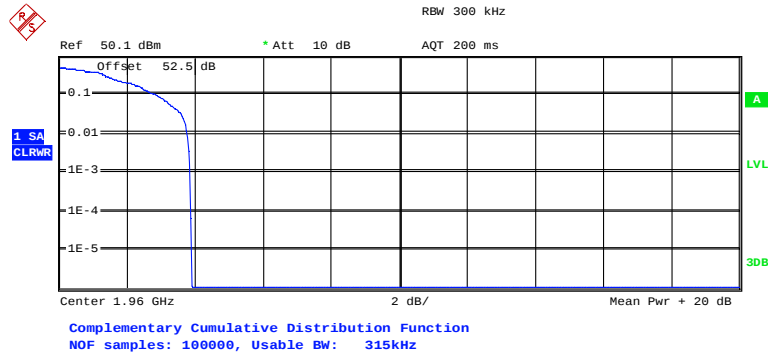
Date: 15.FEB.2011 09:17:20

Configuration 1 - Mode 2GMSK

Date: 19.JAN.2011 09:21:39



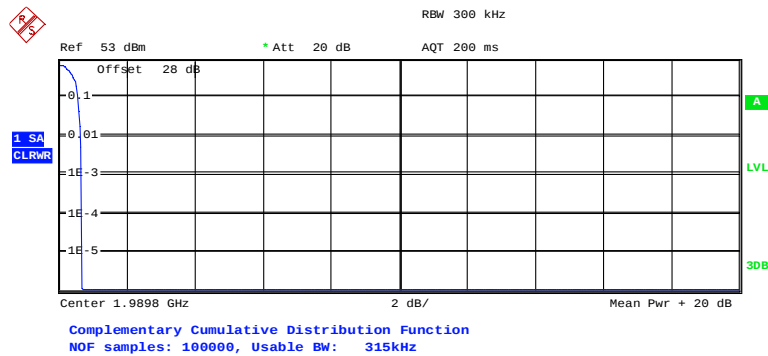
Product Service

8-PSK

Trace 1

Mean	46.43 dBm
Peak	50.30 dBm
Crest	3.87 dB
10 %	2.82 dB
1 %	3.75 dB
.1 %	3.85 dB
.01 %	3.88 dB

Date: 19.JAN.2011 09:22:21

Configuration 1 - Mode 3GMSK

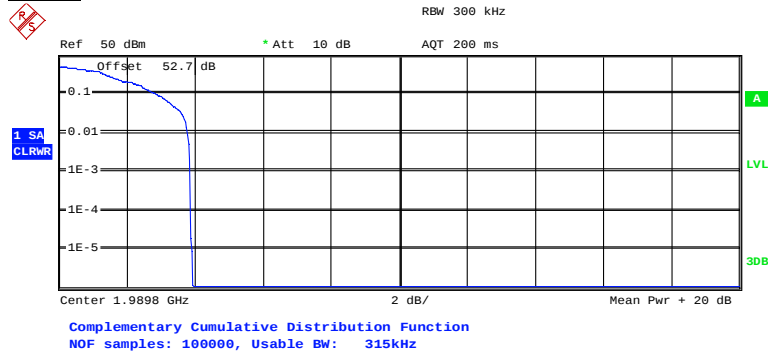
Trace 1

Mean	45.79 dBm
Peak	46.44 dBm
Crest	0.65 dB
10 %	0.54 dB
1 %	0.64 dB
.1 %	0.67 dB
.01 %	0.67 dB

Date: 15.FEB.2011 09:18:11



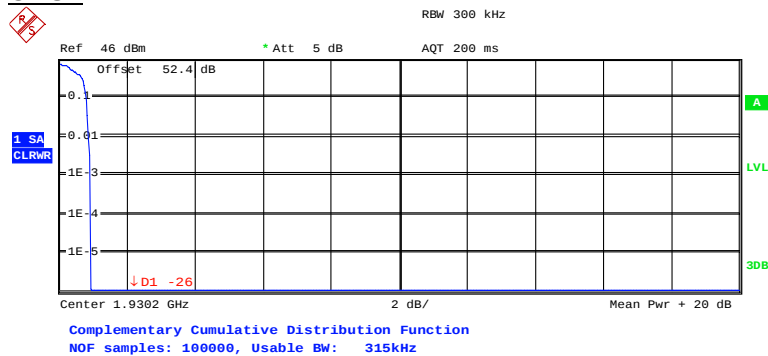
Product Service

8-PSK

Trace 1

Mean	46.41 dBm
Peak	50.34 dBm
Crest	3.93 dB
10 %	2.85 dB
1 %	3.78 dB
.1 %	3.88 dB
.01 %	3.88 dB

Date: 20.JAN.2011 09:54:41

Multi Carrier (1x2)**Configuration 1 - Mode 4****GMSK**

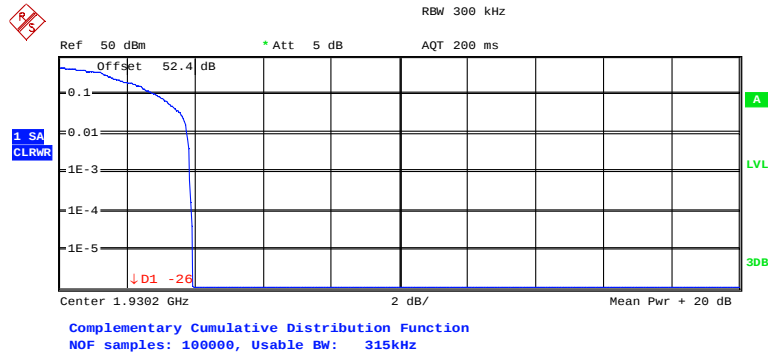
Trace 1

Mean	43.38 dBm
Peak	44.30 dBm
Crest	0.92 dB
10 %	0.80 dB
1 %	0.87 dB
.1 %	0.93 dB
.01 %	0.93 dB

Date: 21.JAN.2011 03:56:29



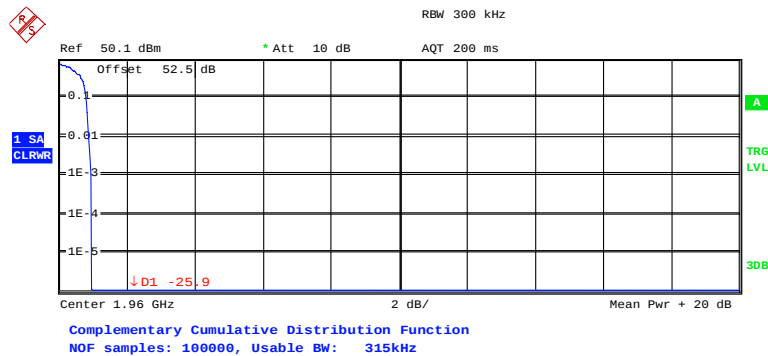
Product Service

8-PSK

Trace 1
Mean 43.20 dBm
Peak 47.11 dBm
Crest 3.91 dB

10 % 2.82 dB
1 % 3.75 dB
.1 % 3.85 dB
.01 % 3.91 dB

Date: 21.JAN.2011 03:57:26

Configuration 1 - Mode 5GMSK

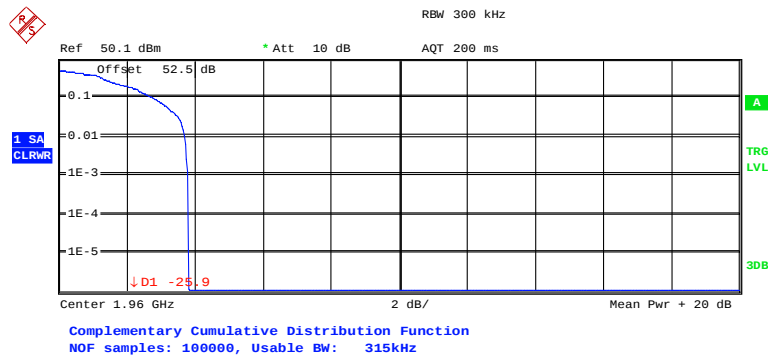
Trace 1
Mean 43.65 dBm
Peak 44.59 dBm
Crest 0.94 dB

10 % 0.80 dB
1 % 0.87 dB
.1 % 0.93 dB
.01 % 0.96 dB

Date: 19.JAN.2011 07:51:45



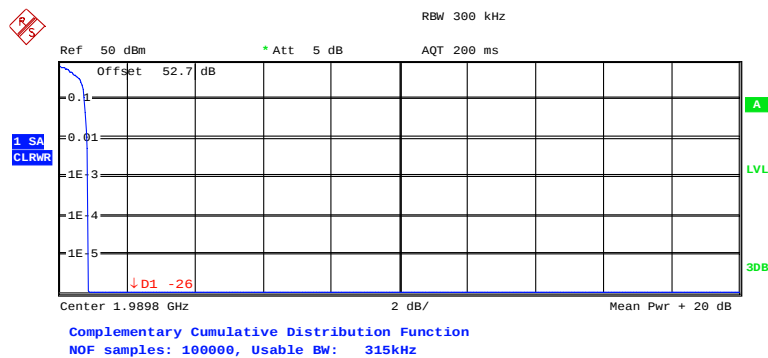
Product Service

8-PSK

Trace 1

Mean	43.53 dBm
Peak	47.34 dBm
Crest	3.81 dB
10 %	2.76 dB
1 %	3.69 dB
.1 %	3.78 dB
.01 %	3.81 dB

Date: 19.JAN.2011 07:53:11

Configuration 1 - Mode 6GMSK

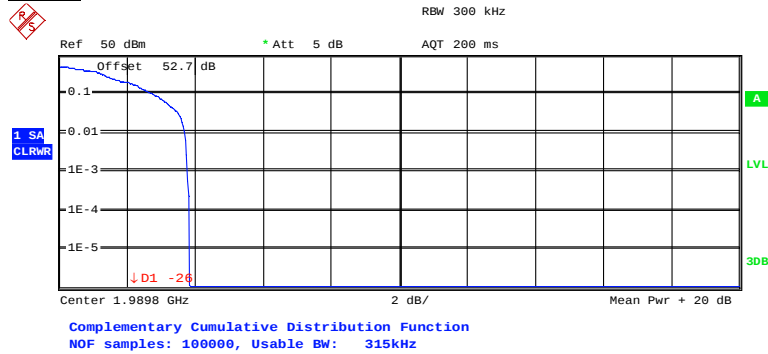
Trace 1

Mean	42.80 dBm
Peak	43.65 dBm
Crest	0.85 dB
10 %	0.74 dB
1 %	0.83 dB
.1 %	0.87 dB
.01 %	0.87 dB

Date: 21.JAN.2011 04:38:41



Product Service

8-PSK

Trace 1

Mean 42.72 dBm

Peak 46.55 dBm

Crest 3.83 dB

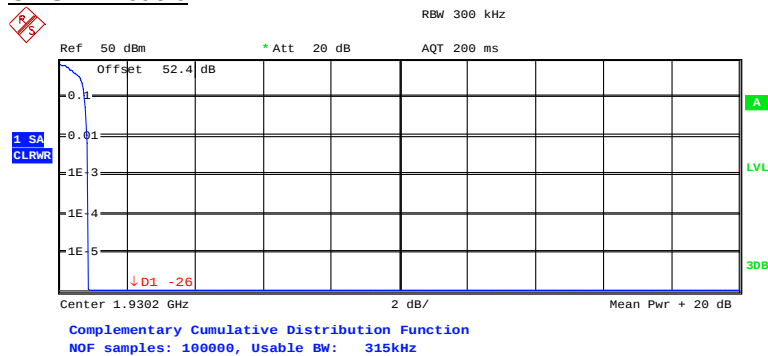
10 % 2.76 dB

1 % 3.69 dB

.1 % 3.78 dB

.01 % 3.85 dB

Date: 21.JAN.2011 04:39:35

Multi Carrier (1x4)**Configuration 1 - Mode 7****GMSK - Mode 9**

Trace 1

Mean 40.45 dBm

Peak 41.31 dBm

Crest 0.86 dB

10 % 0.74 dB

1 % 0.83 dB

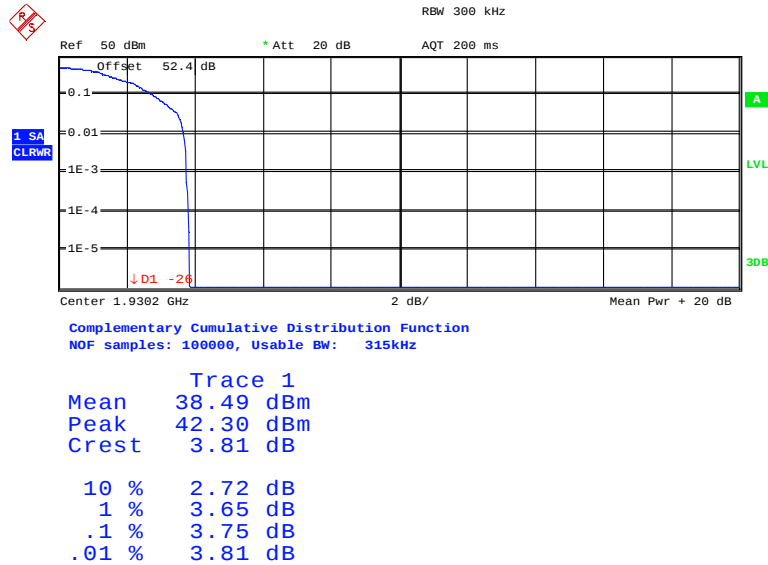
.1 % 0.87 dB

.01 % 0.87 dB

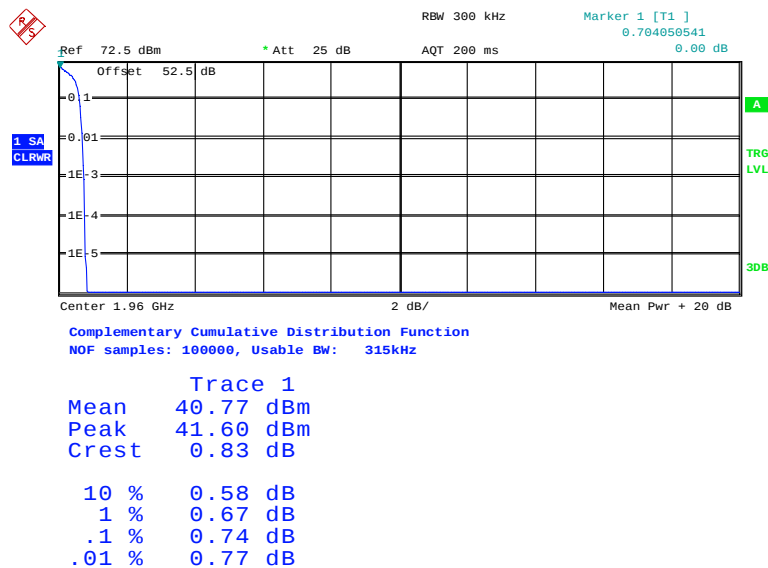
Date: 21.JAN.2011 08:49:16



Product Service

8-PSK

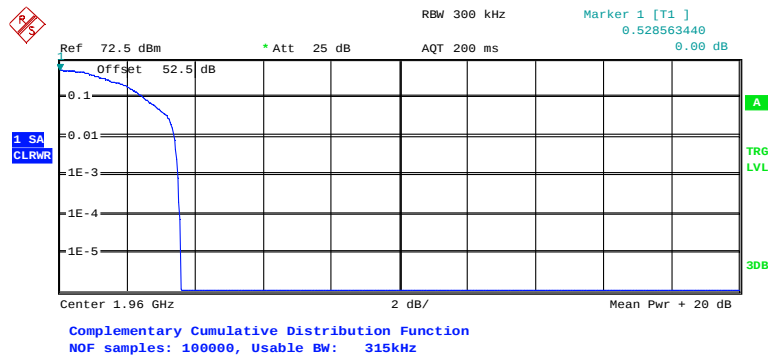
Date: 21.JAN.2011 08:37:59

Configuration 1 - Mode 8GMSK

Date: 19.JAN.2011 04:54:49



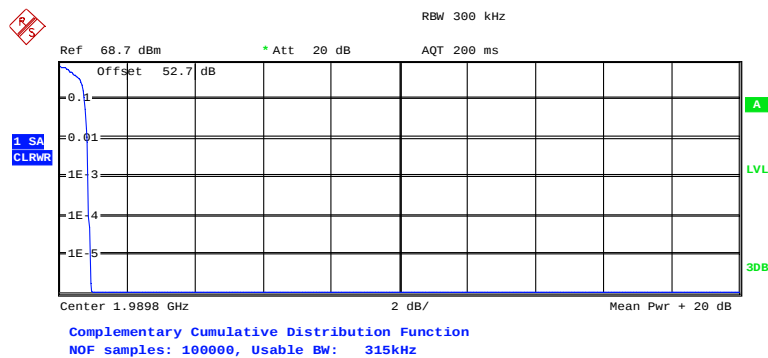
Product Service

8-PSK

Trace 1

Mean	38.95 dBm
Peak	42.52 dBm
Crest	3.57 dB
10 %	2.47 dB
1 %	3.40 dB
.1 %	3.49 dB
.01 %	3.56 dB

Date: 19.JAN.2011 04:58:13

Configuration 1 - Mode 9GMSK

Trace 1

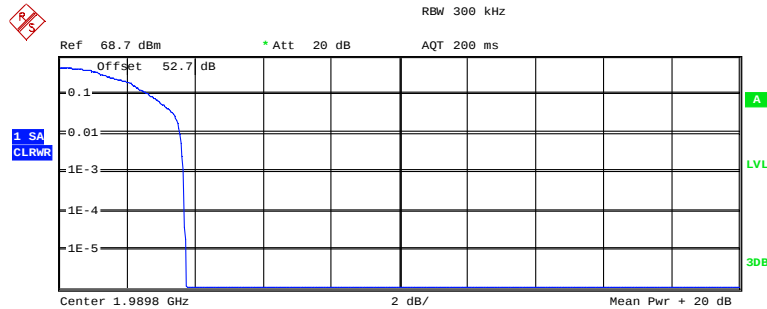
Mean	39.91 dBm
Peak	40.84 dBm
Crest	0.93 dB
10 %	0.74 dB
1 %	0.83 dB
.1 %	0.87 dB
.01 %	0.87 dB

Date: 21.JAN.2011 09:35:07



Product Service

8-PSK



Complementary Cumulative Distribution Function
 NOF samples: 100000, Usable BW: 315kHz

Trace 1
 Mean 38.08 dBm
 Peak 41.82 dBm
 Crest 3.74 dB

10 %	2.63 dB
1 %	3.56 dB
.1 %	3.65 dB
.01 %	3.69 dB

Date: 21.JAN.2011 09:30:09

Limit	13dB
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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-133 Clause 6.2

2.3.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/1, S/N: CB4G022478

2.3.3 Date of Test and Modification State

19 January 2011 – Modification State 0

2.3.4 Test Method and Operating Modes

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

$\text{bit rate} / \text{Channel bandwidth} = 270.83333 \text{ kbit/s} / 200 \text{ kHz} = 1.354 \text{ bit/s/Hz}.$

The bandwidth product $BT = \text{Bandwidth} \times \text{bit duration} = 81.25 \text{ kHz} \times 3.6923 \text{ micros} = 0.3$

GMSK and 8PSK overview.

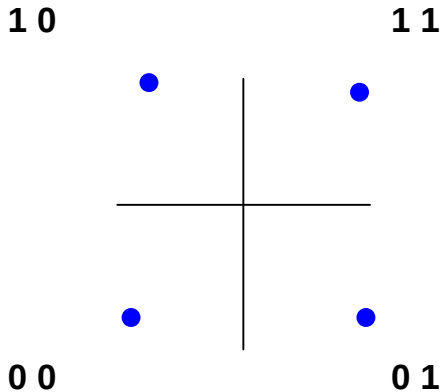
The modulation schemes used for the EUT are GMSK and 8PSK. The 8PSK modulation scheme is EDGE (Enhanced Data Rates for GSM Evolution).

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 2-digit 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	0 0	1 1	1 0	0 1
PHASE	225°	45°	135°	315°

This is called QPSK (Quadratic Phase Shift Keying)

However

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 $\pm 90^\circ$

1. Split bit stream 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	
	$-\pi/2$		$-\pi/2$		$-\pi/2$		$\pi/2$	
Q stream		0		1		1		0
		$-\pi/2$		$\pi/2$		$\pi/2$		$-\pi/2$

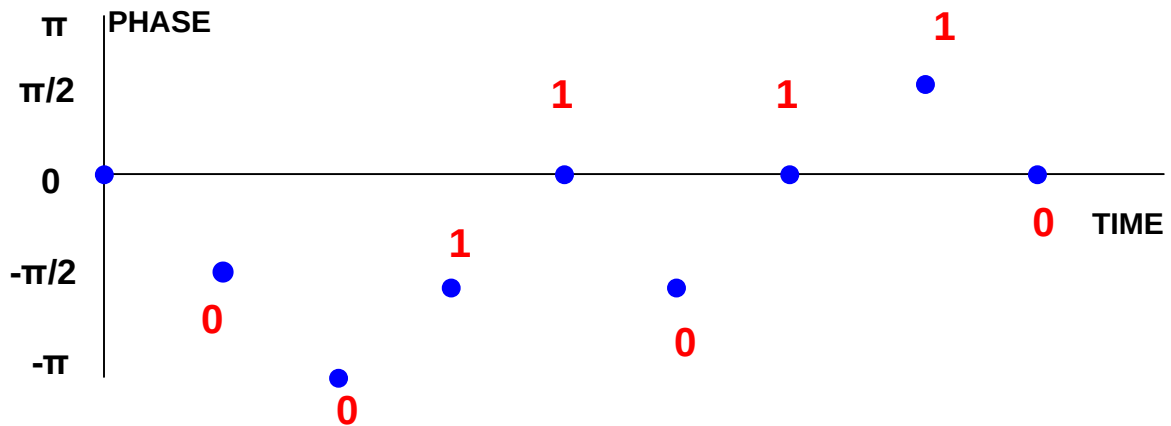


Product Service

3. Combine (add) the two PSK signals:

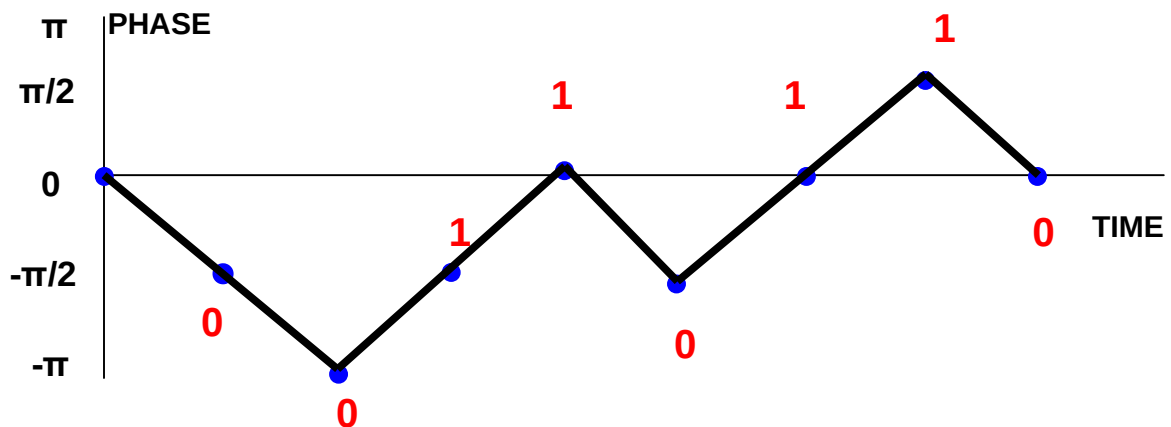
Combined Phase	$-\pi/2$	$-\pi$	$-\pi/2$	0	$-\pi/2$	0	$\pi/2$	0
----------------	----------	--------	----------	---	----------	---	---------	---

Result: offset - QPSK, phase change is restricted to $\pm \pi/2$ radians:



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):





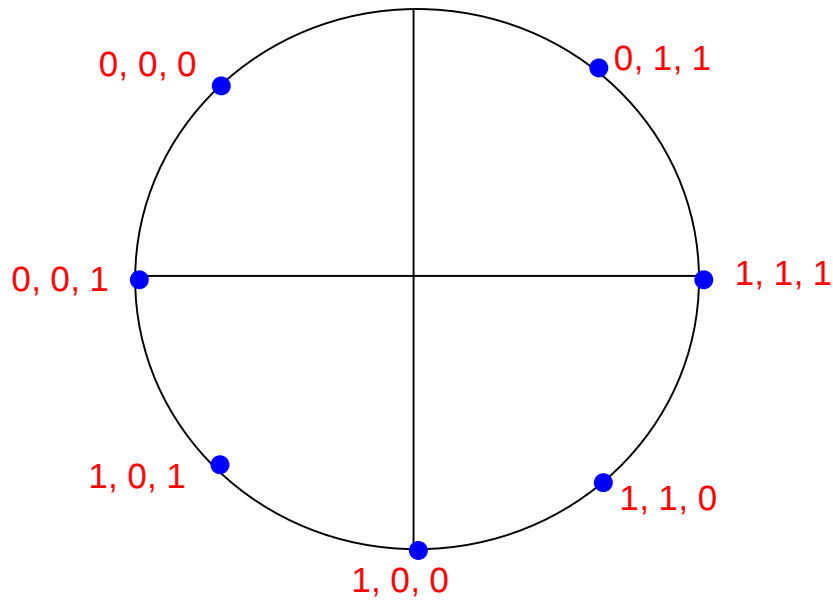
Gaussian Minimum Shift Keying

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 bit stream are filtering using a Gaussian-shaped impulse response filter, we get Gaussian MSK (GMSK) - this has low side lobes compared to MSK.

8-PSK (8-Phase Shift Keying)

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





Product Service

2.4 OCCUPIED BANDWIDTH

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049 (h)
 FCC CFR 47 Part 24, Clause 24.238 (b)
 Industry Canada RSS-GEN, Clause 4.6.1

2.4.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/1, S/N: CB4G022478

2.4.3 Date of Test and Modification State

19 and 20 January 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 24 and Industry Canada RSS-GEN.

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

	19 January 2011	20 January 2011
Ambient Temperature	23.0°C	23.0°C
Relative Humidity	24.0%	22.0%



Product Service

2.4.7 Test Results

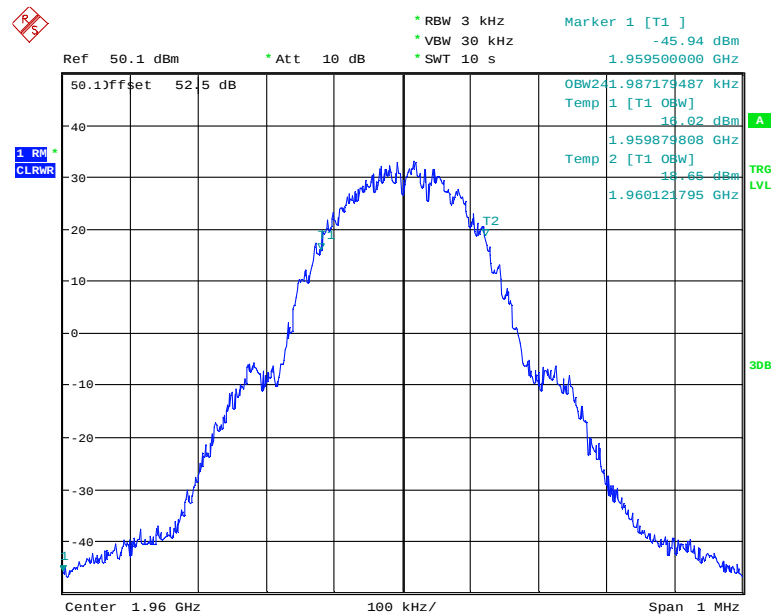
For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-GEN for Occupied Bandwidth.

The test results are shown below

Single Carrier

Configuration 1 - Mode 1

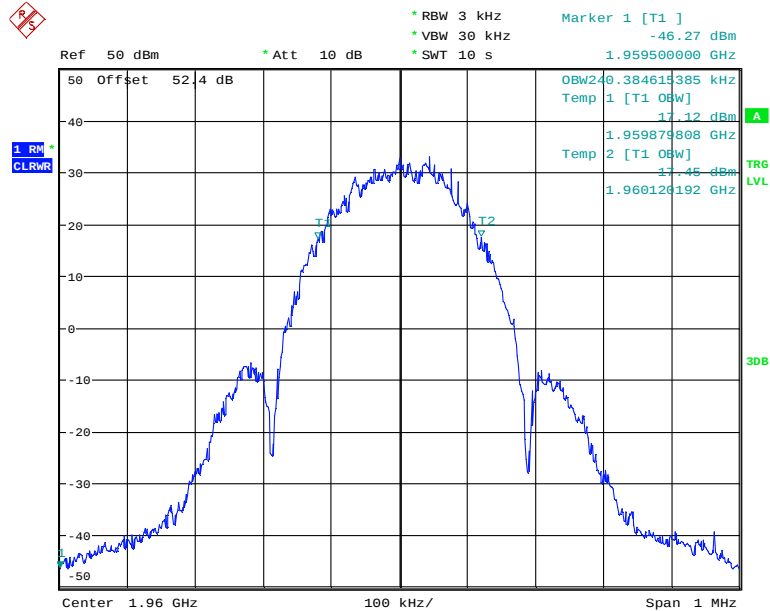
GMSK



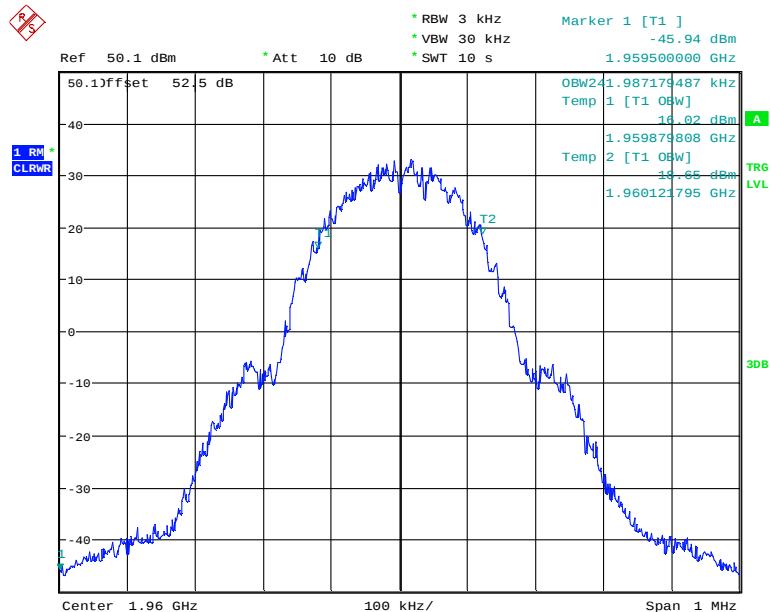
Date: 19.JAN.2011 09:20:45



Product Service

8-PSK

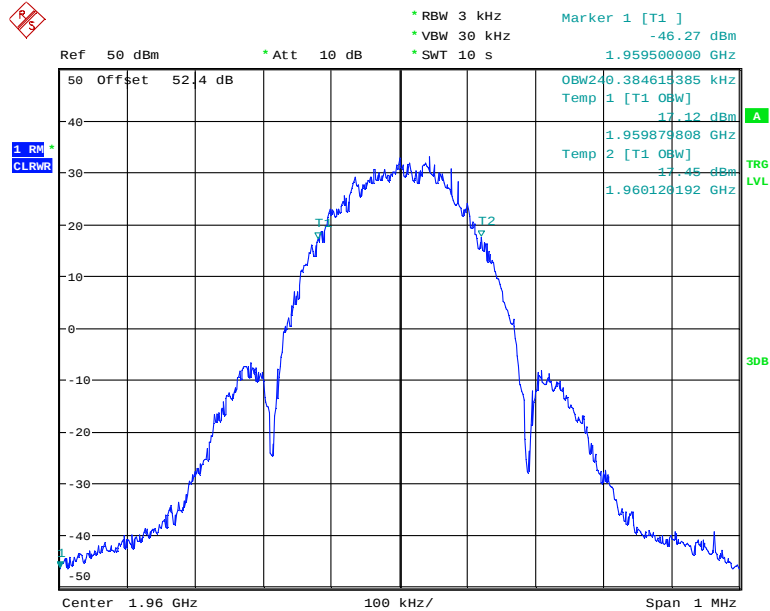
Date: 19.JAN.2011 09:18:02

Configuration 1 - Mode 2GMSK

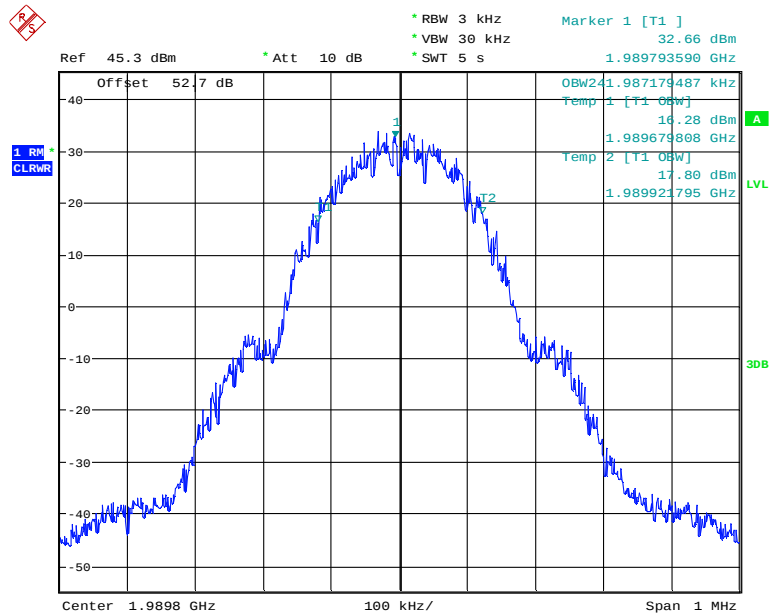
Date: 19.JAN.2011 09:20:45



Product Service

8-PSK

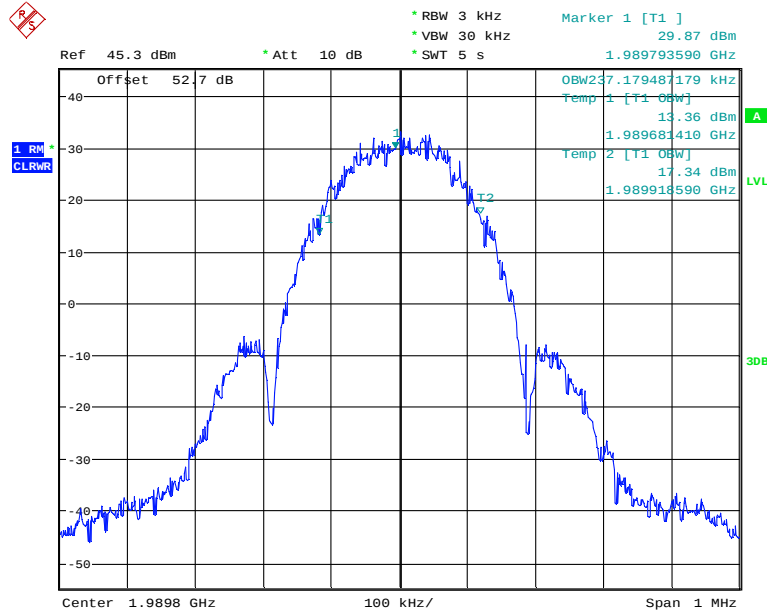
Date: 19.JAN.2011 09:18:02

Configuration 1 - Mode 3GMSK

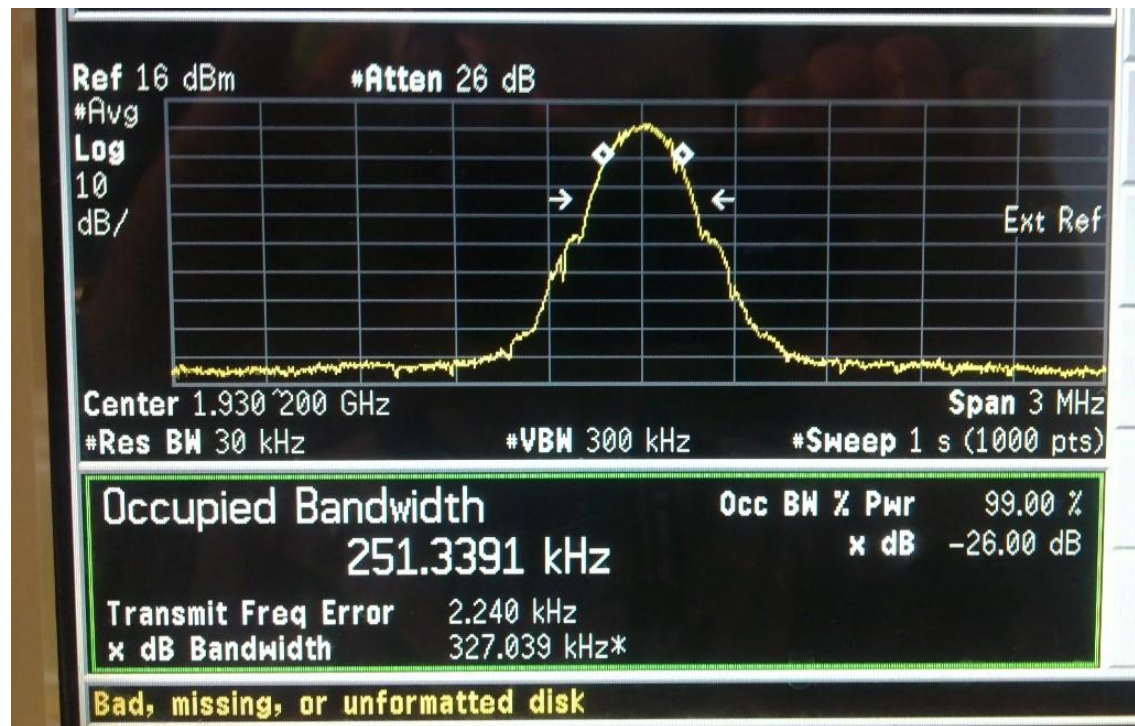
Date: 20.JAN.2011 09:51:19



Product Service

8-PSK

Date: 20.JAN.2011 09:53:42

-26dBc Bandwidth



Product Service

2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (± 1 MHz)

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
 FCC CFR 47 Part 24, Clause 24.238 (a)
 Industry Canada RSS-133 Clause 6.5

2.5.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/1, S/N: CB4G022478

2.5.3 Date of Test and Modification State

15 February 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 24 and Industry Canada RSS-133.

In accordance with 24.238(b), at least 1% of the 26dB 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 1'
 - Mode 3'
 - Mode 4'
 - Mode 6'
 - Mode 7'
 - Mode 9'

2.5.6 Environmental Conditions

15 February 2011

Ambient Temperature 20.5°C

Relative Humidity 27.8%



2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Spurious Emissions Antenna Terminals (± 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 513 (1930.4 MHz), the highest usable channel is 809 (1989.6 MHz)

Single Carrier

Configuration 1 - Mode 1' and 3'

GMSK and 8-PSK

Band Edge Frequency	Edge Test with GMSK modulation Channel No./Frequencies	Edge Test with 8-PSK modulation Channel No./Frequencies
Bottom 1930 MHz	Channel: 513 Frequency: 1930.4 MHz	Channel: 513 Frequency: 1930.4 MHz
Top 1990 MHz	Channel: 809 Frequency: 1989.6 MHz	Channel: 809 Frequency: 1989.6 MHz

Multi Carrier (1x2)

Configuration 1 - Mode 4' and 6'

GMSK and 8-PSK

Band Edge Frequency	Edge Test with GMSK modulation Channel No./Frequencies	Edge Test with 8-PSK modulation Channel No./Frequencies
Bottom 1930 MHz	Channel: 513 & 515 Frequency: 1930.4 & 1930.8 MHz	Channel: 513 & 515 Frequency: 1930.4 & 1930.8 MHz
Top 1990 MHz	Channel: 807 & 809 Frequency: 1989.2 & 1989.6 MHz	Channel: 807 & 809 Frequency: 1989.2 & 1989.6 MHz

**Multi Carrier (1x4)****Configuration 1 - Mode 7' and 9'****GMSK and 8-PSK**

Band Edge Frequency	Edge Test with GMSK modulation Channel No./Frequencies	Edge Test with 8-PSK modulation Channel No./Frequencies
Bottom 1930 MHz	Channel: 513 & 515 & 517 & 519 Frequency: 1930.4 & 1930.8 & 1931.2 & 1931.6 MHz	Channel: 513 & 515 & 517 & 519 Frequency: 1930.4 & 1930.8 & 1931.2 & 1931.6 MHz
Top 1990 MHz	Channel: 803 & 805 & 807 & 809 Frequency: 1988.4 & 1988.8 & 1989.2 & 1989.6 MHz	Channel: 803 & 805 & 807 & 809 Frequency: 1988.4 & 1988.8 & 1989.2 & 1989.6 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.



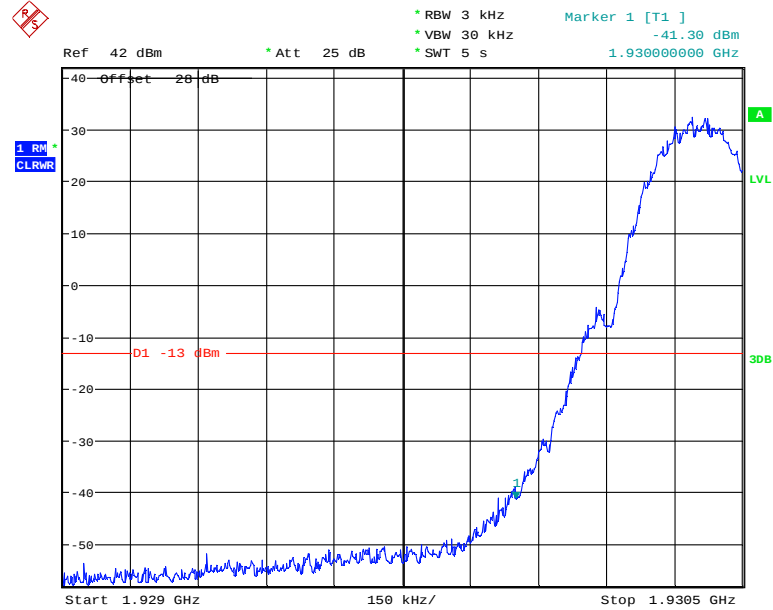
Product Service

The test results are shown below

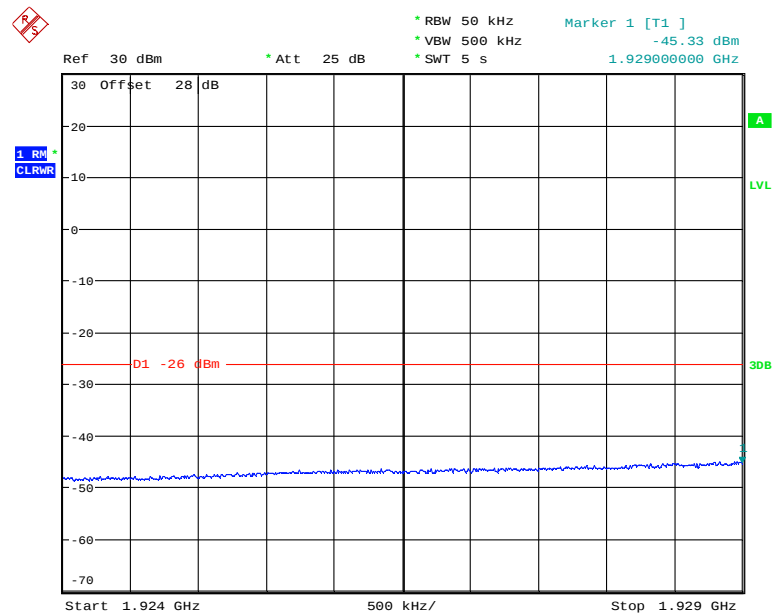
Single Carrier

Configuration 1 - Mode 1'

GMSK



Date: 15.FEB.2011 11:01:09

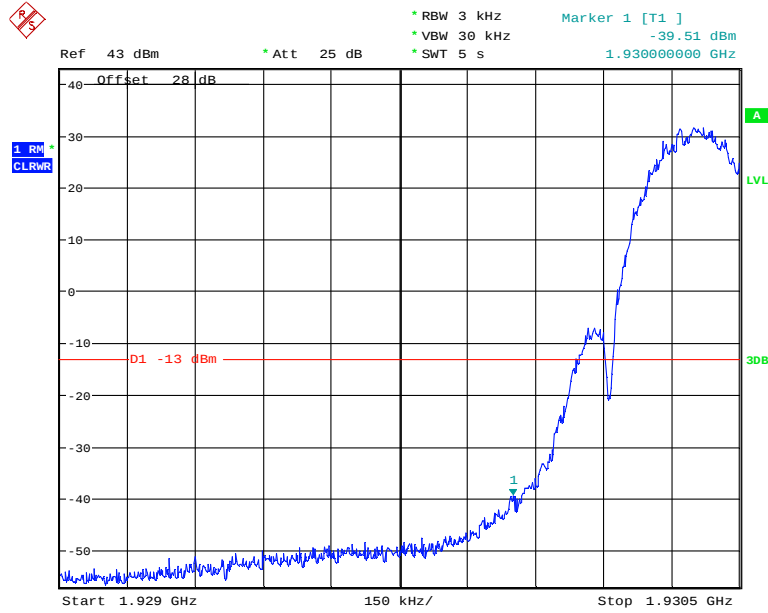


Date: 15.FEB.2011 11:06:12

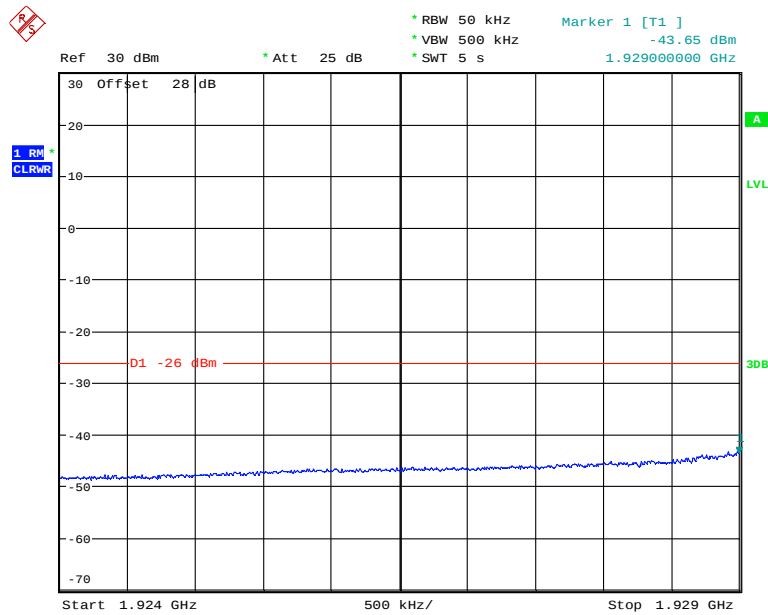


Product Service

8-PSK



Date: 15.FEB.2011 11:03:14



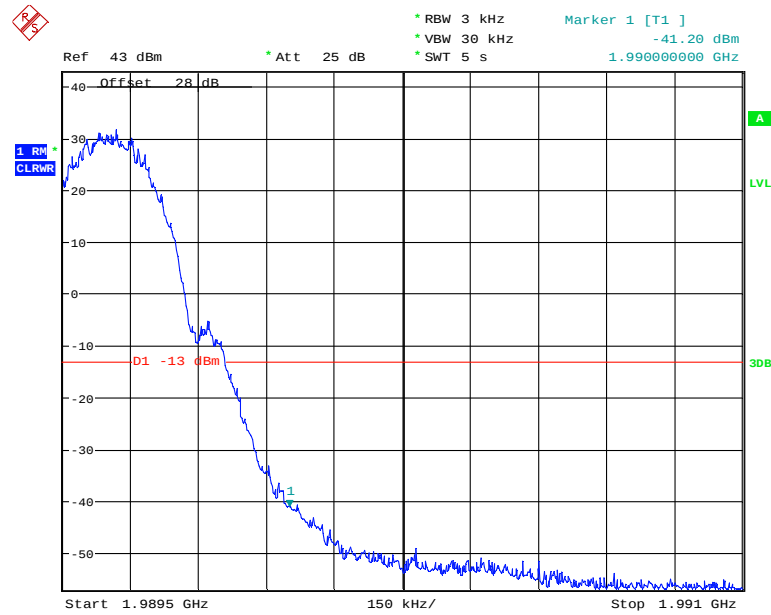
Date: 15.FEB.2011 11:05:20



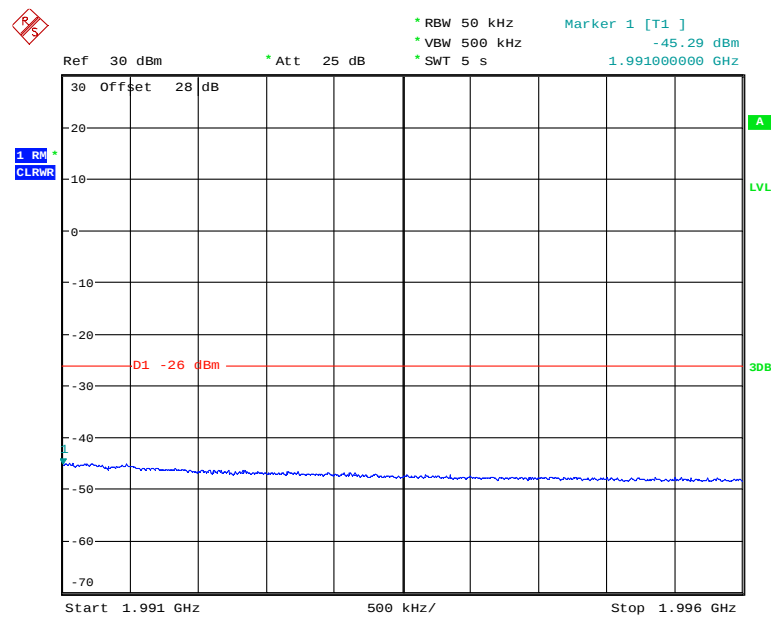
Product Service

Configuration 1 - Mode 3'

GMSK



Date: 15.FEB.2011 11:09:59

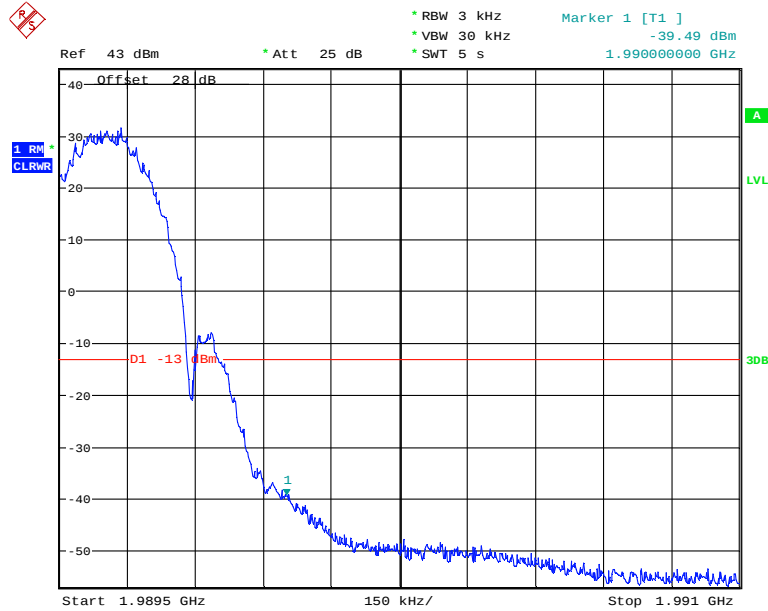


Date: 15.FEB.2011 11:07:10

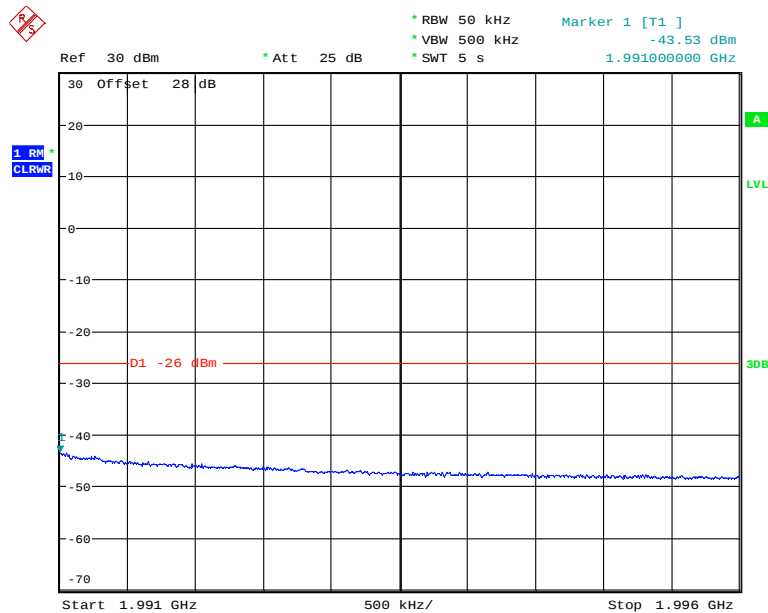


Product Service

8-PSK



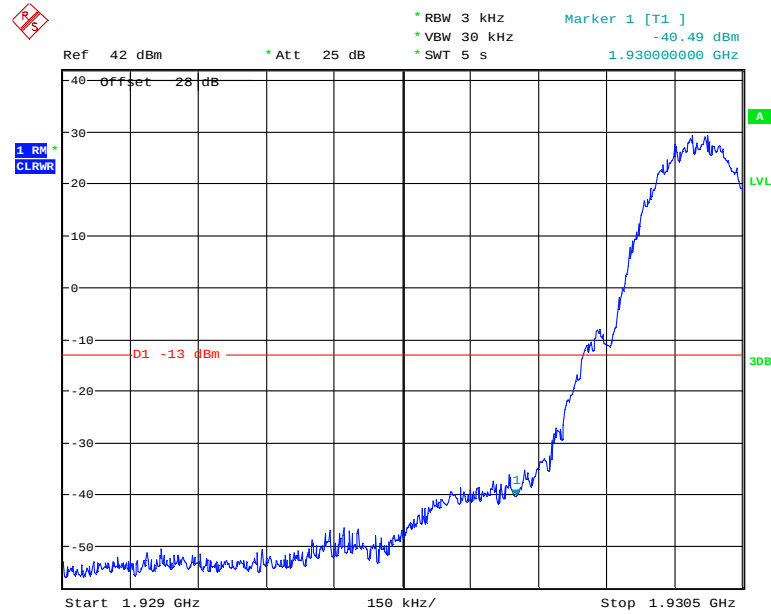
Date: 15.FEB.2011 11:09:24



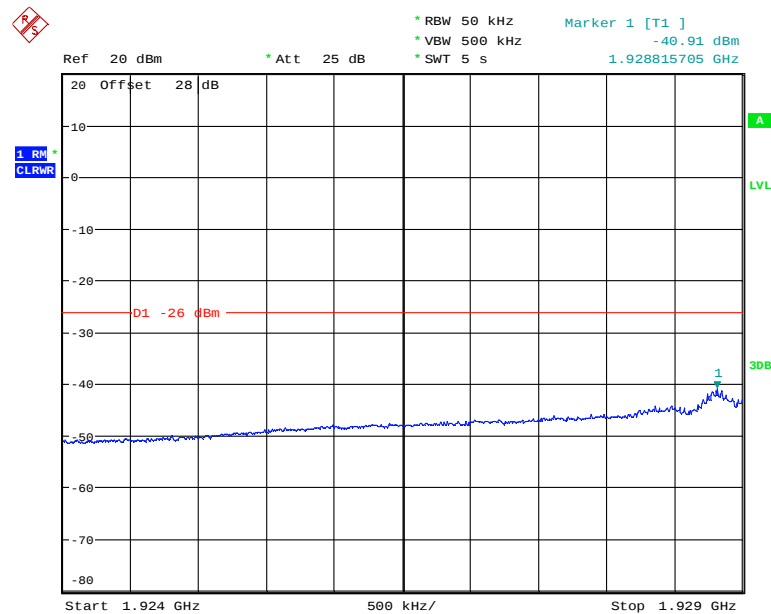
Date: 15.FEB.2011 11:07:43



Product Service

Multi Carrier (1x2)**Configuration 1 - Mode 4'****GMSK**

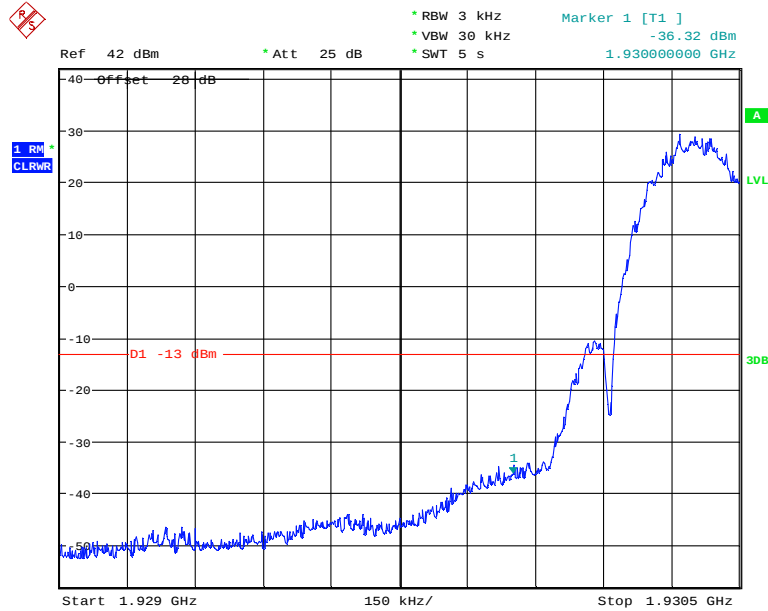
Date: 15.FEB.2011 11:27:00



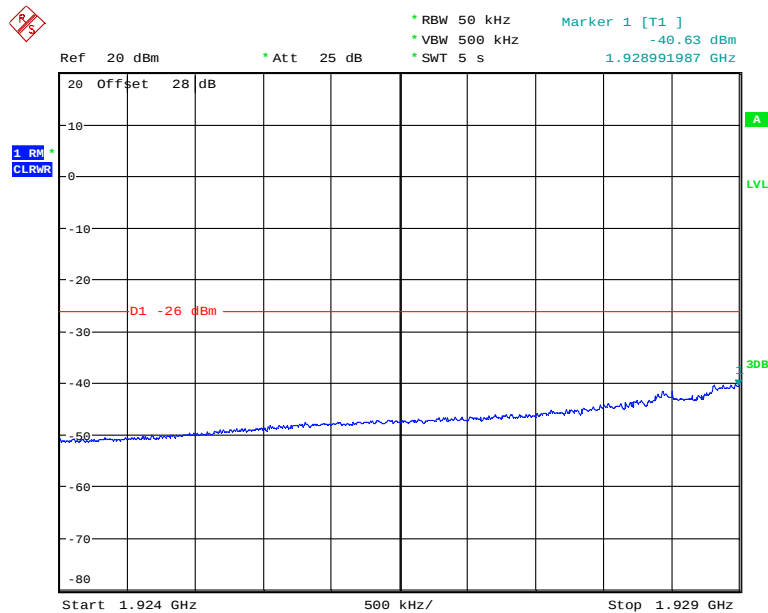
Date: 15.FEB.2011 11:22:41



Product Service

8-PSK

Date: 15.FEB.2011 11:26:20



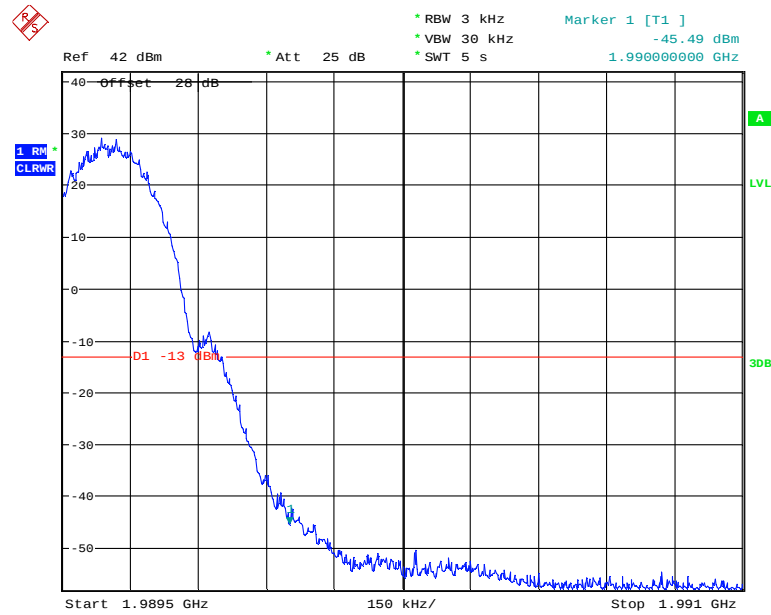
Date: 15.FEB.2011 11:24:45



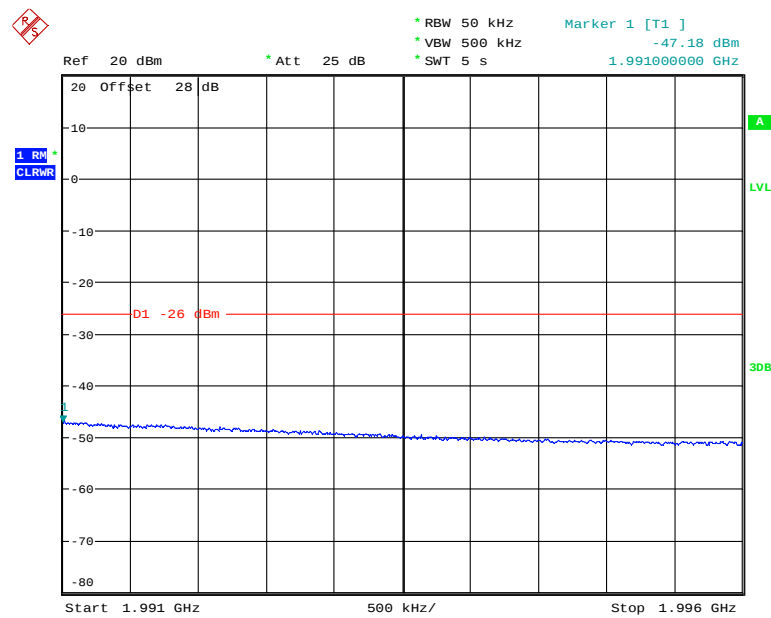
Product Service

Configuration 1 - Mode 6'

GMSK



Date: 15.FEB.2011 11:16:18

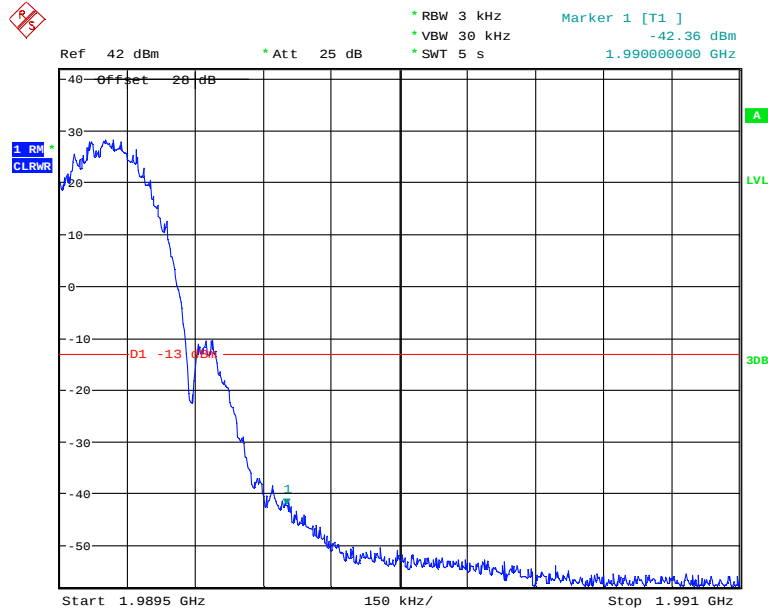


Date: 15.FEB.2011 11:19:14

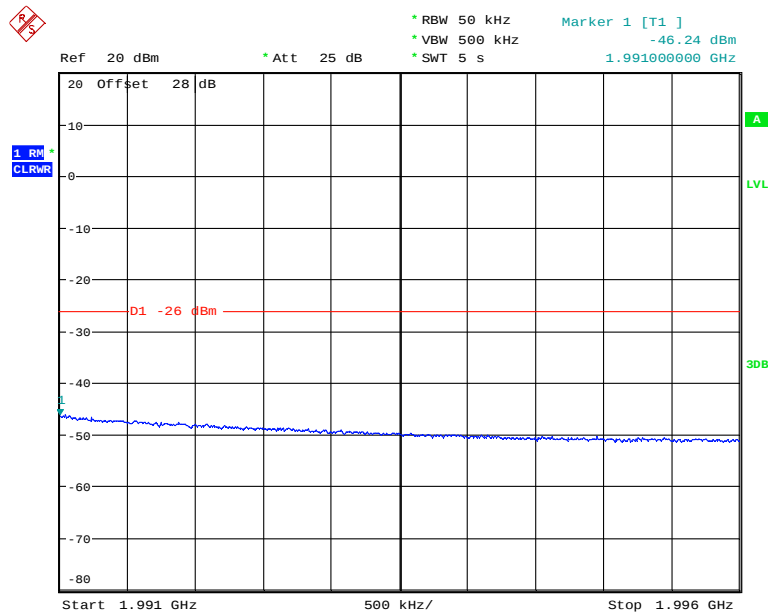


Product Service

8-PSK



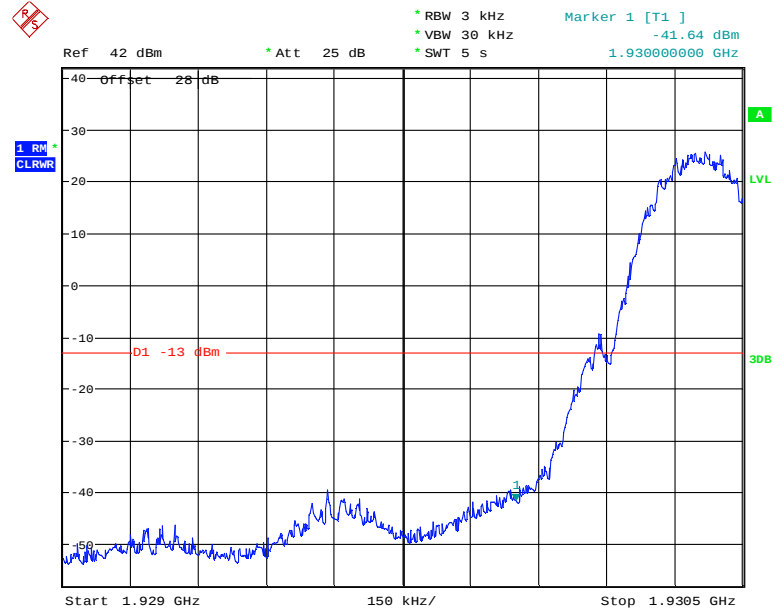
Date: 15.FEB.2011 11:17:04



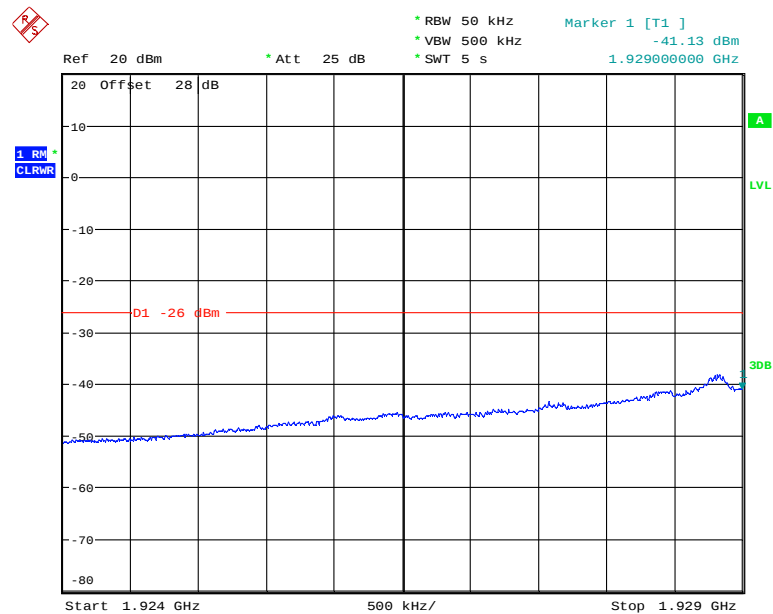
Date: 15.FEB.2011 11:18:28



Product Service

Multi Carrier (1x4)**Configuration 1 - Mode 7'****GMSK**

Date: 15.FEB.2011 11:28:24

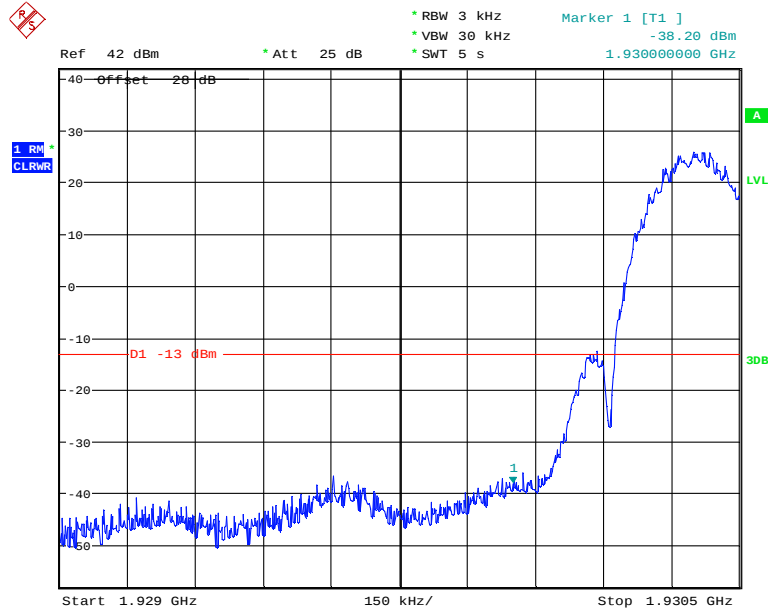


Date: 15.FEB.2011 11:31:12

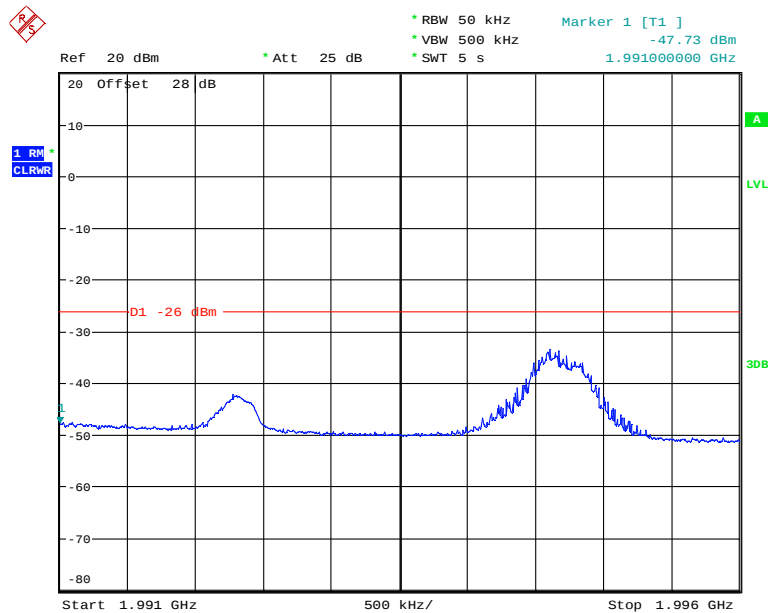


Product Service

8-PSK



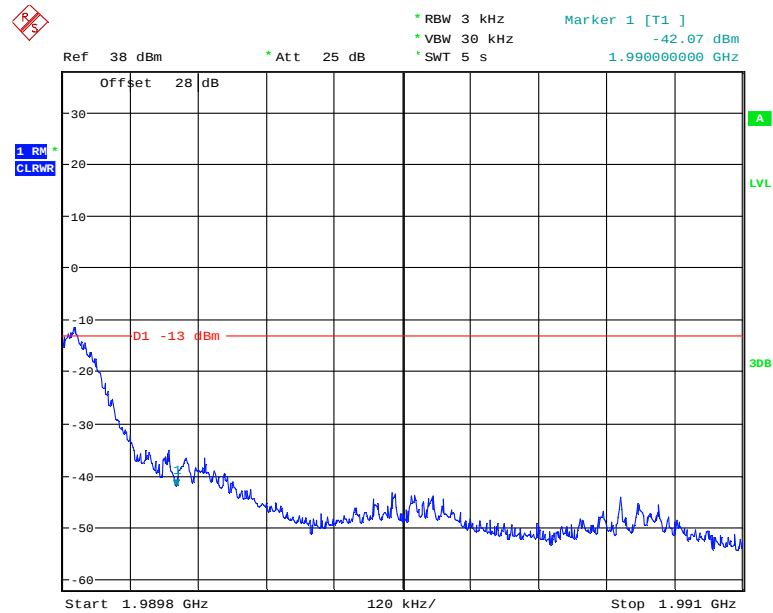
Date: 15.FEB.2011 11:29:11



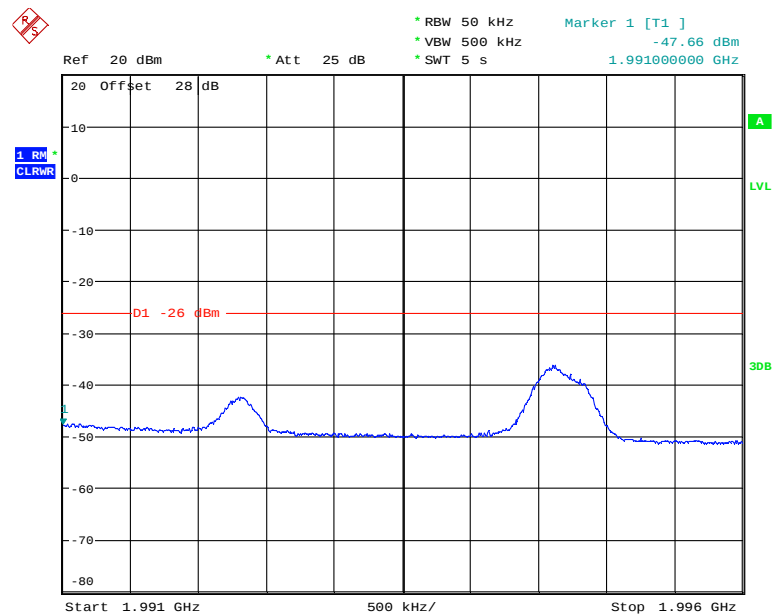
Date: 15.FEB.2011 11:33:07



Product Service

Configuration 1 - Mode 9'GMSK

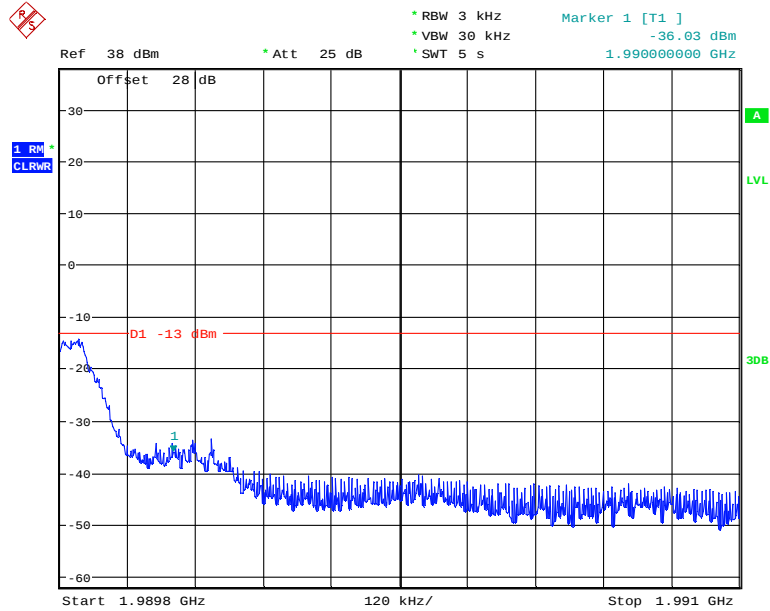
Date: 15.FEB.2011 11:41:45



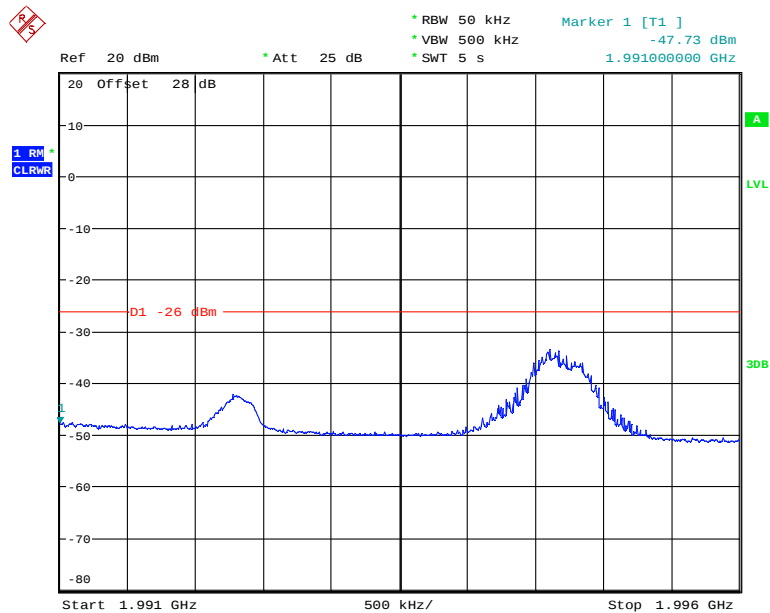
Date: 15.FEB.2011 11:32:34



Product Service

8-PSK

Date: 15.FEB.2011 11:40:58



Date: 15.FEB.2011 11:33:07

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 24, 24.238 (a)
Industry Canada RSS-133, Clause 6.5

2.6.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/1, S/N: CB4G022478

2.6.3 Date of Test and Modification State

25 and 26 January 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 24 and Industry Canada RSS-133.

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 – 20GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz – 20GHz, 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 μ 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:

$$E_{(v/m)} = (30 \times 1.64 \times 60.12)^{0.5} / 3 = 18.129V/m = 145.2dB\mu V/m$$

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

$$43 + 10\log(60.12) = 60.8dB$$

Therefore the limit at 3m measurement distance is:

$$145.2 - 60.8 = 84.4 \text{ dB}\mu V/m$$

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

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

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

2.6.6 Environmental Conditions

	25 January 2011	26 January 2011
Ambient Temperature	26.5°C	26.0°C
Relative Humidity	35.0%	36.0%



Product Service

2.6.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 & Part 24 and Industry Canada RSS-133 for Radiated Spurious Emissions.

The test results are shown below

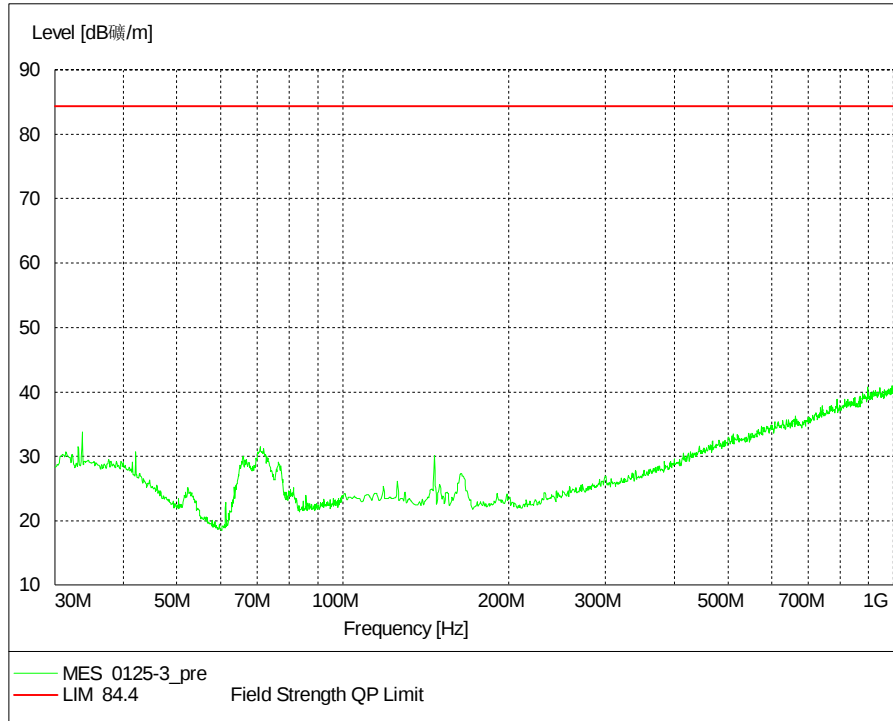
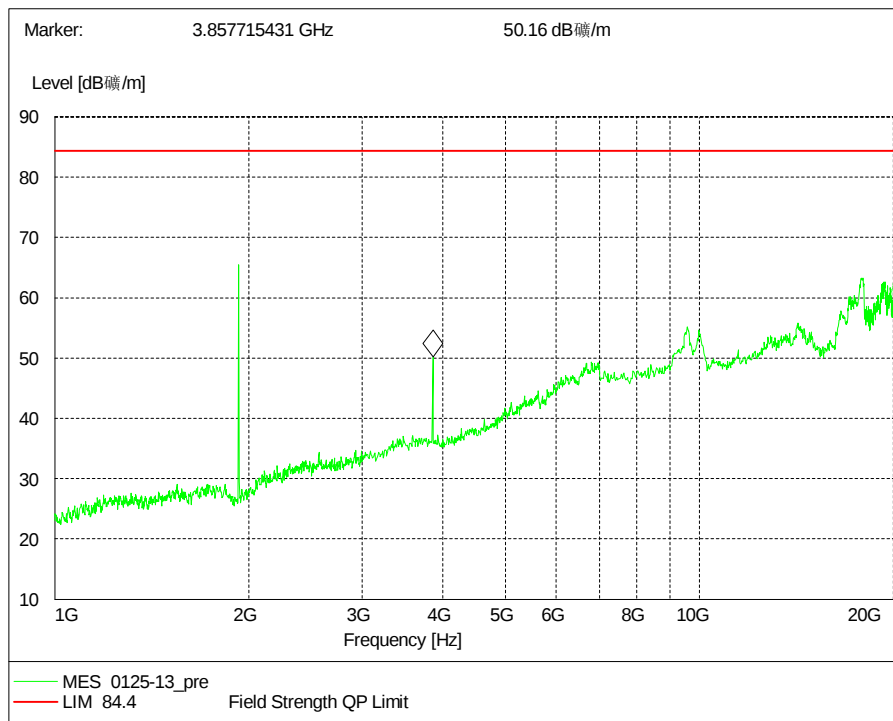
Note: Only the worst case results plots have been included as all of the emissions are greater than 20dB below the limit. A set of plots have been included to show the measurement system noise floor

Single Carrier

Configuration 1 - Mode 1

GMSK

No emissions were detected within 20dB of the limit.

8-PSK30kHz – 1GHz1GHz – 20GHz



Product Service

Configuration 1 - Mode 2GMSK and 8-PSK

No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 3GMSK and 8-PSK

No emissions were detected within 20dB of the limit.

Multi Carrier (1x2)Configuration 1 - Mode 4GMSK and 8-PSK

No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 5GMSK and 8-PSK

No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 6GMSK and 8-PSK

No emissions were detected within 20dB of the limit.

Limit	-13dBm
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Remarks

The EUT does not exceed -13dBm 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 24, 24.238 (a)
Industry Canada RSS-133, Clause 6.5

2.7.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/1, S/N: CB4G022478

2.7.3 Date of Test and Modification State

15 February 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 24 and Industry Canada RSS-133.

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 9kHz to 20GHz. The EUT was set to transmit on maximum power. The EUT was tested on Bottom, Middle and Top channels for GMSK and 8-PSK modulation types. The resolution was set to 1MHz for 9kHz to 20GHz thus meeting the requirements of Part 24.238(b). The spectrum analyser detector was set to peak and trace was kept on Max Hold.

The 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
 - Mode 4
 - Mode 5
 - Mode 6
 - Mode 7
 - Mode 8
 - Mode 9



Product Service

2.7.6 Environmental Conditions

15 February 2011

Ambient Temperature 20.5°C

Relative Humidity 27.8%

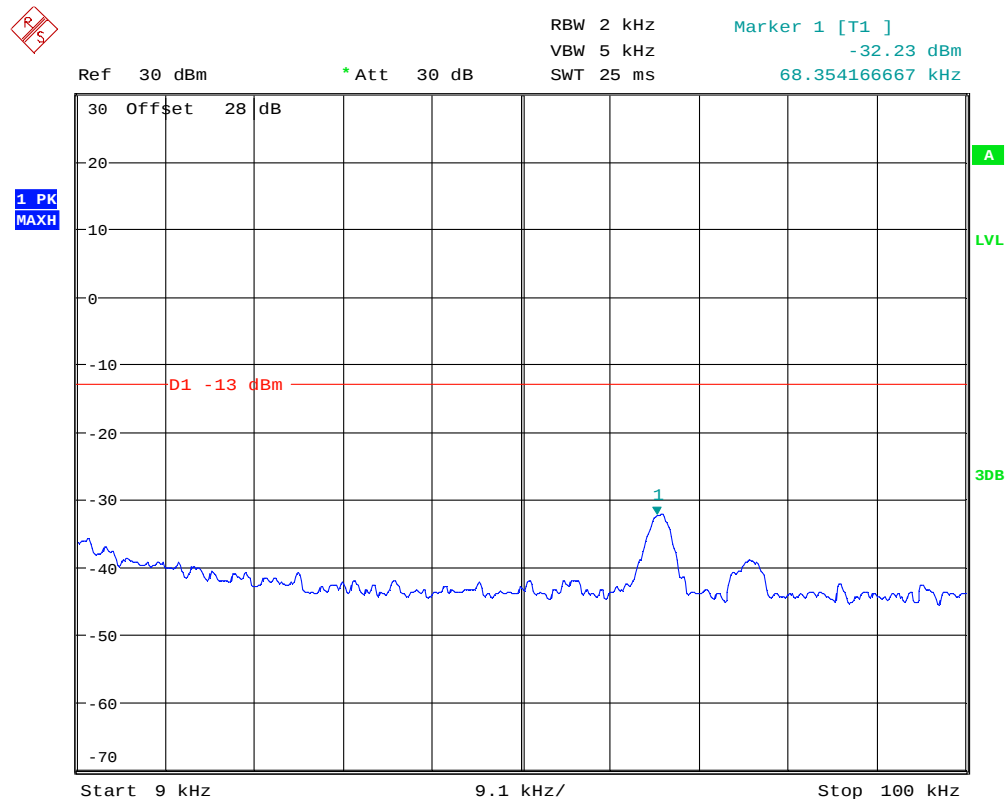
2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Conducted Spurious Emissions.

The test results are shown below

Remark:

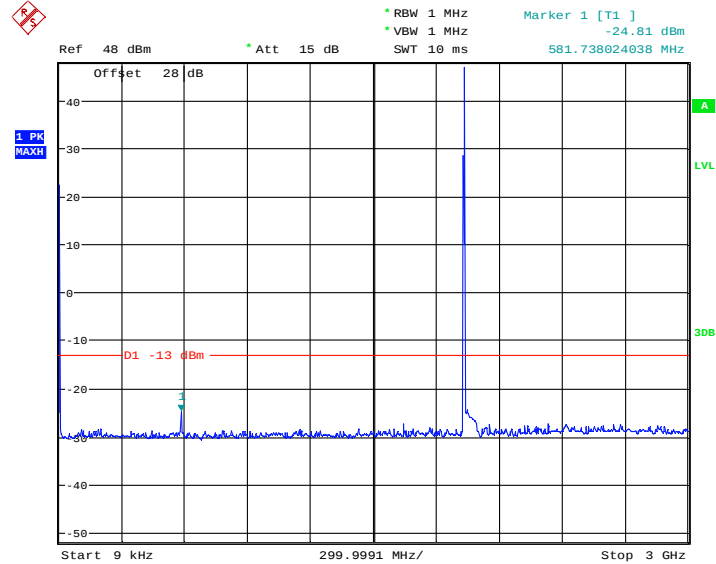
The emissions at 9kHz on the plots was not generated by the test object. A complementary measurement with a smaller Span showed that it was related to the LO feedthrough.



Date: 15.FEB.2011 08:50:57

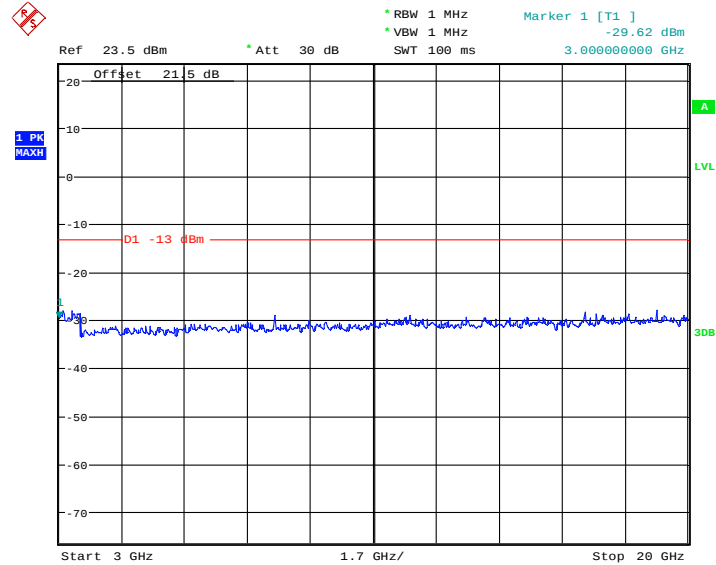


Product Service

Single Carrier**Configuration - Mode 1****GMSK****9kHz to 3GHz**

Date: 15.FEB.2011 08:47:29

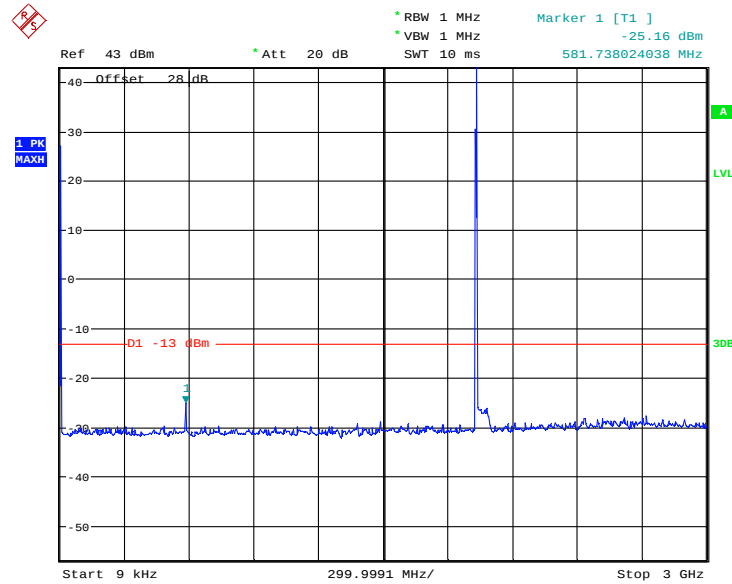
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 08:52:26

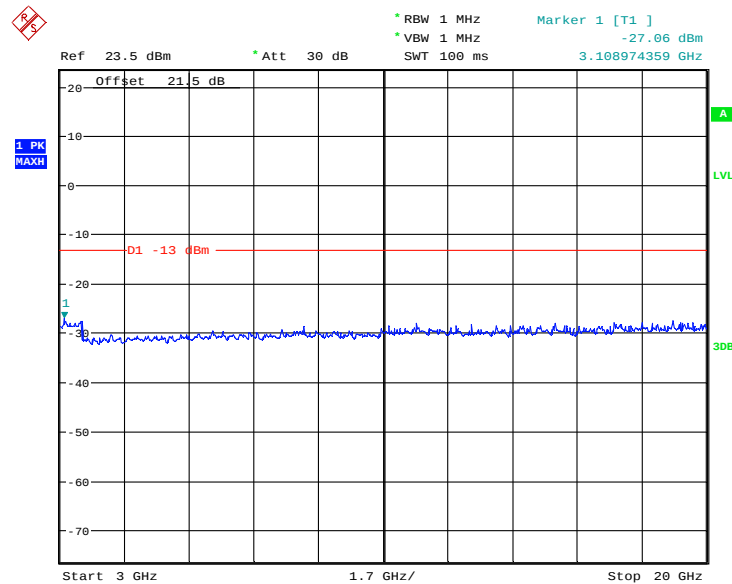


Product Service

8-PSK9kHz to 3GHz

Date: 15.FEB.2011 09:00:54

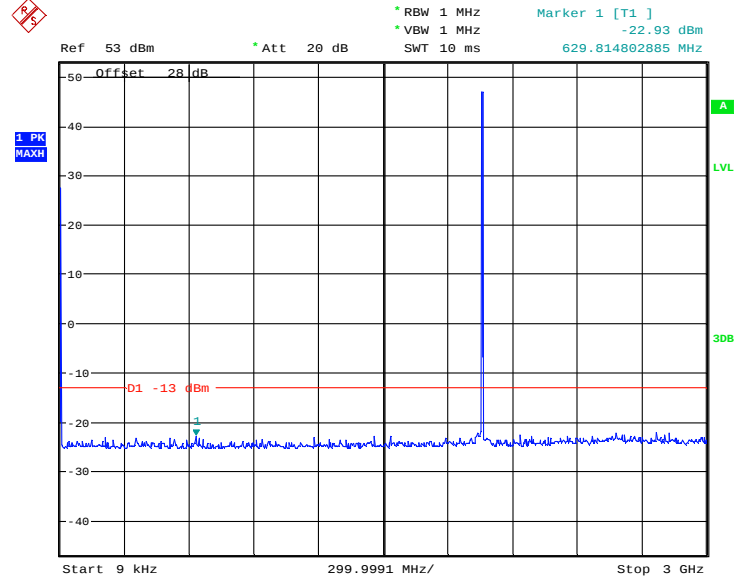
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 08:58:58

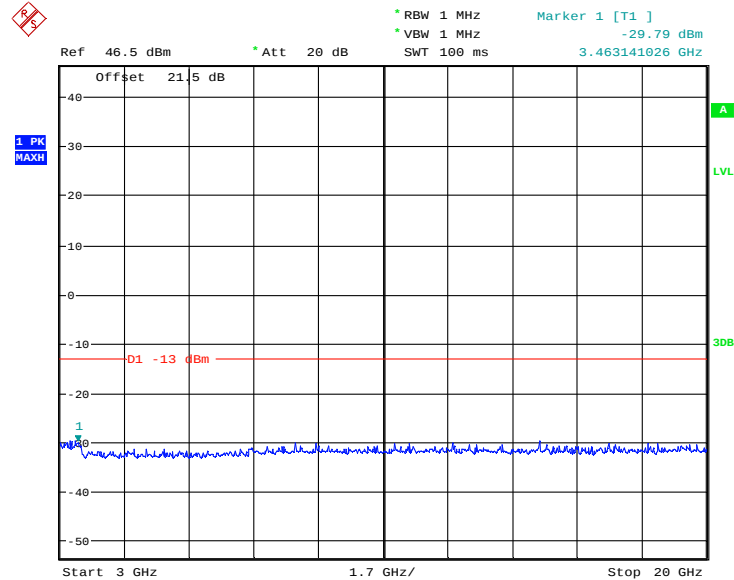


Product Service

Configuration 1 - Mode 2GMSK9kHz to 3GHz

Date: 15.FEB.2011 09:06:57

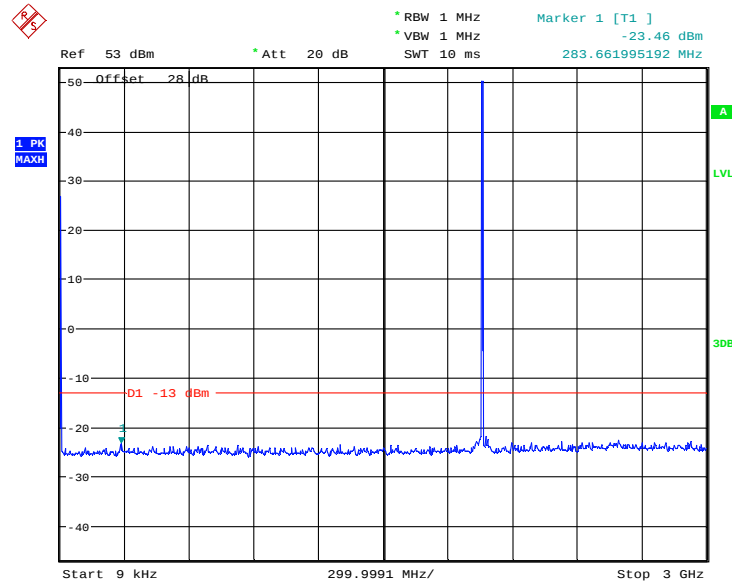
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 09:05:28

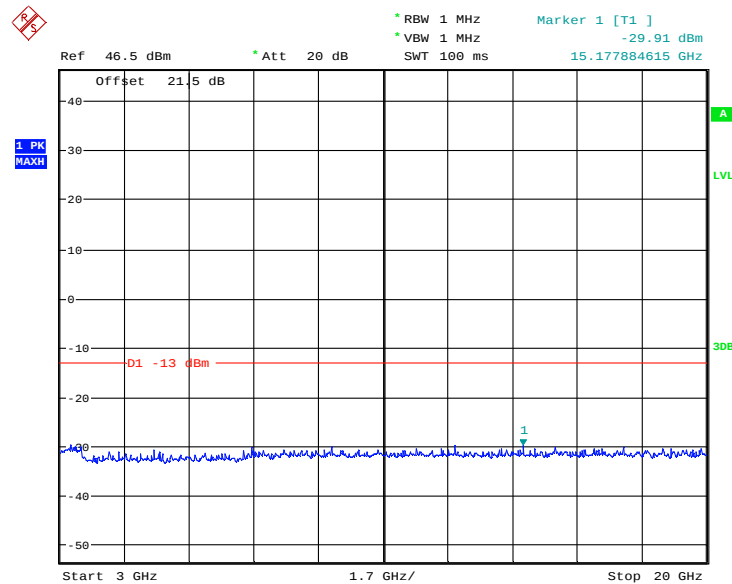


Product Service

8-PSK9kHz to 3GHz

Date: 15.FEB.2011 09:02:56

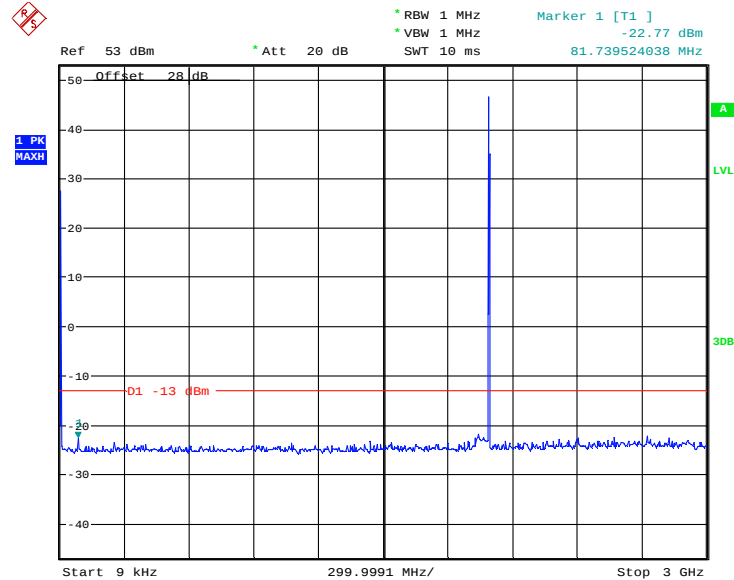
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 09:04:01

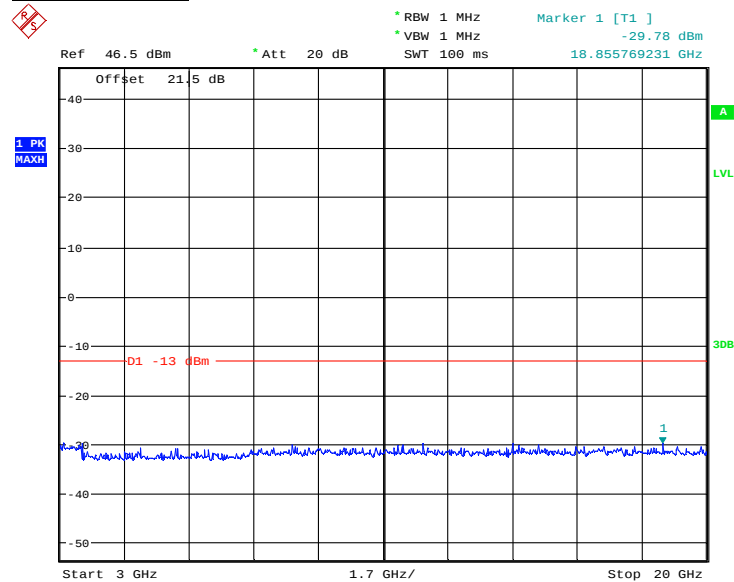


Product Service

Configuration 1 - Mode 3GMSK9kHz to 3GHz

Date: 15.FEB.2011 09:09:31

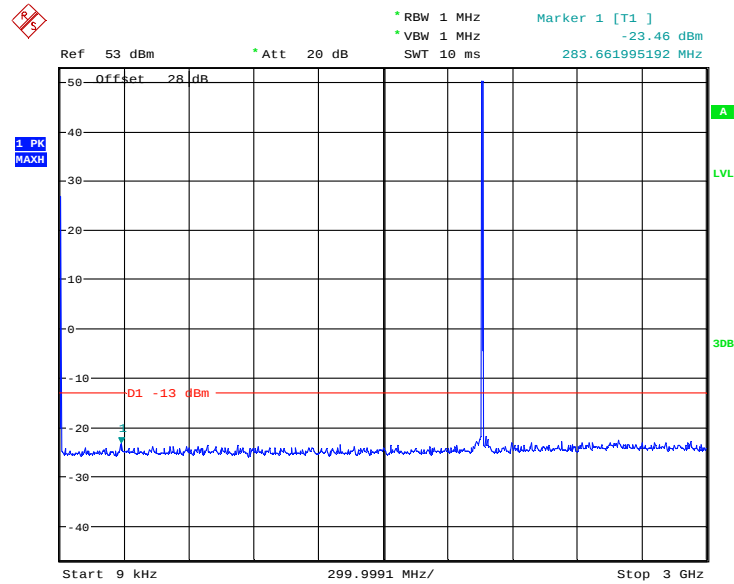
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 09:10:28

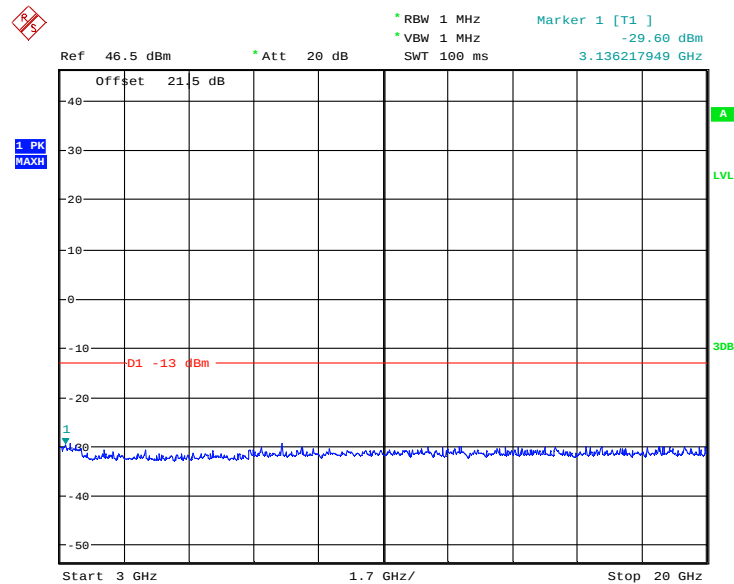


Product Service

8-PSK9kHz to 3GHz

Date: 15.FEB.2011 09:02:56

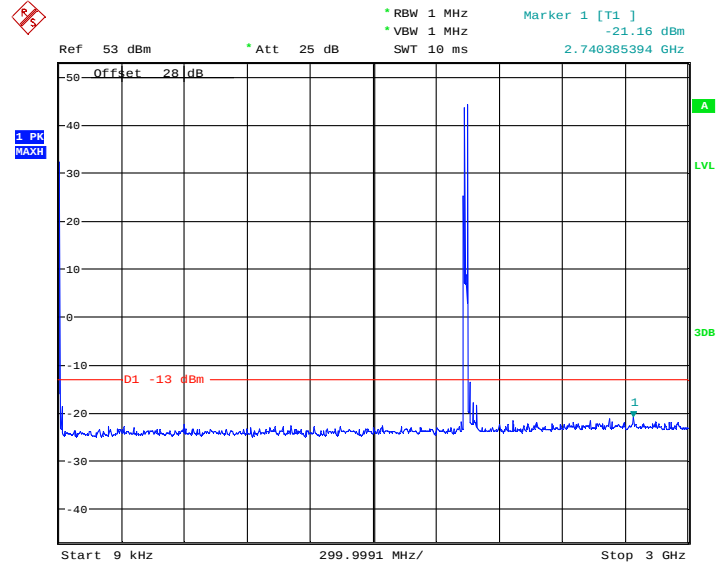
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 09:11:54

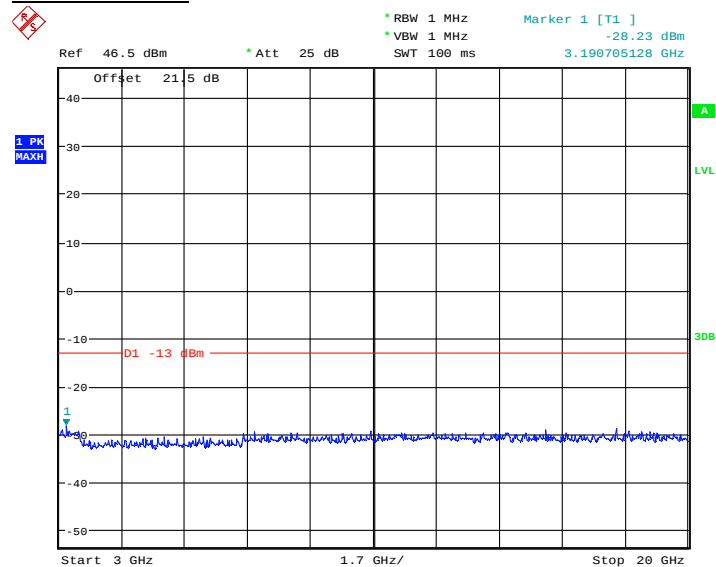


Product Service

Multi Carrier (1x2)**Configuration 1 - Mode 4****GMSK****9kHz to 3GHz**

Date: 15.FEB.2011 09:23:57

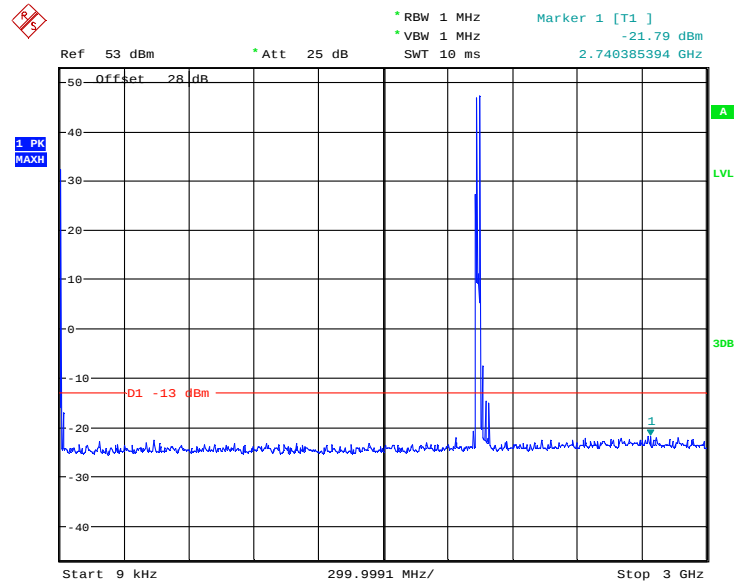
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 09:25:41

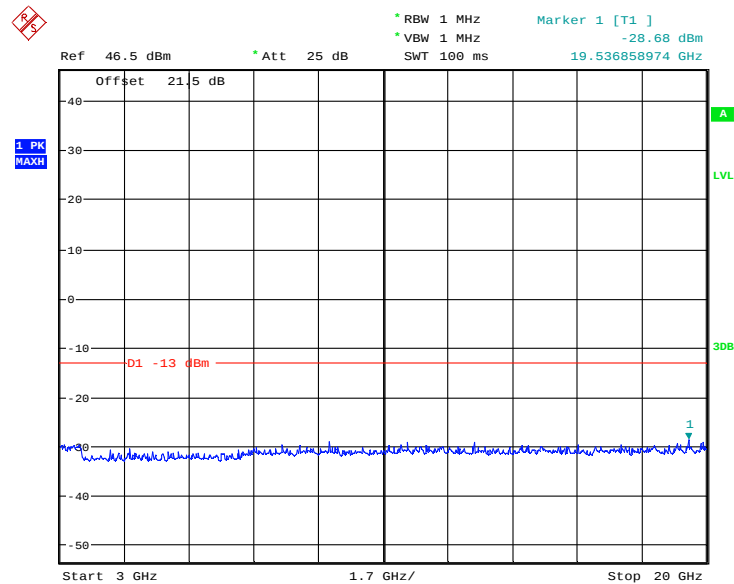


Product Service

8-PSK9kHz to 3GHz

Date: 15.FEB.2011 09:29:01

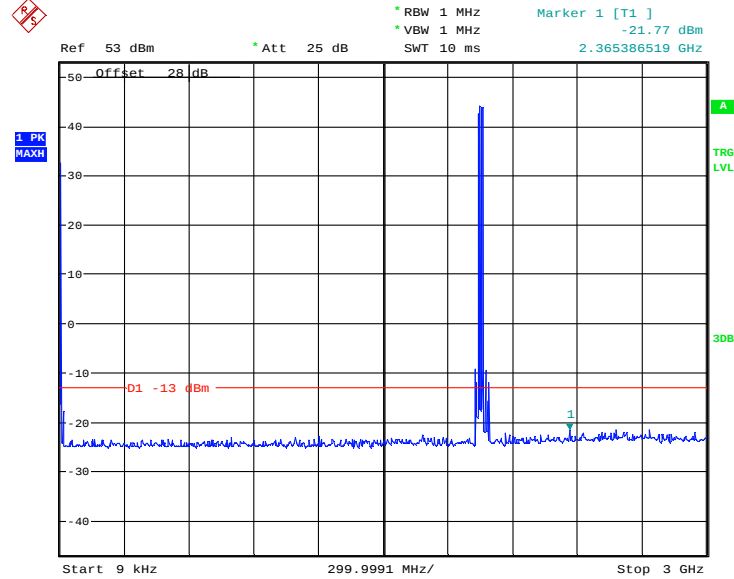
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 09:26:55

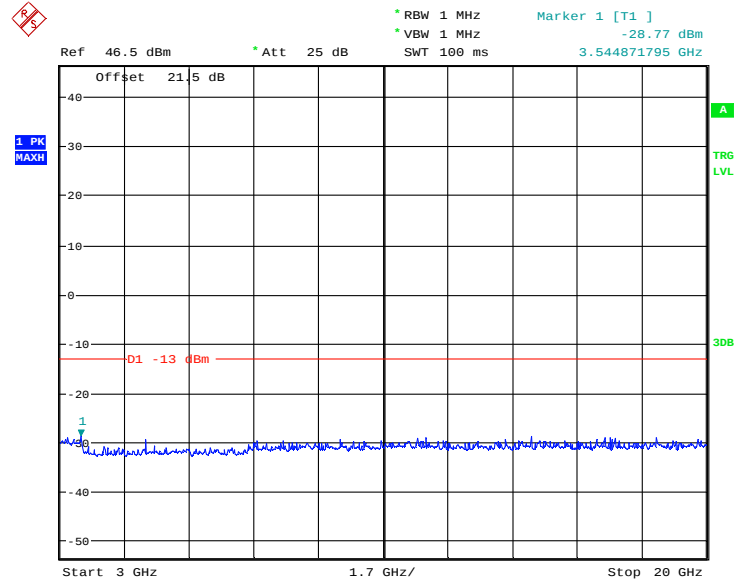


Product Service

Configuration 1 - Mode 5GMSK9kHz to 3GHz

Date: 15.FEB.2011 10:00:16

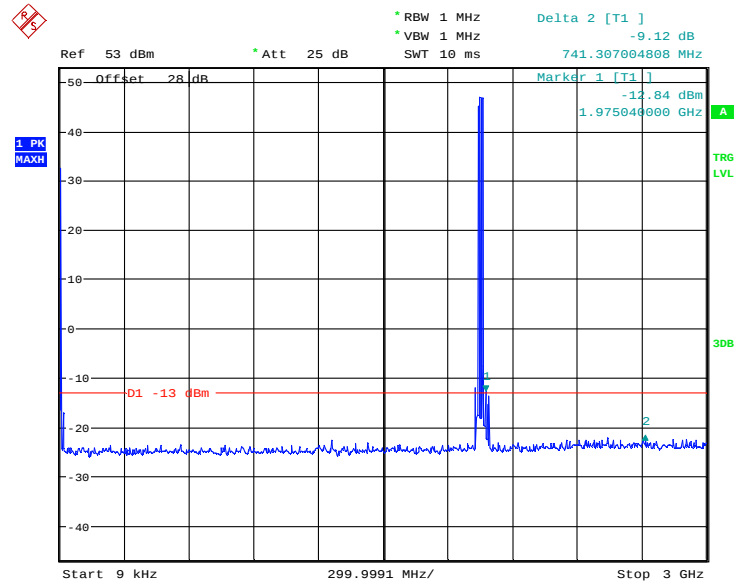
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 10:00:59

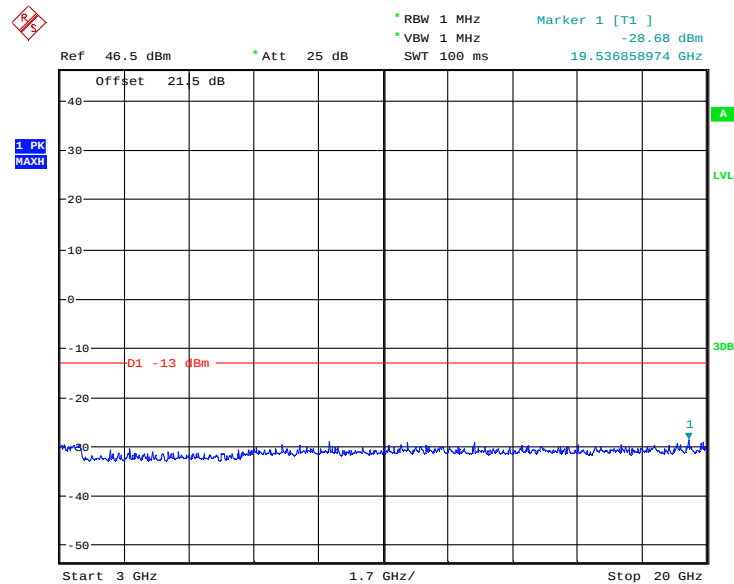


Product Service

8-PSK9kHz to 3GHz

Date: 15.FEB.2011 09:58:04

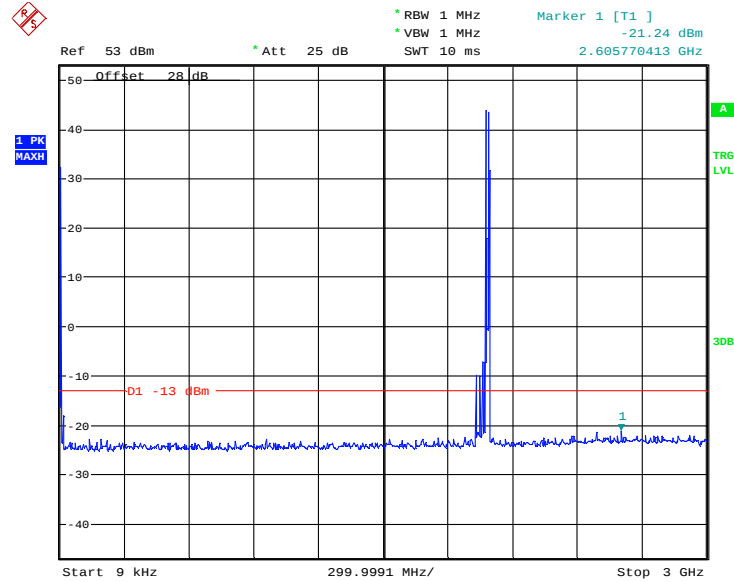
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 09:26:55

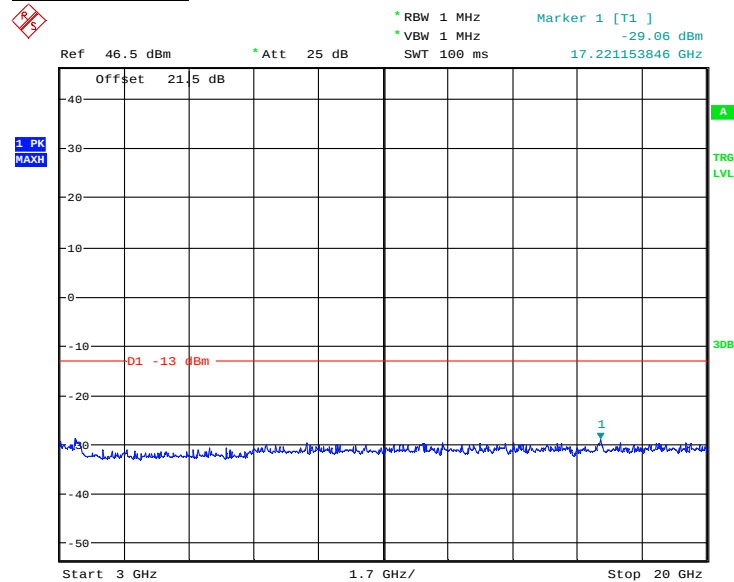


Product Service

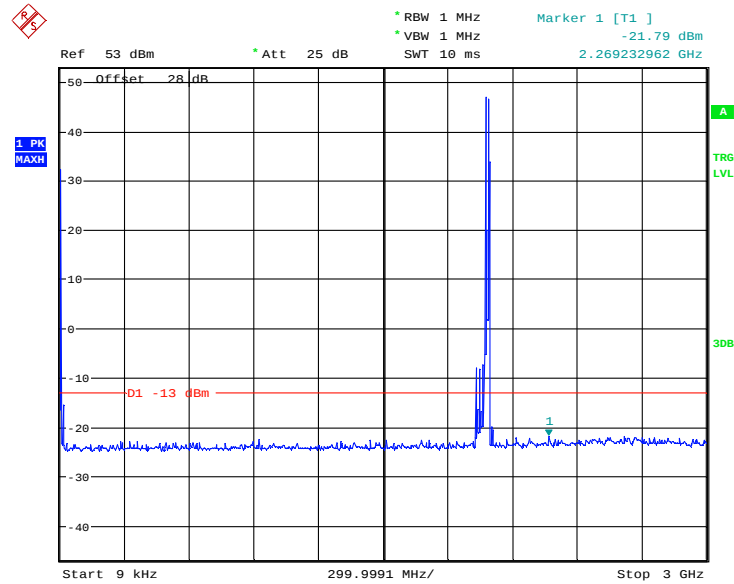
Configuration 1 - Mode 6GMSK9kHz to 3GHz

Date: 15.FEB.2011 10:05:09

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

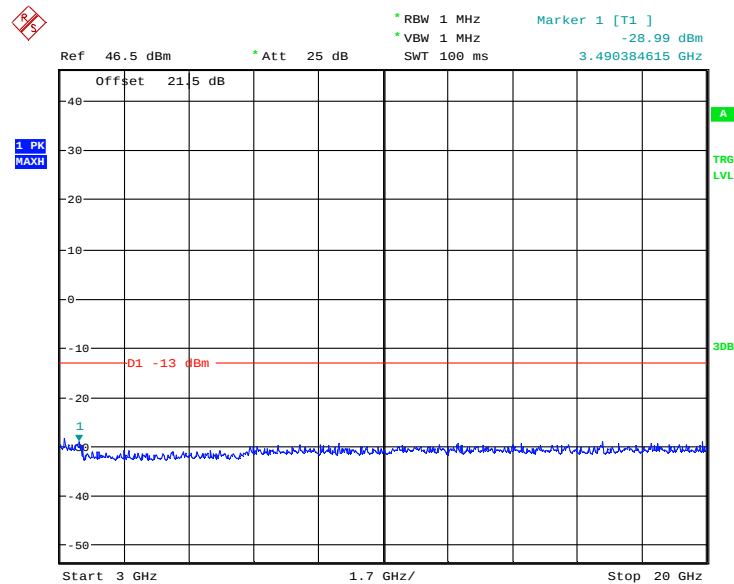
3GHz to 20GHz

Date: 15.FEB.2011 10:15:00

8-PSK9kHz to 3GHz

Date: 15.FEB.2011 10:12:14

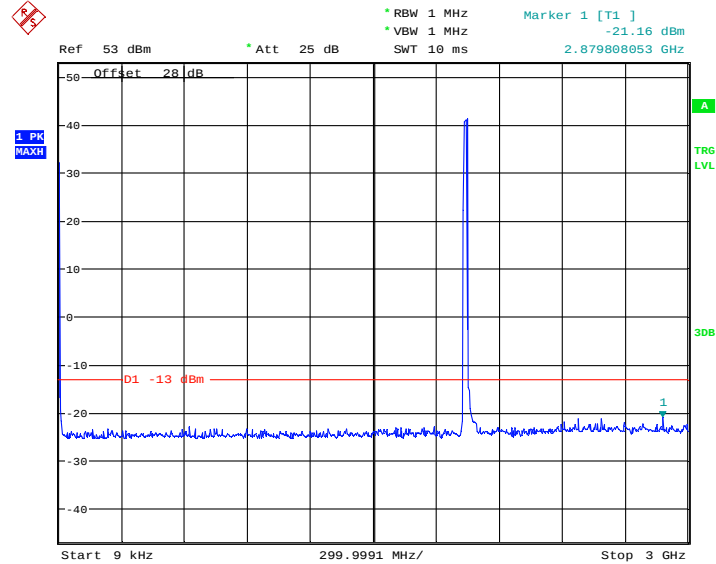
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 10:03:44

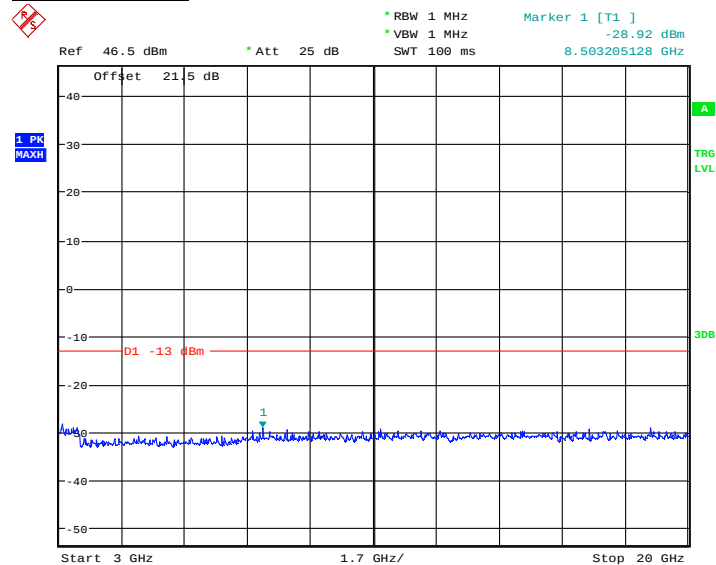


Product Service

Multi Carrier (1x4)**Configuration 1 - Mode 7****GMSK****9kHz to 3GHz**

Date: 15.FEB.2011 10:21:38

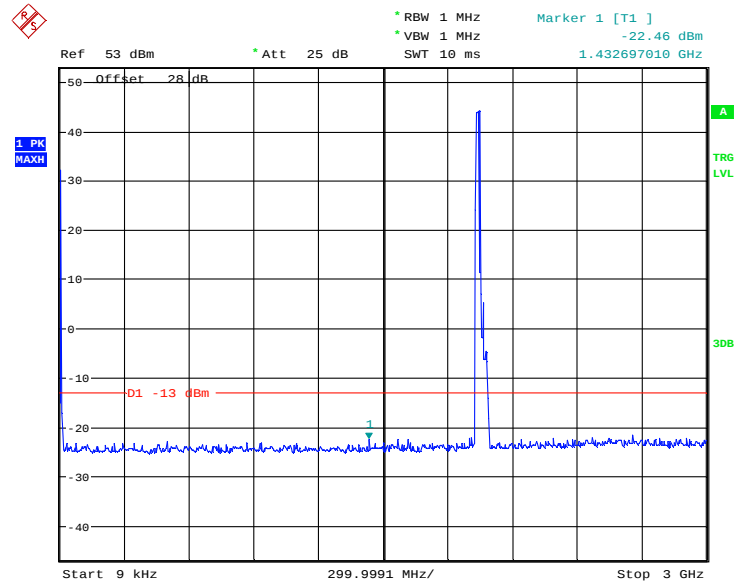
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 10:40:40

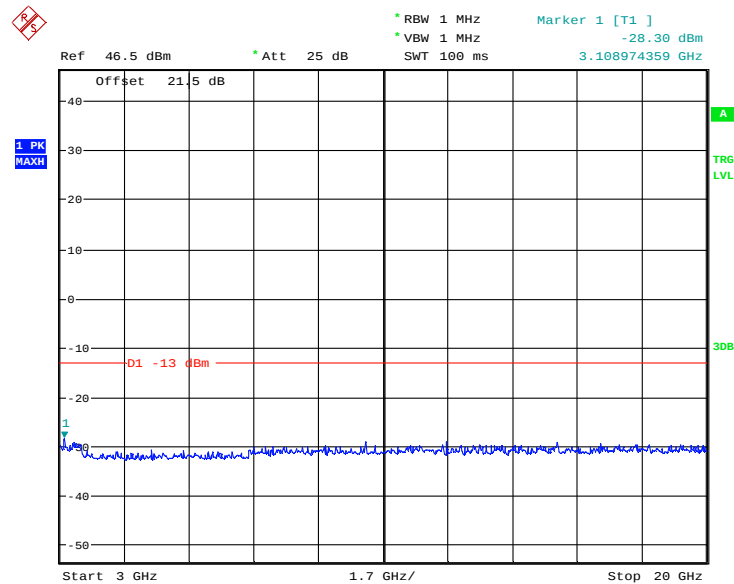


Product Service

8-PSK9kHz to 3GHz

Date: 15.FEB.2011 10:20:29

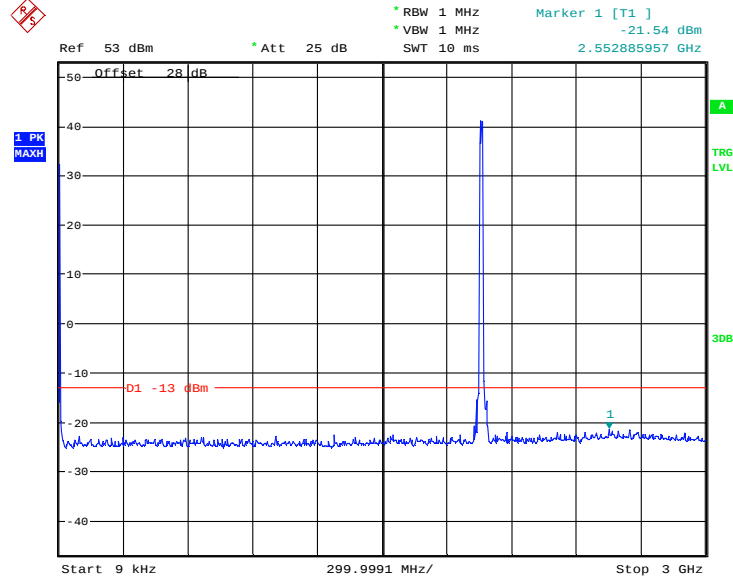
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 10:41:28

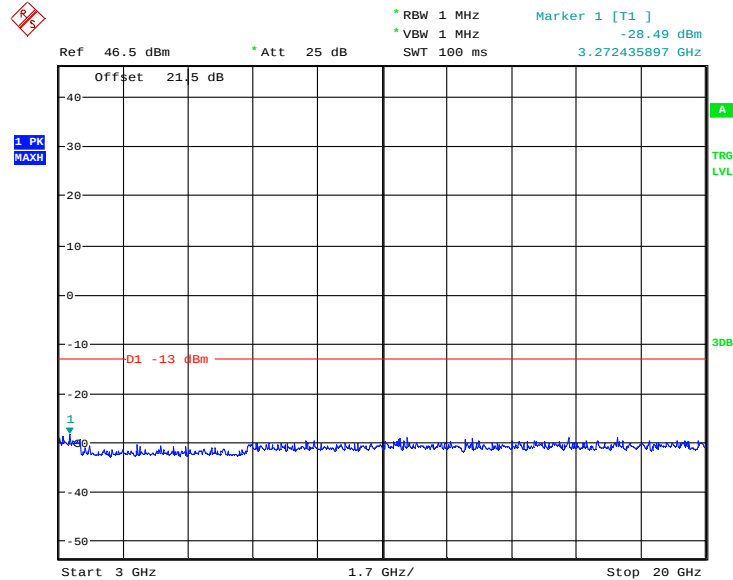


Product Service

Configuration 1 - Mode 8GMSK9kHz to 3GHz

Date: 15.FEB.2011 10:34:23

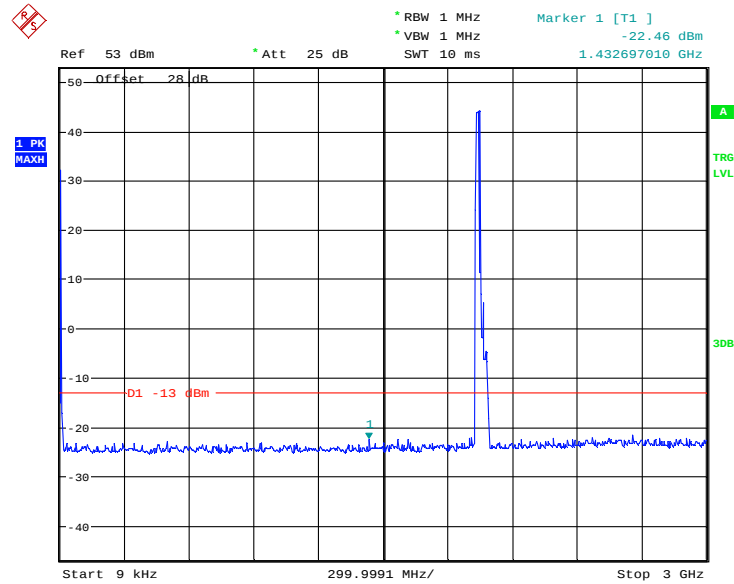
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 10:37:15

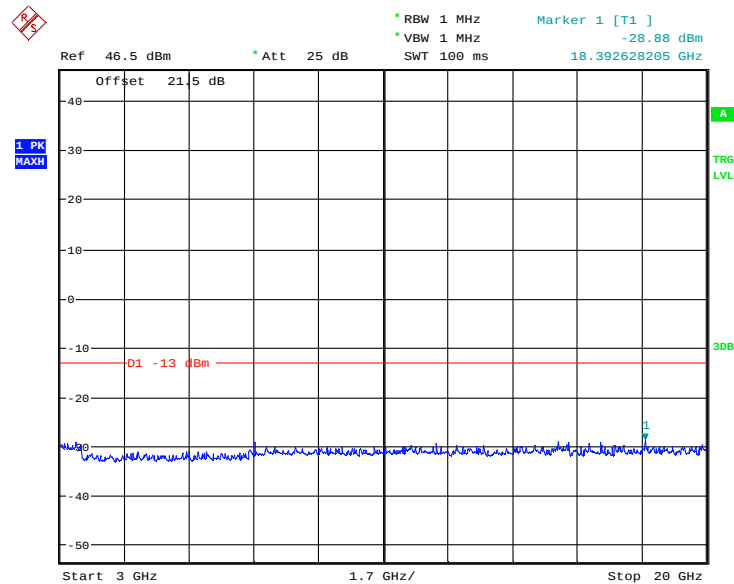


Product Service

8-PSK9kHz to 3GHz

Date: 15.FEB.2011 10:20:29

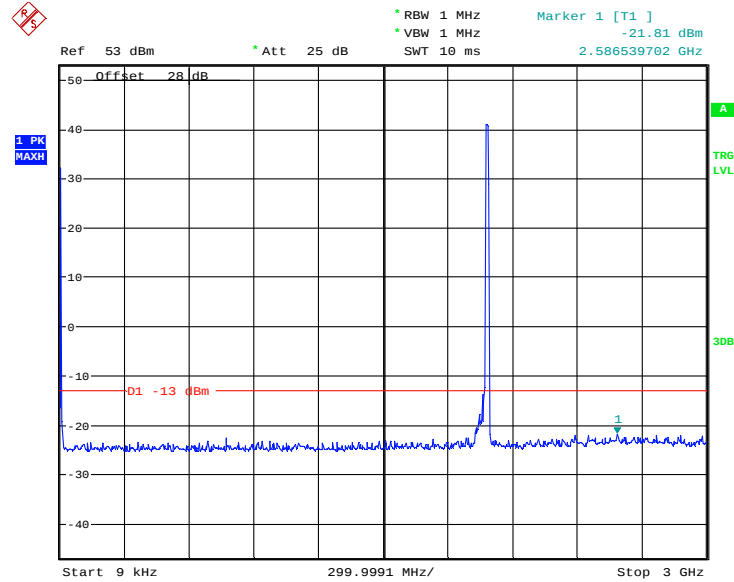
Note: The emission beyond the limit is the operating frequency.

3GHz to 20GHz

Date: 15.FEB.2011 10:19:01

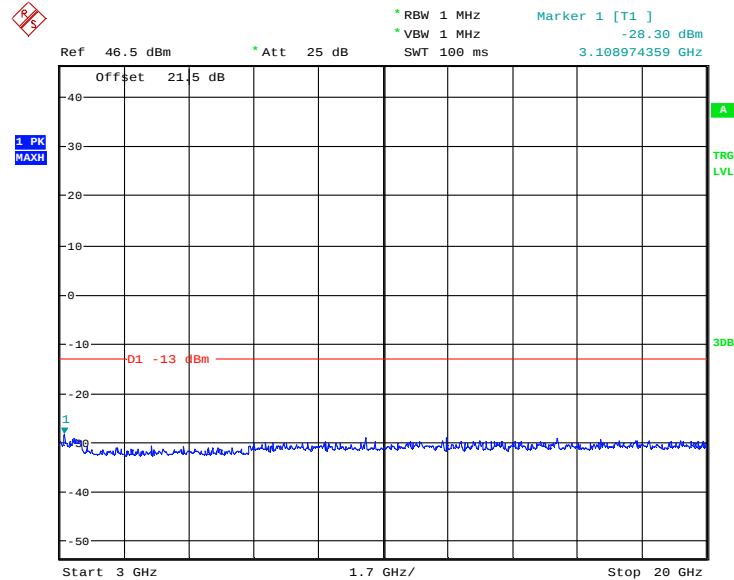


Product Service

Configuration 1 - Mode 9GMSK9kHz to 3GHz

Date: 15.FEB.2011 10:43:20

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

3GHz to 20GHz

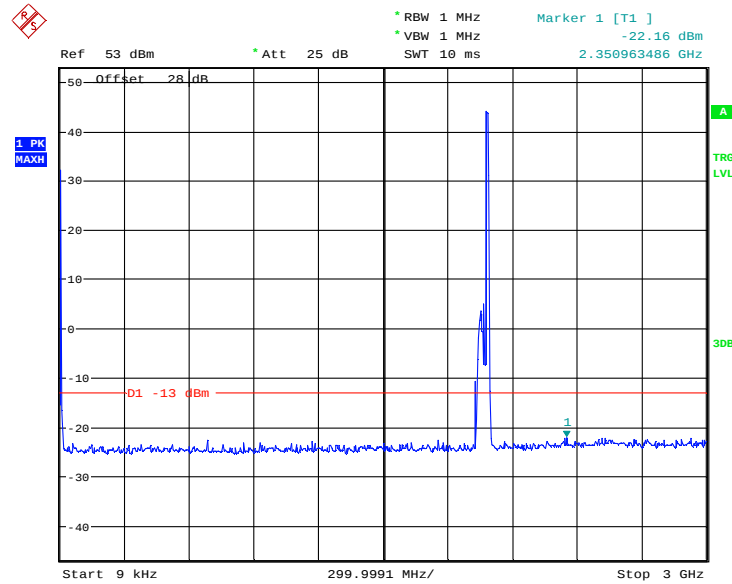
Date: 15.FEB.2011 10:41:28



Product Service

8-PSK

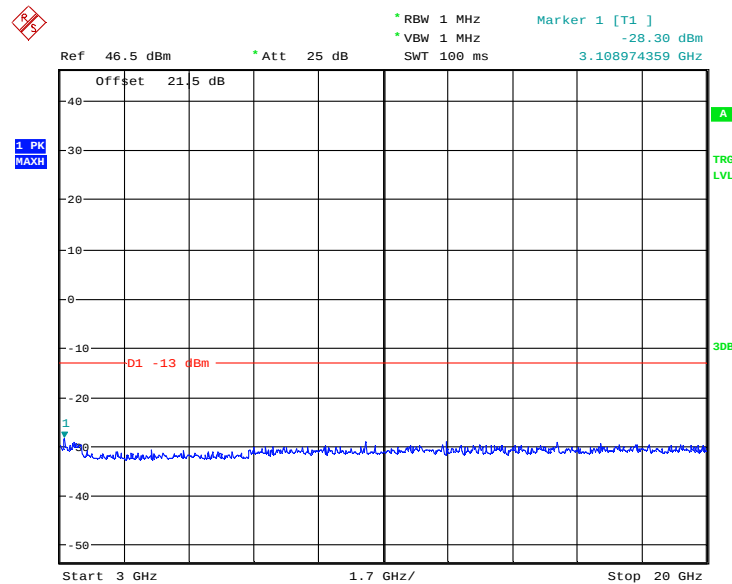
9kHz to 3GHz



Date: 15.FEB.2011 10:42:26

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

3GHz to 20GHz



Date: 15.FEB.2011 10:41:28



Product Service

Limit	-13dBm
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Remarks

The EUT does not exceed -13dBm at the frequency range of 9kHz to 20GHz.



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 24, Clause 24.235
Industry Canada RSS-133, Clause 6.3

2.8.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/1, S/N: CB4G022478

2.8.3 Date of Test and Modification State

20 January 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 24 and Industry Canada RSS-133.

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

20 January 2011

Ambient Temperature 23.0°C

Relative Humidity 22.0%



2.8.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Frequency Stability Under Temperature Variations.

The test results are shown below

Single Carrier

Power Supply: -48V DC

Configuration 1 - Mode 2

GMSK

Temperature Interval (°C)	Deviation (Hz)
-30	25.70
-20	24.36
-10	29.90
0	24.89
+10	27.68
+20	25.96
+30	30.59
+40	29.15
+50	26.74

8-PSK

Temperature Interval (°C)	Deviation (Hz)
-30	28.11
-20	24.62
-10	33.46
0	24.80
+10	28.31
+20	27.65
+30	25.43
+40	29.10
+50	27.59

Limit	±1.0 ppm or ±1.96kHz
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Remarks

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



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 24, Clause 24.235
Industry Canada RSS-133, Clause 6.3

2.9.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/1, S/N: CB4G022478

2.9.3 Date of Test and Modification State

20 January 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 24 and Industry Canada RSS-133.

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

20 January 2011

Ambient Temperature 23.0°C

Relative Humidity 22.0%



2.9.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Frequency Stability Under Voltage Variations.

The test results are shown below

Single Carrier

Temperature: 20°C

Configuration 1 - Mode 2

GMSK

DC Voltage (V)	Deviation (Hz)
-40.8	29.04
-48.0	25.96
-55.2	26.54

8-PSK

DC Voltage (V)	Deviation (Hz)
-40.8	29.22
-48.0	27.65
-55.2	28.18

Limit	± 1.0 ppm or ± 1.96 kHz
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Remarks

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



Product Service

2.10 RECEIVER SPURIOUS EMISSIONS

2.10.1 Specification Reference

Industry Canada RSS-133, Clause 6.6

2.10.2 Equipment Under Test

RRUS 01 B2 / KRC 118 74/1, S/N: CB4G022478

2.10.3 Date of Test and Modification State

20 January 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 Industry Canada RSS-133.

In accordance with RSS-Gen Clause 6(b), 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 10GHz thus meeting the requirements of RSS-Gen Clause 6(b), the spectrum analyser detector was set to peak and trace was kept on Max Hold 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 5th 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 2

2.10.6 Environmental Conditions

20 January 2011

Ambient Temperature 23.0°C

Relative Humidity 22.0%



Product Service

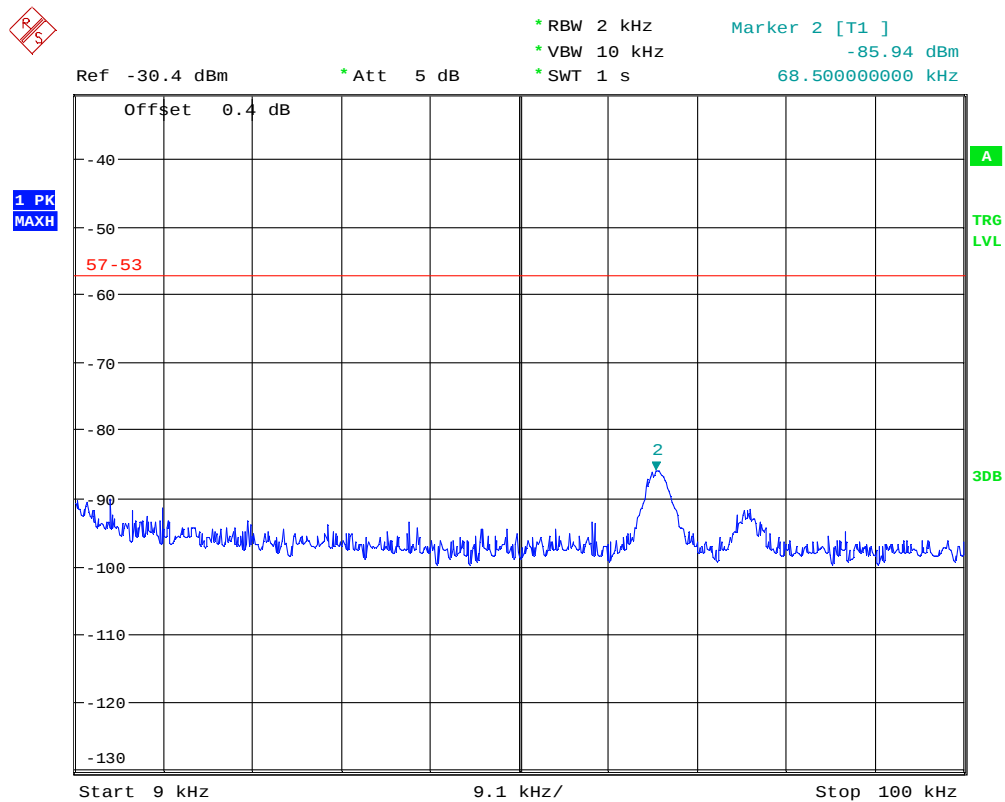
2.10.7 Test Results

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

The test results are shown below

Remark:

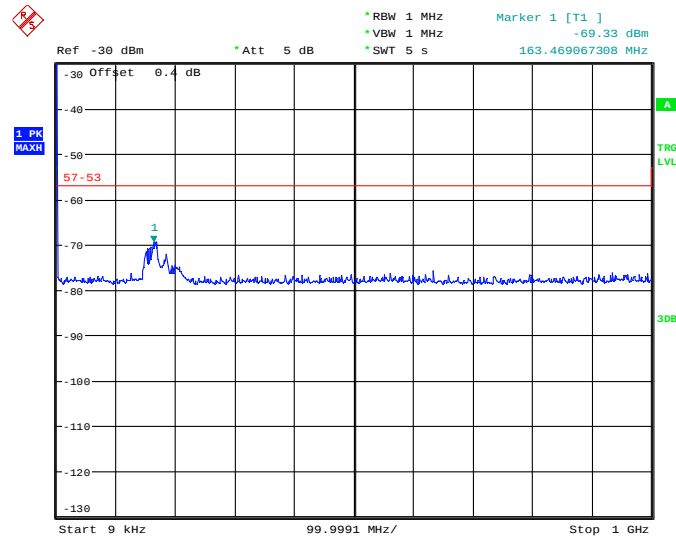
The emissions at 9kHz on the plots was not generated by the test object. A complementary measurement with a smaller Span showed that it was related to the LO feedthrough.



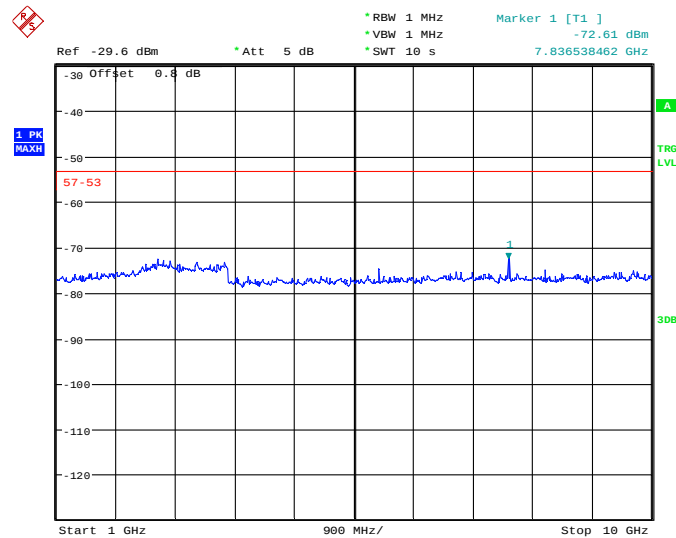
Date: 20.JAN.2011 09:29:59



Product Service

Single Carrier**Configuration 1 - Mode 2****GMSK****9kHz to 1GHz**

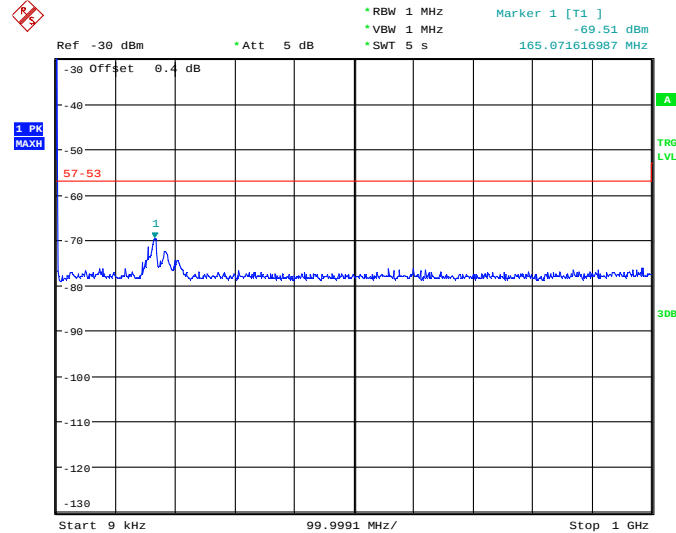
Date: 20.JAN.2011 04:47:56

1GHz to 10GHz

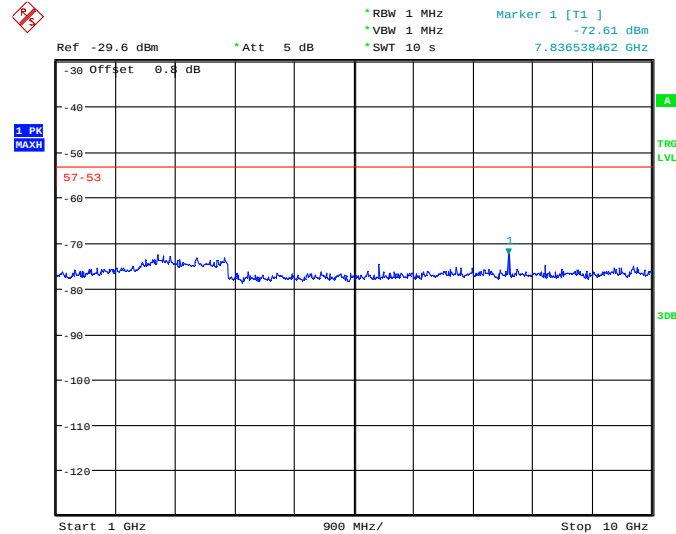
Date: 20.JAN.2011 04:51:22



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8-PSK9kHz to 1GHz

Date: 20.JAN.2011 04:50:15

1GHz to 10GHz

Date: 20.JAN.2011 04:51:22

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 10GHz.



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	Serial No.	Calibration Due
Section 2.1, 2.2, 2.3, 2.4, 2.6, 2.7 and 2.10 – Maximum Conducted Output Power, Peak – Average Ratio, Modulation Characteristics, Occupied Bandwidth, Spurious Emissions at Antenna Terminals (± 1MHz), Conducted Spurious Emissions and Receiver Spurious Emissions.				
Spectrum Analyser	Rohde & Schwarz	FSQ26	200761	2011/08/24
Spectrum Analyser	Agilent	E4440A	MY45304526	2011/08/24
Power Metre	Rohde & Schwarz	NRP	102431	2011/08/24
Thermal Power Sensor	Rohde & Schwarz	NRP-Z51	102126	2011/08/24
Network Analyzer	Agilent	8720D	US38431317	2011/08/24
Coaxial Directional Coupler	Narda Microwave Corporation	3042B-10	42110	O/P MON
40dB Attenuator	SHX	DTS40-100-3	090323452	O/P MON
Load	Shanghai Huaxiang	TF150-3	090323436	O/P MON
RF Box	TOPYOUNG	TX-MU	BAMS-1000785455	O/P MON
RF Box	TOPYOUNG	TX-FU 1900	BAMS-1000785956	O/P MON
Power Supply	Dahua	DH1716-5D	200360033	O/P MON
Digital Multi-meter	FLUKE	179	91820401	2012/01/03
Thermo-hygrometer	AZ Instruments	8705	9151655	2011/12/16
Section 2.5 – Radiated Spurious Emissions				
Load	Shanghai Huaxiang	TF150-3	090323436	O/P MON
Load	Shanghai Huaxiang	TF100	09121641	O/P MON
EMI Receiver	Rohde & Schwarz	ESI 40	100015	2011/08/19
Ultra log test antenna	Rohde & Schwarz	HL562	100167	2011/08/19
Double-Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF 906	100029	2011/08/19
Antenna master	Frankonia	MA 260	-	2011/08/19
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	TU
Semi Anechoic Chamber	Frankonia	23.18m×16.88m×9.60m	-	2011/08/19
Power Supply	Dahua	DH1716-5D	2008040018	O/P MON
Digital Multimeter	FLUKE	179	91820401	2012/01/03
Section 2.8 and 2.9 – Frequency Stability Under Temperature and Voltage Variations				
Spectrum Analyser	Rohde & Schwarz	FSQ26	200761	2011/08/24
40dB Attenuator	SHX	DTS100-40-3	090323456	O/P MON
Temperature Chamber	Zengda	ZTH100U	10080004	O/P MON
Power Supply	Dahua	DH1716-5D	200360033	O/P MON
Digital Multimeter	FLUKE	179	91820401	2012/01/03
Thermo-hygrometer	AZ Instruments	8705	9151655	2011/12/16

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



3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
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



Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

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

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