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Report On

FCC and Industry Canada Testing of the
Ericsson AB RUS 01 B2 / KRC 118 66/2

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FCC ID: TA8AKRC11866-2
IC ID: 287AB-AS118662

Document 75921580 Report 04 Issue 1

April 2013



Product Service

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FCC and Industry Canada Testing of the
Ericsson RUS 01 B2 / KRC 118 66/2

Document 75921580 Report 04 Issue 1

April 2013

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DATED

22 April 2013

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);

G Zhao

X Zhang





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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Ericsson RUS 01 B2 / KRC 118 66/2



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RUS 01 B2 / KRC 118 66/2 to the requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133.

Testing was carried out in support of a C2PC application for Grant of RUS 01 B2 / KRC 118 66/2 for hardware update in CDMA mode.

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	RUS 01 B2
Part Number	KRC 118 66/2
IC Model Number	AS118662
Serial Number(s)	D164655167
Software Version	CXP102051/18 Rev R19N
PIS Software Version	CXP9017316/1 Rev R39UL
Hardware Version	R1G
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 24: 2012 Industry Canada RSS-133 Issue 6: 2013
Incoming Release Date	Declaration of Build Status 23 February 2013
Order Number Date	PTP 24 February 2013
Start of Test	28 February 2013
Finish of Test	26 March 2013
Name of Engineer(s)	G Zhao X Zhang
Related Document(s)	ANSI C63.4: 2009 FCC CFR 47 Part 2: 2012 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 – Radio Equipment							
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	1931.25MHz		N/A	No integral antenna.
				1960.00MHz		N/A	
				1988.75MHz		N/A	
				1931.25MHz+1932.50MHz		N/A	
				1960.00MHz+1961.25MHz		N/A	
				1987.50MHz+1988.75MHz		N/A	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz		N/A	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz		N/A	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz		N/A	
2.1	2.1046, 24.232 (a)	6.4	Maximum Peak Output Power - Conducted	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz+1932.50MHz	0	Pass	
				1960.00MHz+1961.25MHz	0	Pass	
				1987.50MHz+1988.75MHz	0	Pass	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz	0	Pass	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz	0	Pass	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz	0	Pass	
2.2	24.232 (d)	6.4	Peak – Average Ratio	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz+1932.50MHz	0	Pass	
				1960.00MHz+1961.25MHz	0	Pass	
				1987.50MHz+1988.75MHz	0	Pass	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz	0	Pass	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz	0	Pass	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz	0	Pass	



Configuration 1 – Radio Equipment							
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	1931.25MHz		N/A	-
				1960.00MHz	0	Pass	
				1988.75MHz		N/A	
				1931.25MHz+1932.50MHz		N/A	
				1960.00MHz+1961.25MHz		N/A	
				1987.50MHz+1988.75MHz		N/A	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz		N/A	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz		N/A	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz		N/A	
2.4	2.1049, 24.238 (b)	RSS-Gen 4.6.1	Occupied Bandwidth	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz+1932.50MHz		N/A	
				1960.00MHz+1961.25MHz		N/A	
				1987.50MHz+1988.75MHz		N/A	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz		N/A	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz		N/A	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz		N/A	
2.5	2.1051, 24.238 (b)	6.5	Spurious Emissions at Antenna Terminals (±1MHz)	1931.25MHz	0	Pass	-
				1960.00MHz		N/A	
				1988.75MHz	0	Pass	
				1931.25MHz+1933.75MHz	0	Pass	
				1960.00MHz+1962.50MHz			
				1986.25MHz+1988.75MHz	0	Pass	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz		N/A	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz		N/A	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz		N/A	



Configuration 1 – Radio Equipment							
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	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz+1932.50MHz		N/A	
				1960.00MHz+1961.25MHz		N/A	
				1987.50MHz+1988.75MHz	0	Pass	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz		N/A	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz		N/A	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz	0	Pass	
2.7	2.1051, 24.238 (a)	6.5	Conducted Spurious Emissions	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz+1932.50MHz	0	Pass	
				1960.00MHz+1961.25MHz	0	Pass	
				1987.50MHz+1988.75MHz	0	Pass	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz		N/A	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz		N/A	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz		N/A	
	2.1055, 24.235	6.3	Frequency Stability Under Temperature Variations	1931.25MHz		N/A	-
				1960.00MHz		N/A	
				1988.75MHz		N/A	
				1931.25MHz+1932.50MHz		N/A	
				1960.00MHz+1961.25MHz		N/A	
				1987.50MHz+1988.75MHz		N/A	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz		N/A	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz		N/A	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz		N/A	



Configuration 1 – Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 24	RSS-133 and RSS-GEN					
	2.1055, 24.235	6.3	Frequency Stability Under Voltage Variations	1931.25MHz		N/A	-
				1960.00MHz		N/A	
				1988.75MHz		N/A	
				1931.25MHz+1932.50MHz		N/A	
				1960.00MHz+1961.25MHz		N/A	
				1987.50MHz+1988.75MHz		N/A	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz		N/A	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz		N/A	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz		N/A	
	-	6.6	Receiver Spurious Emissions	1931.25MHz		N/A	-
				1960.00MHz		N/A	
				1988.75MHz		N/A	
				1931.25MHz+1932.50MHz		N/A	
				1960.00MHz+1961.25MHz		N/A	
				1987.50MHz+1988.75MHz		N/A	
				1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz		N/A	
				1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz		N/A	
				1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz		N/A	

N/A – Not Applicable

1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Equipment
MANUFACTURER	Ericsson AB
PRODUCT NAME	RUS 01 B2
PART NUMBER	KRC 118 66/2
IC Model Number	AS118662
SERIAL NUMBER(s)	D164655167
HARDWARE VERSION	R1G
PIS SOFTWARE VERSION	CXP9017316/1 Rev R39UL
SOFTWARE VERSION	CXP102051/18 Rev R19N
TRANSMITTER OPERATING RANGE	TX: 1931.25MHz - 1988.75MHz RX: 1851.25MHz - 1908.75MHz
MODULATIONS	QPSK, 8PSK, 16QAM
INTERMEDIATE FREQUENCIES	--
ITU DESIGNATION OF EMISSION	1M25F9W
CHANNEL BANDWIDTH	1.25 MHz
OUTPUT POWER (RMS) (W or dBm)	Single Carrier: 1 x 49.0dBm (1 x 80W) Multi Carrier (x 2): 2 x 46.0dBm (2 x 40W) Multi Carrier (x 4): 2 x 43.0dBm (4 x 20W)
OUTPUT POWER TOLERANCE	± 2.0dB
NUMBER OF ANTENNA PORTS	1 TX/RX port, 1 RX port
SUPPORTED CONFIGURATION	Single Carrier or Multi Carrier.
FCC ID	TA8AKRC11866-2
IC ID	287AB-AS118662
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is the Radio Part of CDMA Base Station.

Signature



Date

07 April 2013

D of B S Serial No

75921580/04

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

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) RUS 01 B2 / KRC 118 66/2 is an Ericsson Radio Equipment working in the public mobile service 1900MHz band which provides communication connections to CDMA1900 network. The RUS 01 B2 / KRC 118 66/2 operates from a -48V DC supply.

The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturers documentation.



Equipment Under Test



1.4.2 Test Configuration

Configuration 1: Radio Equipment

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

The RUS 01 B2 / KRC 118 66/2 supports CDMA with QPSK, 8PSK and 16QAM modulations at 1900MHz. The setting below was found to be representative for all traffic scenarios when several settings with the different modulations and the number of carriers were tested to find the worst case setting. These settings were used for all measurements if not otherwise noted:

- Single carrier:
QPSK Modulation
Forward Traffic Channel using Spreading Rate 1 (1X), Voice
User Channels: 6
Channel rate: 9.6kbps
Channel bandwidth: 1.25MHz.

For other modulations, the settings are as follows:

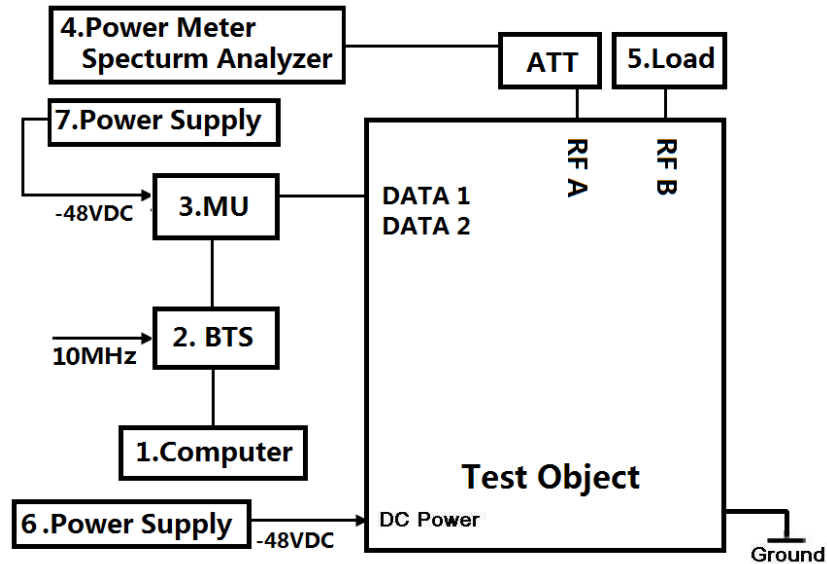
- QPSK Modulation: High Rate Packet Data
User Channels: 14
Channel rate: 614.4kbps
- 8PSK Modulation: High Rate Packet Data
User Channels: 14
Channel rate: 921.6kbps
- 16QAM Modulation: High Rate Packet Data
User Channels: 14
Channel rate: 2457.6kbps

Channel bandwidth: 1.25MHz

The EUT has only one TX/RX port and one RX port and it can be configured to transmit with 1900MHz single or multi carrier at RF A output connector. All TX measurements were performed on the TX output connector RF A.

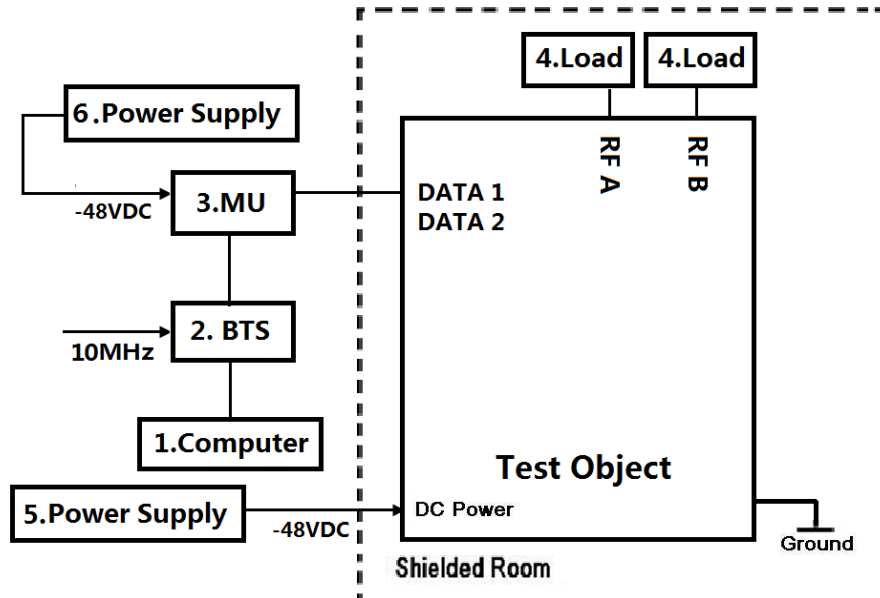
The complete testing was performed with the EUT transmitting at maximum RF power unless otherwise stated.

The EUT was powered by a -48V DC Power supply.

**Test Setup, Conducted Measurement:**

Test Object	Part Number	Version	Serial Number
Radio Part	RUS 01 B2 / KRC 118 66/2	R1G	D164655167

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP 8470P	--	AP533355
2	BTS 602A	--	--	--
	DBA	NTLK90AAE5	06	NNTMPX00P6XF
	CEEM	NTLK86AAE5	02	NNTMPX00MHPR
	AEM1302	NTLK85GAE5	07	NNTMPX00VJV8
	AEM1302	NTLK85GAE5	07	NNTMPX00VL8Y
3	DUL 20 01	KDU 137 533/4	R1C	C824321396
	XMU 02 01	KDU 137 745/1	R2B	TU8X761275
	SUP 6601	1/BFL 901 009/1	R3B	BR81262548
4	Power Meter	NRP	--	102438
	Power Sensor	NRP-Z51	--	102434
	Spectrum Analyzer	FSQ26	--	201123
	Spectrum Analyzer	Agilent E4440A	--	MY46187580
5	Load	TFE5-3	--	090715057
6	Power Supply	DH1716-5D	--	2008040041
7	Power Supply	DH1716-5D	--	200360003

**Test Setup, Radiated Measurement:**

Test Object	Part Number	Version	Serial Number
Radio Part	RUS 01 B2 / KRC 118 66/2	R1G	D164655167

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	ADVANTECH 610H	--	ATB5103888
2	BTS 602A	--	--	--
	DBA	NTLK90AAE5	06	NNTMPX00P6XF
	CEEM	NTLK86AAE5	02	NNTMPX00MHPR
	AEM1302	NTLK85GAE5	07	NNTMPX00VJV8
	AEM1302	NTLK85GAE5	07	NNTMPX00VL8Y
3	DUL 20 01	KDU 137 533/4	R1C	C824321396
	XMU 02 01	KDU 137 745/1	R2B	TU8X761275
	SUP 6601	1/BFL 901 009/1	R3B	BR81262548
4	Load	TF100	--	09121648
	Load	TF100	--	09121605
5	Power Supply	DH1716A-14	--	20080401
6	Power Supply	DH1716-5D	--	200360003

1.4.3 Modes of Operation

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

Mode 1 - Channel No. 25: 1931.25MHz (Bottom Channel)

Mode 2 - Channel No. 600: 1960.00MHz (Middle Channel)

Mode 3 - Channel No. 1175: 1988.75MHz (Top Channel)

Mode 4 - Channel No. 25 + 50: 1931.25MHz + 1932.50MHz (B and B+1.25MHz)

Mode 5 - Channel No. 600 + 625: 1960.00MHz + 1961.25MHz (M and M+1.25MHz)

Mode 6 - Channel No. 1150 + 1175: 1987.50MHz + 1988.75MHz (T-1.25MHz and T)

Mode 7 - Channel No. 25 + 75: 1931.25MHz + 1933.75MHz (B and B+2.50MHz)

Mode 8 - Channel No. 1125 + 1175: 1986.25MHz + 1988.75MHz (T-2.50MHz and T)

Mode 9 - Channel No. 25 + 50 + 75 + 100:
1931.25MHz+1932.50MHz+1933.75MHz+1935.00MHz (B, B+1.25MHz, B+2.50MHz and B+3.75MHz)

Mode 10 - Channel No. 575 + 600 + 625 + 650:
1958.75MHz+1960.00MHz+1961.25MHz+1962.50MHz (M-1.25MHz, M, M+1.25MHz and B+2.50MHz)

Mode 11 - Channel No. 1100 + 1125 + 1150 + 1175:
1985.00MHz+1986.25MHz+1987.50MHz+1988.75MHz (T-3.75MHz, T-2.50MHz, T-1.25MHz and T)

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



1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

The EUT was powered from a -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

Only Radiated Spurious Emissions 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-1:

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 RUS 01 B2 / KRC 118 66/2



2.1 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
 FCC CFR 47 Part 24, Clause 24.232 (a)
 Industry Canada RSS-133, Clause 6.4

2.1.2 Equipment Under Test

RUS 01 B2 / KRC 118 66/2, S/N: D164655167

2.1.3 Date of Test and Modification State

28 February and 01, 05 to 07 March 2013 – 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 QPSK, 8PSK and 16QAM modulations.

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 9
 - Mode 10
 - Mode 11

2.1.6 Environmental Conditions

	28 Feb 2013	01 Mar 2013	05 Mar 2013	06 Mar 2013	07 Mar 2013
Ambient Temperature	26.5°C	24.0°C	23.5°C	22.5°C	24.5°C
Relative Humidity	38.2%	22.8%	30.4%	34.0%	37.0%



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

Configuration 1 - Mode 1, 2 and 3

QPSK

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 (Bottom)	1931.25	41.0	48.72	74.47
600 (Middle)	1960.00	41.0	48.80	75.86
1175 (Top)	1988.75	41.0	48.70	74.13

8PSK

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 (Bottom)	1931.25	41.0	48.71	74.30
600 (Middle)	1960.00	41.0	48.56	71.78
1175 (Top)	1988.75	41.0	48.68	73.79

16QAM

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 (Bottom)	1931.25	41.0	48.39	69.02
600 (Middle)	1960.00	41.0	48.48	70.47
1175 (Top)	1988.75	41.0	48.40	69.18

**Multi Carrier (1x2)****Configuration 1 - Mode 4, 5 and 6****QPSK**

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 & 50	1931.25 & 1932.50	41.0	48.90	77.62
600 & 625	1960.00 & 1961.25	41.0	48.88	77.27
1150 & 1175	1987.50 & 1988.75	41.0	48.69	73.96

8PSK

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 & 50	1931.25 & 1932.50	41.0	48.63	72.95
600 & 625	1960.00 & 1961.25	41.0	48.59	72.28
1150 & 1175	1987.50 & 1988.75	41.0	48.53	71.29

16QAM

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 & 50	1931.25 & 1932.50	41.0	48.43	69.66
600 & 625	1960.00 & 1961.25	41.0	48.56	71.78
1150 & 1175	1987.50 & 1988.75	41.0	48.52	71.12

Multi Carrier (1x4)**Configuration 1 - Mode 9, 10 and 11****QPSK**

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 & 50 & 75 & 100	1931.25 & 1932.50 & 1933.75 & 1935.00	41.0	48.85	76.74
575 & 600 & 625 & 650	1958.75 & 1960.00 & 1961.25 & 1962.50	41.0	48.78	75.51
1100 & 1125 & 1150 & 1175	1985.00 & 1986.25 & 1987.50 & 1988.75	41.0	48.77	75.34

8PSK

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 & 50 & 75 & 100	1931.25 & 1932.50 & 1933.75 & 1935.00	41.0	48.76	75.16
575 & 600 & 625 & 650	1958.75 & 1960.00 & 1961.25 & 1962.50	41.0	48.56	71.78
1100 & 1125 & 1150 & 1175	1985.00 & 1986.25 & 1987.50 & 1988.75	41.0	48.53	71.29

16QAM

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 & 50 & 75 & 100	1931.25 & 1932.50 & 1933.75 & 1935.00	41.0	48.56	71.78
575 & 600 & 625 & 650	1958.75 & 1960.00 & 1961.25 & 1962.50	41.0	48.57	71.94
1100 & 1125 & 1150 & 1175	1985.00 & 1986.25 & 1987.50 & 1988.75	41.0	48.56	71.78

Limit	$\leq 100W$ or $\leq +50dBm$
-------	------------------------------

Remarks

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



2.2 PEAK – AVERAGE RATIO

2.2.1 Specification Reference

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

2.2.2 Equipment Under Test

RUS 01 B2 / KRC 118 66/2, S/N: D164655167

2.2.3 Date of Test and Modification State

28 February and 01, 05, 06 and 11 March 2013 – 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 and Industry Canada RSS-133.

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 2MHz for single carrier, 3MHz for 2 carriers and 10MHz for 4 carriers, the path loss measured and entered as a reference level offset.

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

Configuration 1 - Mode 1
- Mode 2
- Mode 3
- Mode 4
- Mode 5
- Mode 6
- Mode 9
- Mode 10
- Mode 11

2.2.6 Environmental Conditions

	28 Feb 2013	01 Mar 2013	05 Mar 2013	06 Mar 2013	11 Mar 2013
Ambient Temperature	26.5°C	24.0°C	23.5°C	22.5°C	23.5°C
Relative Humidity	38.2%	22.8%	30.4%	34.0%	31.0%



Product Service

2.2.7 Test Results

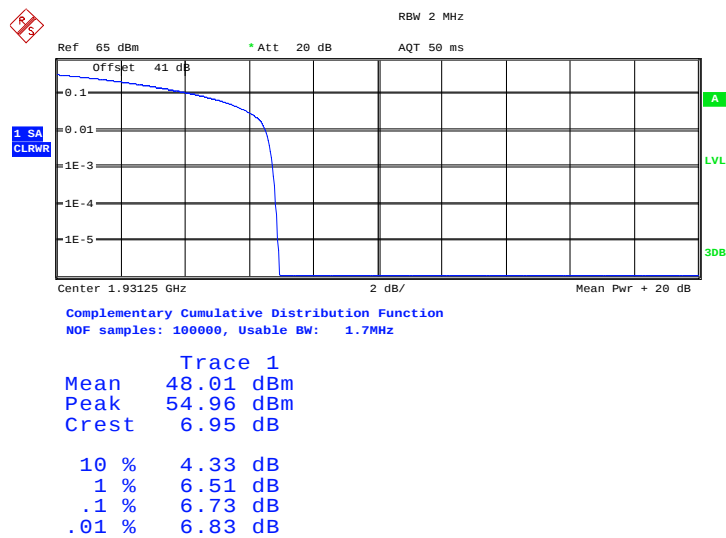
For the period of test the EUT met the requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133 for Peak – Average Ratio.

The test results are shown below.

Single Carrier

Configuration 1 - Mode 1

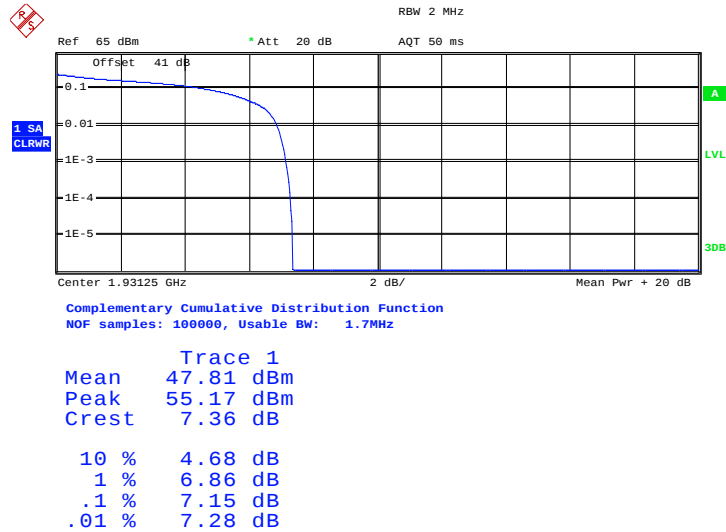
QPSK



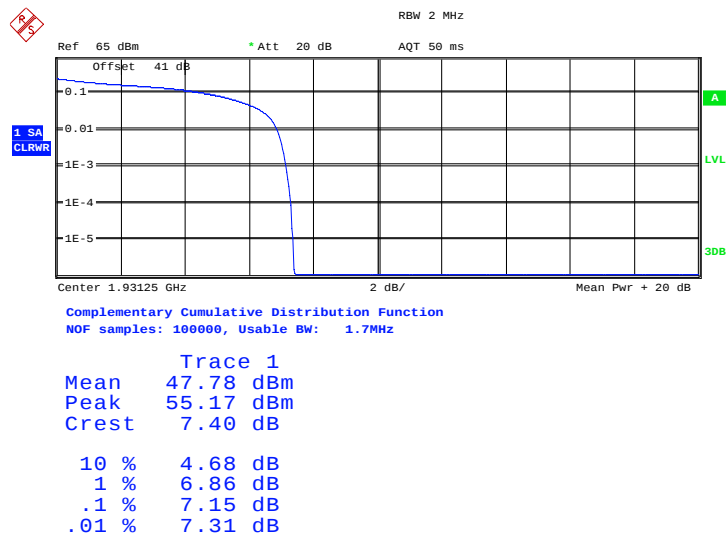
Date: 28.FEB.2013 06:34:48



Product Service

8PSK

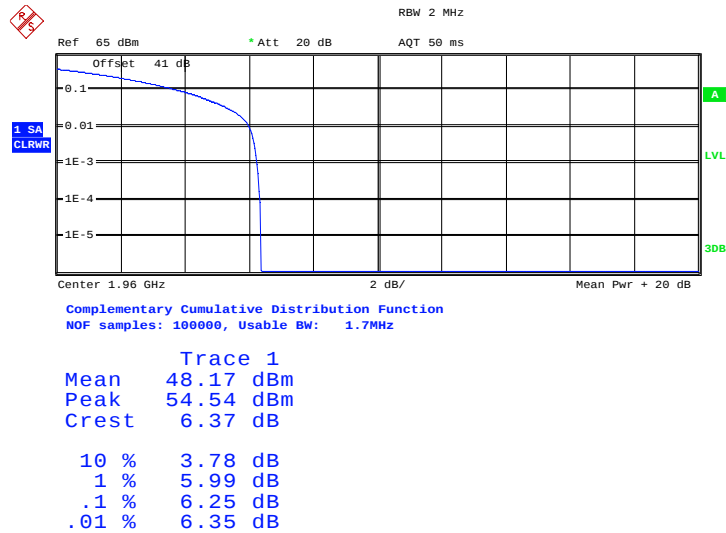
Date: 6.MAR.2013 04:58:00

16QAM

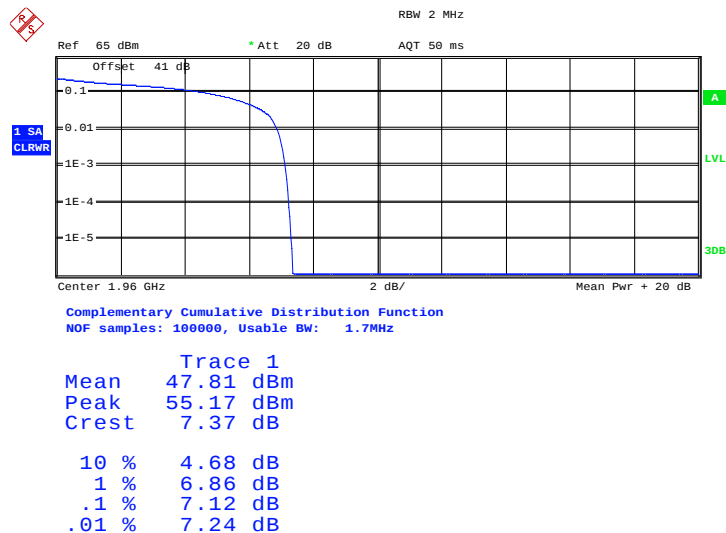
Date: 5.MAR.2013 04:37:03



Product Service

Configuration 1 - Mode 2QPSK

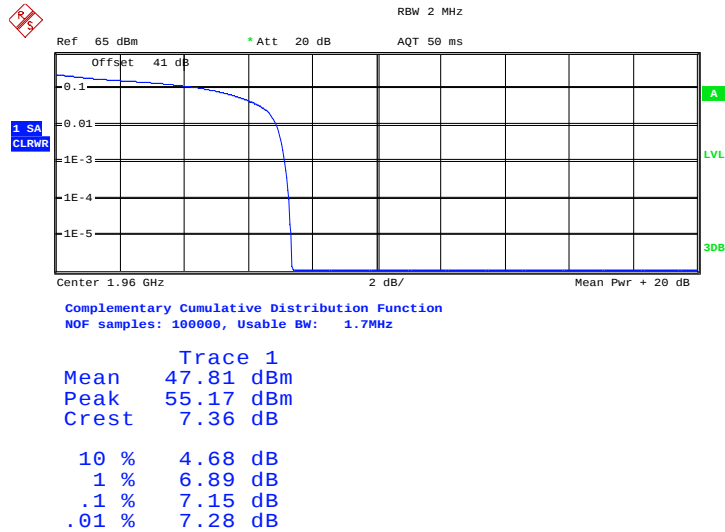
Date: 28.FEB.2013 07:57:53

8PSK

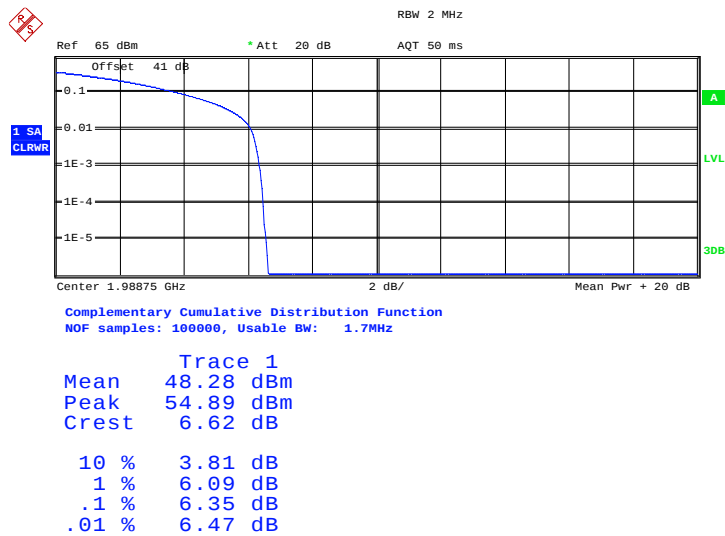
Date: 6.MAR.2013 04:37:11



Product Service

16QAM

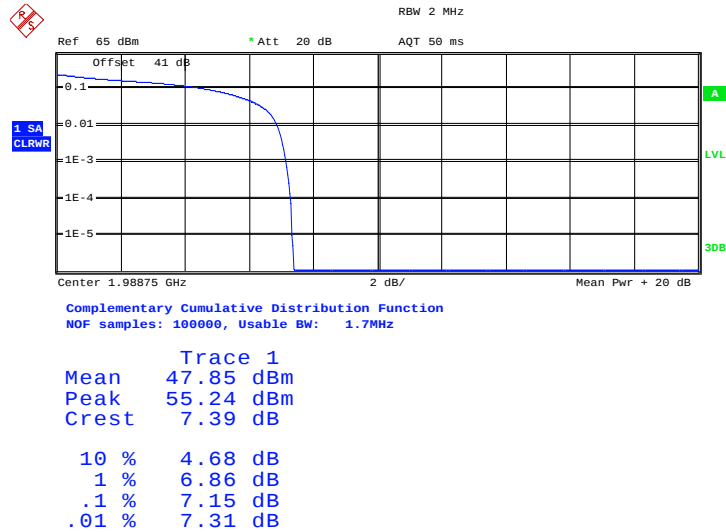
Date: 5.MAR.2013 05:12:32

Configuration 1 - Mode 3QPSK

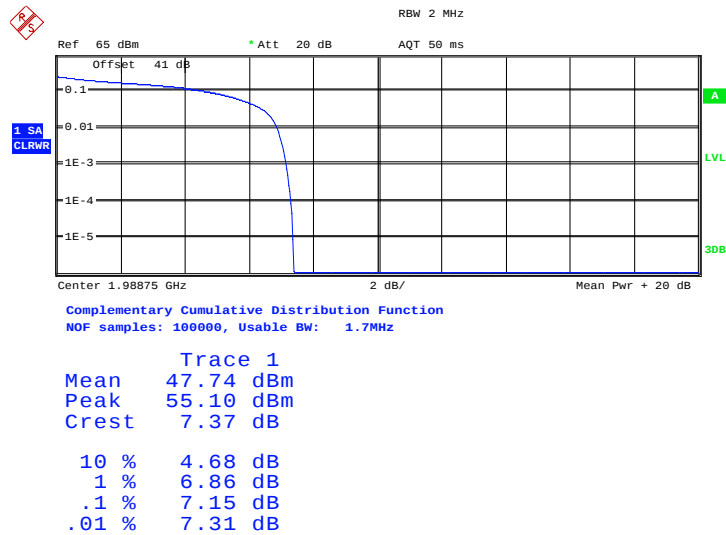
Date: 28.FEB.2013 08:19:05



Product Service

8PSK

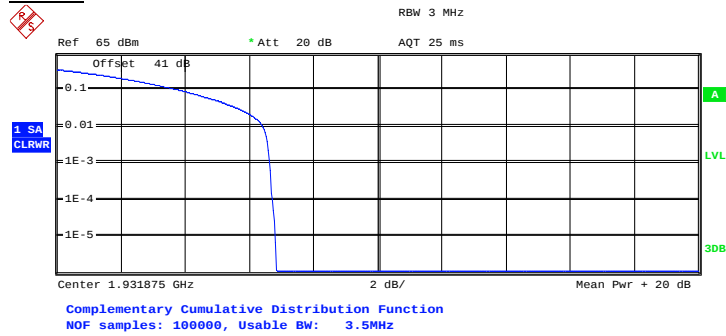
Date: 6.MAR.2013 04:12:19

16QAM

Date: 5.MAR.2013 04:05:53



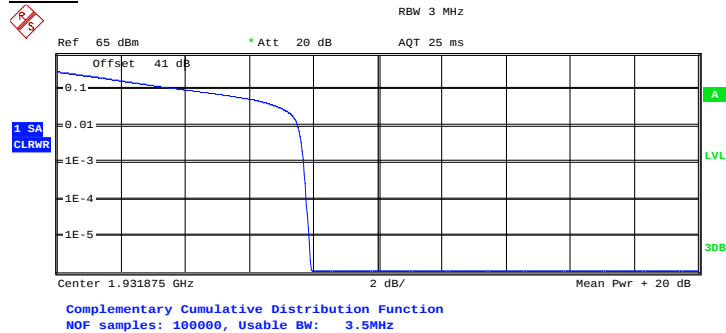
Product Service

Multi Carrier (1x2):**Configuration 1 - Mode 4****QPSK**

Trace 1

Mean	48.56 dBm
Peak	55.38 dBm
Crest	6.83 dB
10 %	3.81 dB
1 %	6.41 dB
.1 %	6.63 dB
.01 %	6.73 dB

Date: 11.MAR.2013 10:37:48

8PSK

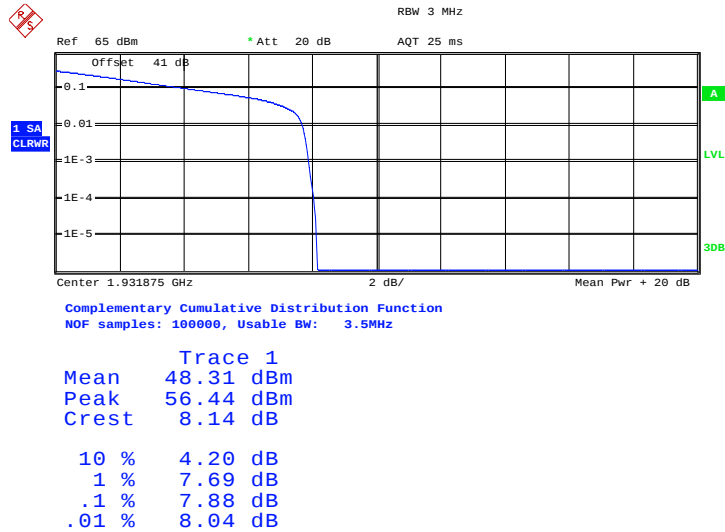
Trace 1

Mean	48.24 dBm
Peak	56.16 dBm
Crest	7.92 dB
10 %	4.07 dB
1 %	7.50 dB
.1 %	7.69 dB
.01 %	7.79 dB

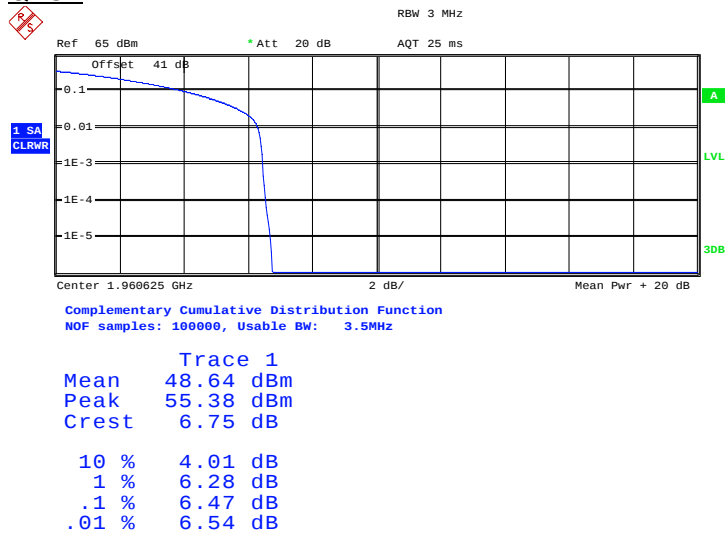
Date: 6.MAR.2013 03:42:25



Product Service

16QAM

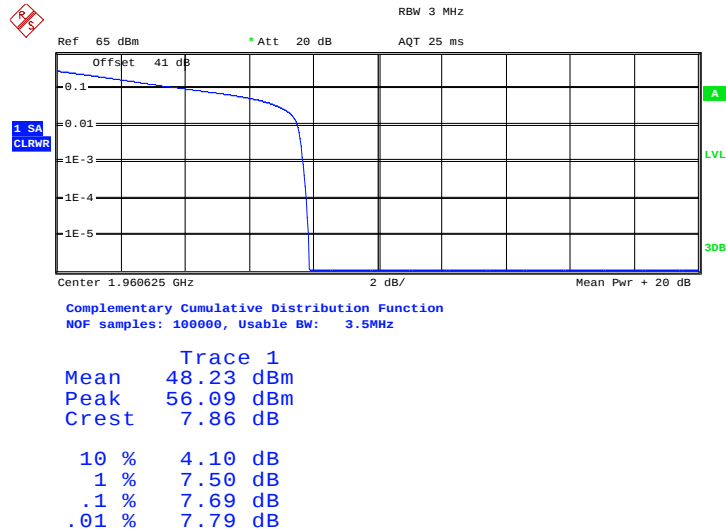
Date: 5.MAR.2013 07:15:18

Configuration 1 - Mode 5QPSK

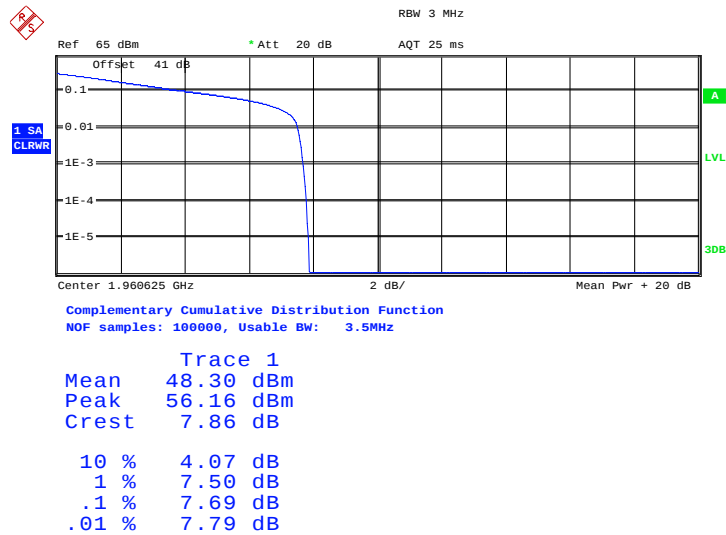
Date: 28.FEB.2013 10:23:21



Product Service

8PSK

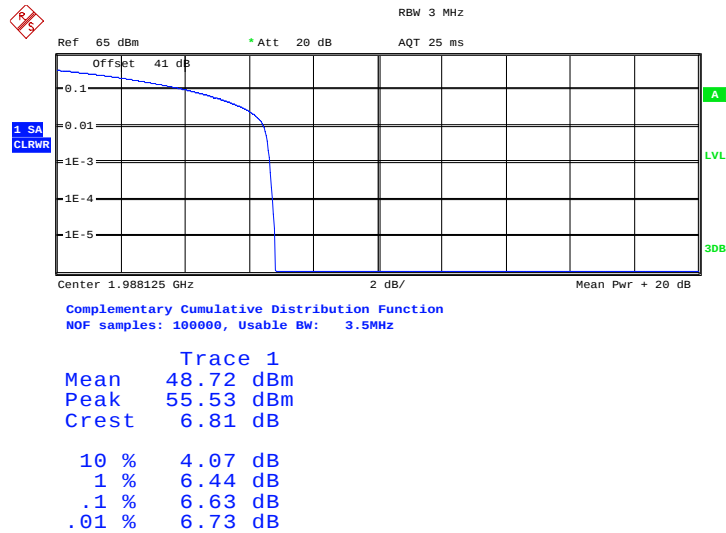
Date: 6.MAR.2013 03:24:46

16QAM

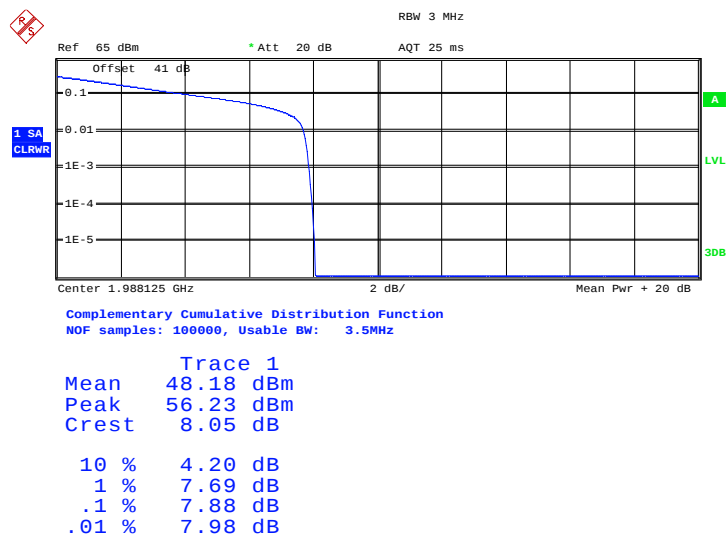
Date: 5.MAR.2013 07:54:37



Product Service

Configuration 1 - Mode 6QPSK

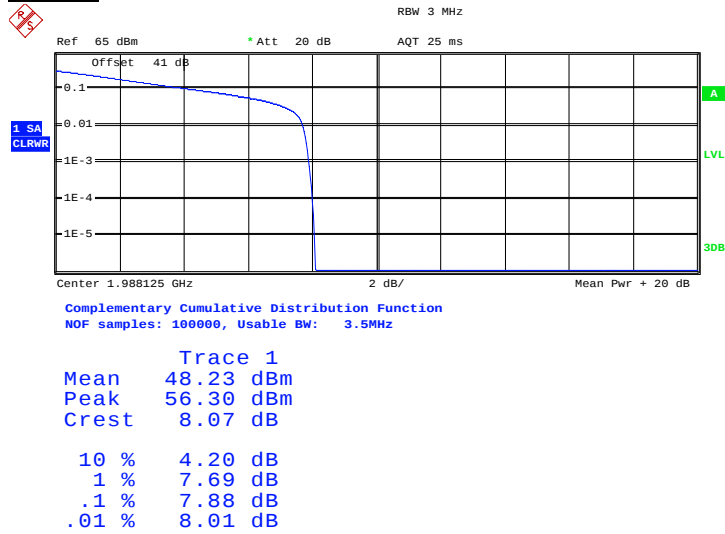
Date: 1.MAR.2013 07:57:35

8PSK

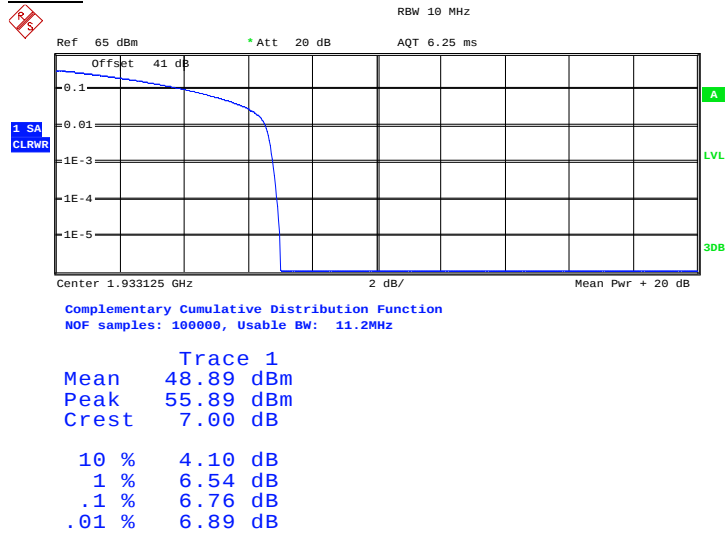
Date: 5.MAR.2013 11:03:52



Product Service

16QAM

Date: 5.MAR.2013 08:11:59

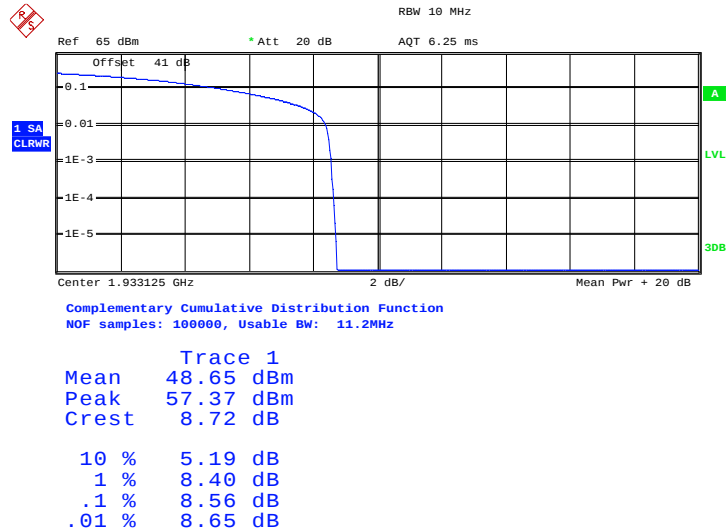
Multi Carrier (1x4):**Configuration 1 - Mode 9****QPSK**

Date: 1.MAR.2013 09:27:59



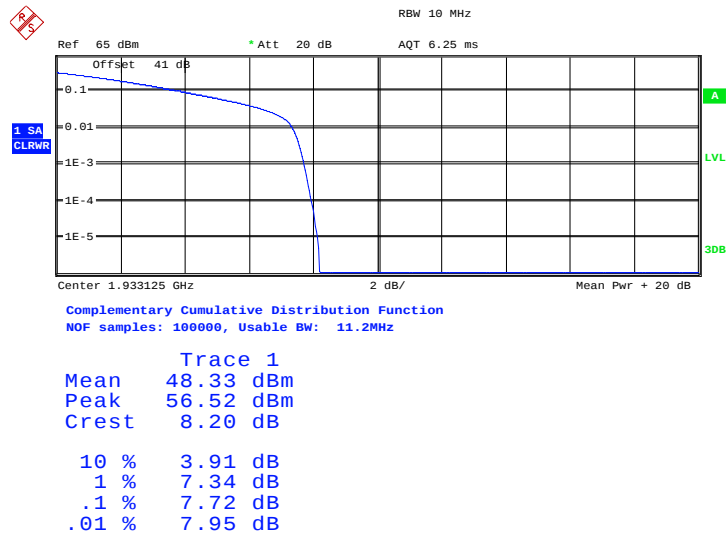
Product Service

8PSK



Date: 5.MAR.2013 10:45:23

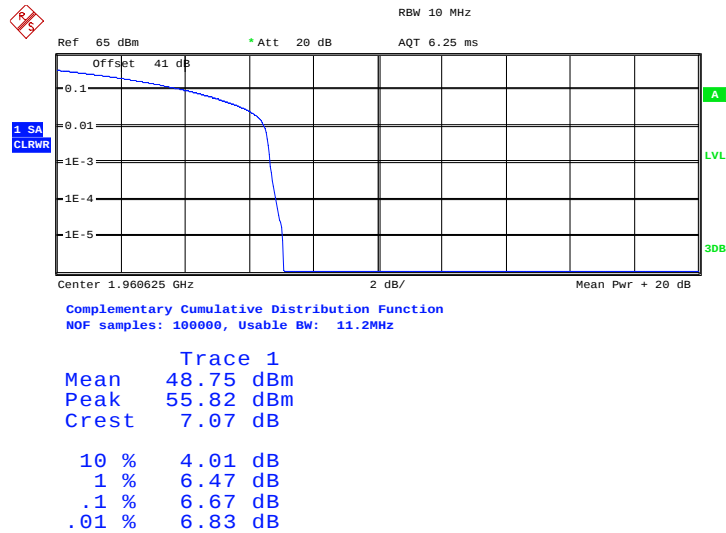
16QAM



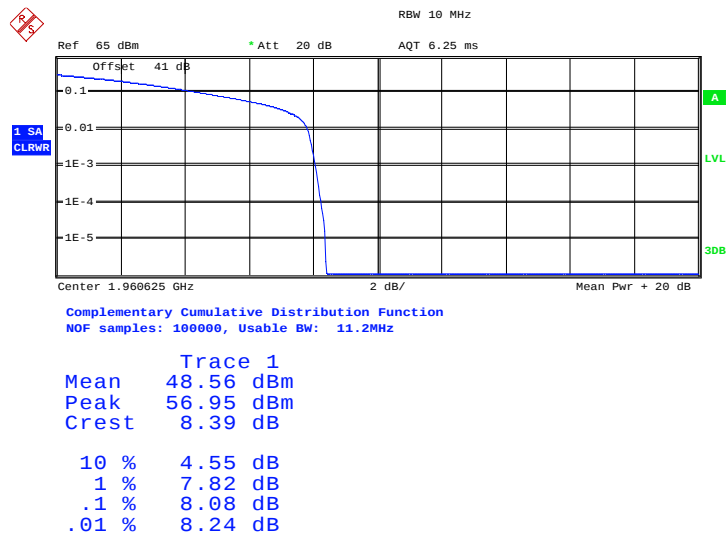
Date: 5.MAR.2013 08:39:51



Product Service

Configuration 1 - Mode 10QPSK

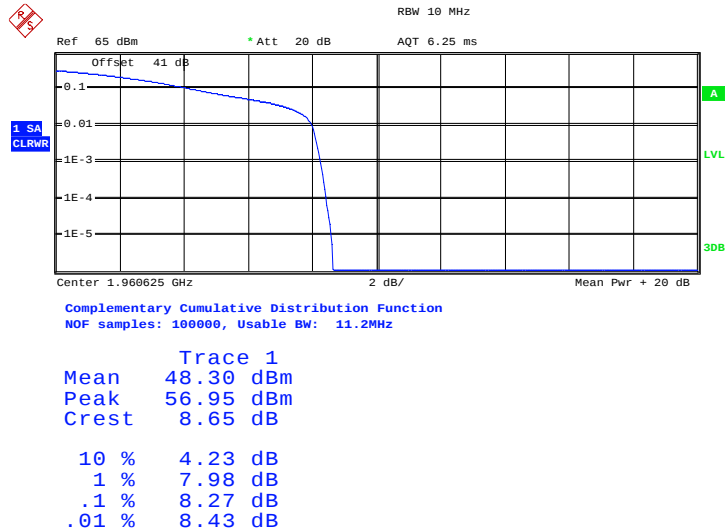
Date: 1.MAR.2013 10:47:00

8PSK

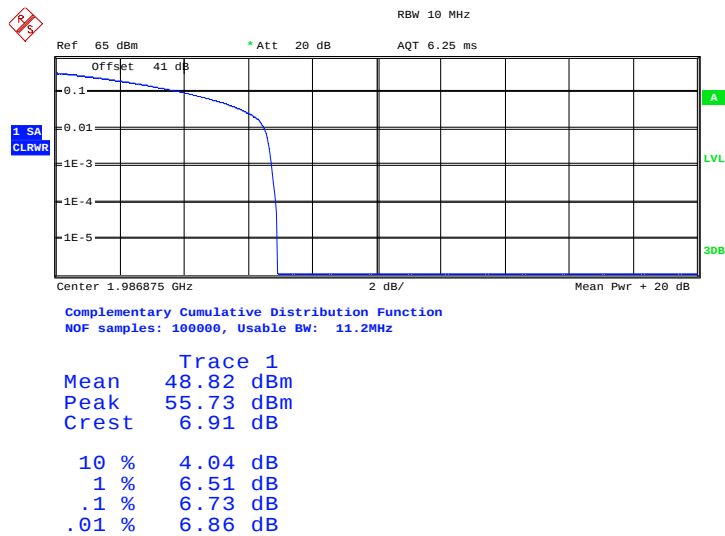
Date: 5.MAR.2013 10:17:48



Product Service

16QAM

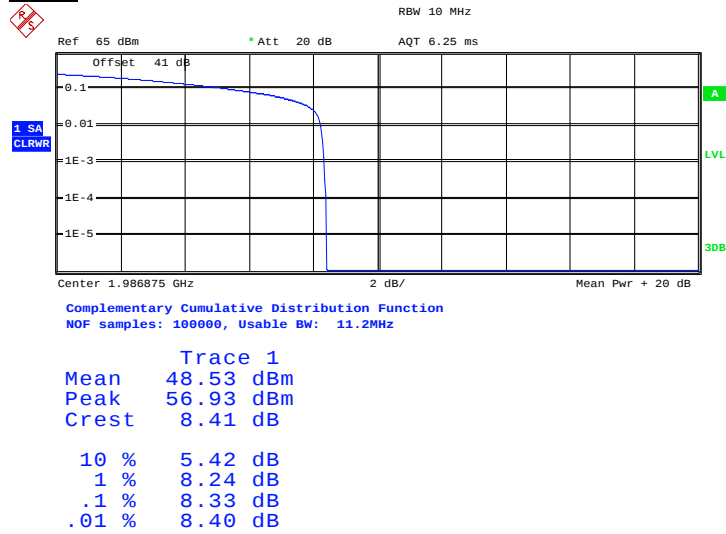
Date: 5.MAR.2013 09:04:15

Configuration 1 - Mode 11QPSK

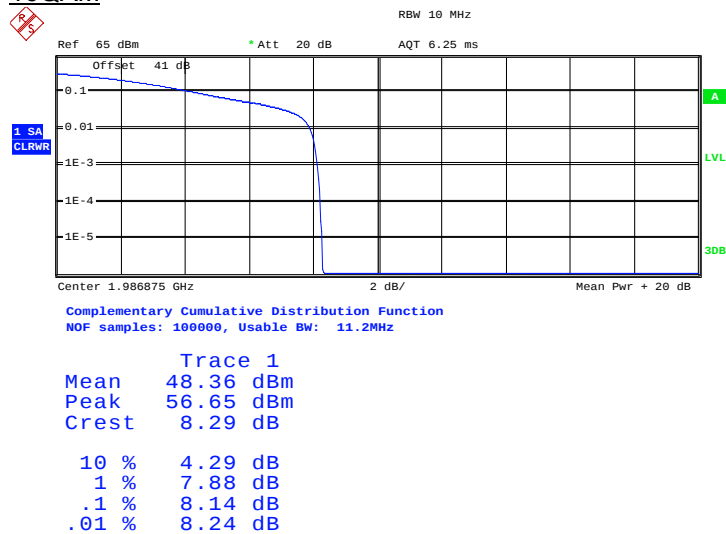
Date: 1.MAR.2013 11:05:58



Product Service

8PSK

Date: 5.MAR.2013 09:44:26

16QAM

Date: 5.MAR.2013 09:28:19

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

Remarks

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



2.3 MODULATION CHARACTERISTICS

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047 (d)
Industry Canada RSS-133 Clause 6.2

2.3.2 Equipment Under Test

RUS 01 B2 / KRC 118 66/2, S/N: D164655167

2.3.3 Date of Test and Modification State

28 February and 11 March 2013 – 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-133.

Connect the TX output connector RF A to a spectrum analyzer with an attenuator. The other connector RF B was connected to match load. The EUT was controlled to transmit maximum power. Measure and record the constellation of the EUT by the spectrum analyzer.

The EUT supports QPSK, 8PSK and 16QAM 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

	28 February 2013	11 March 2013
Ambient Temperature	26.5°C	23.5°C
Relative Humidity	38.2%	31.0%

2.3.6 Test Result

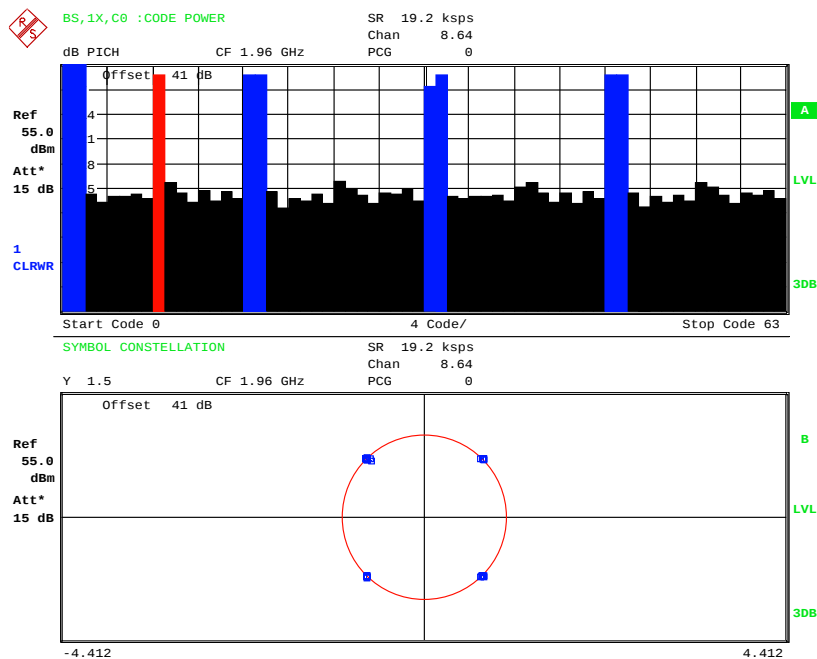
Plots are shown on the following showing the EUT transmitting with all of the modulations:

The test results are shown below

Single Carrier

Configuration 1 - Mode 2

EUT transmitting with QPSK modulation:

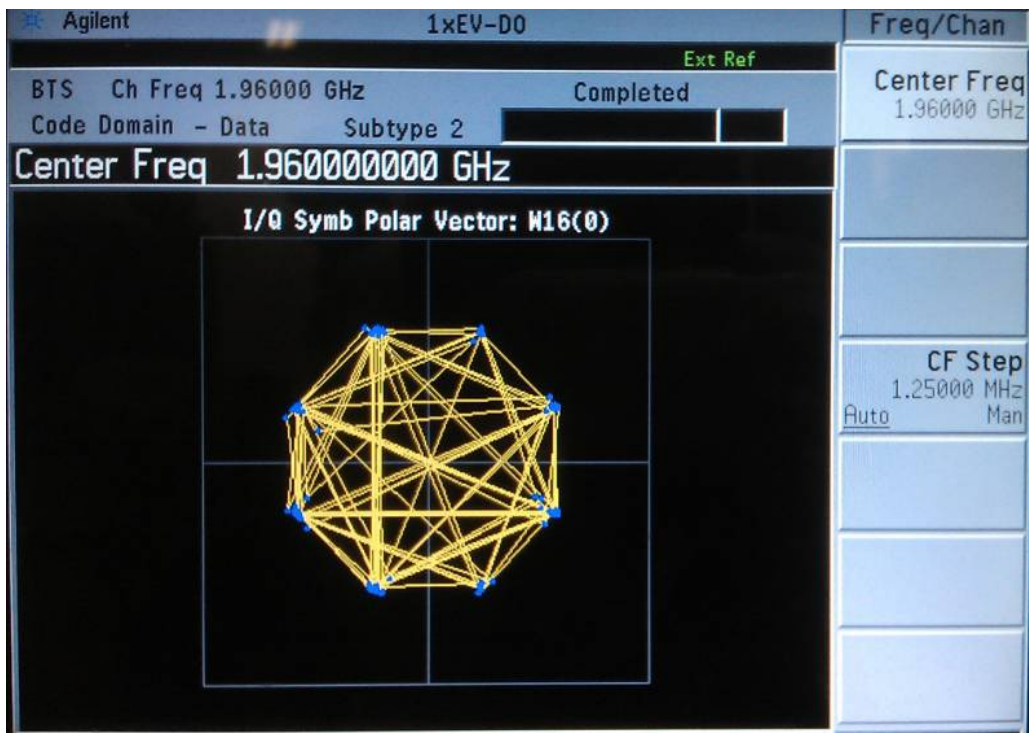


Date: 28.FEB.2013 07:48:59

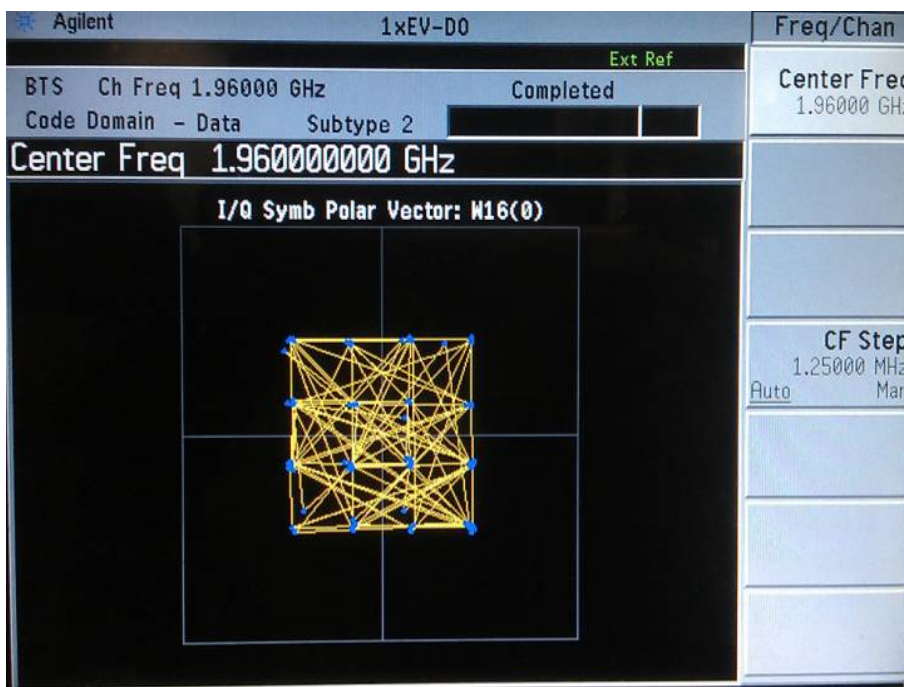


Product Service

EUT transmitting with 8PSK modulation:



EUT transmitting with 16QAM modulation:





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

RUS 01 B2 / KRC 118 66/2, S/N: D164655167

2.4.3 Date of Test and Modification State

28 February 2013 – 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 using QPSK as the representative test modulation. Using a resolution bandwidth of 20kHz and a video bandwidth of 200kHz. 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

	28 February 2013
Ambient Temperature	26.5°C
Relative Humidity	38.2%



Product Service

2.4.7 Test Results

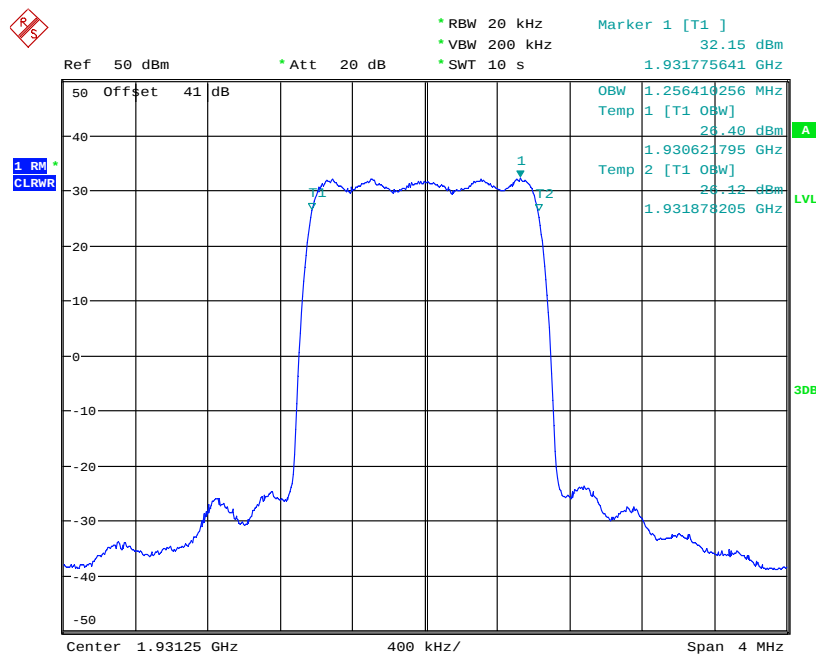
For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-GEN for Occupied Bandwidth.

The test results are shown below

Single Carrier

QPSK

Configuration 1 - Mode 1

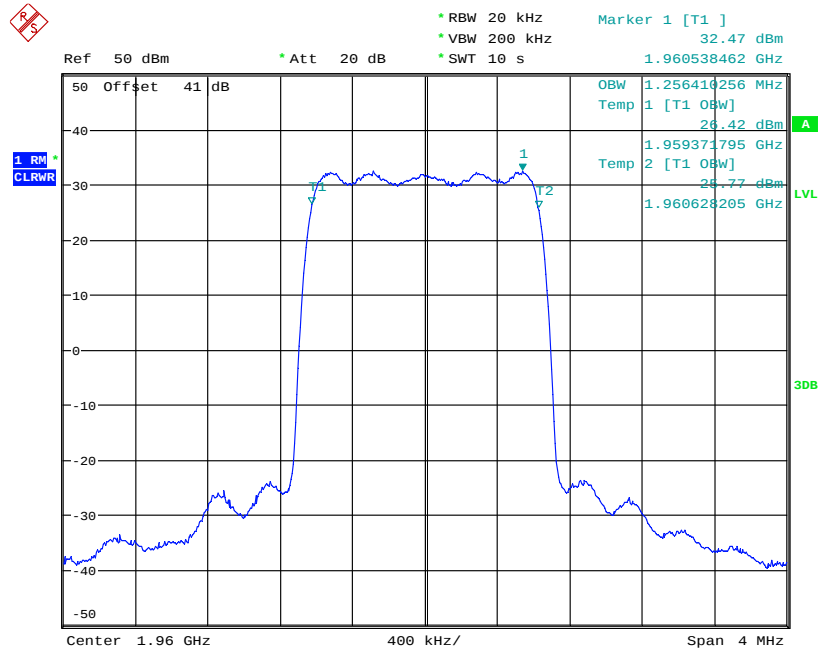


Date: 28.FEB.2013 06:31:16



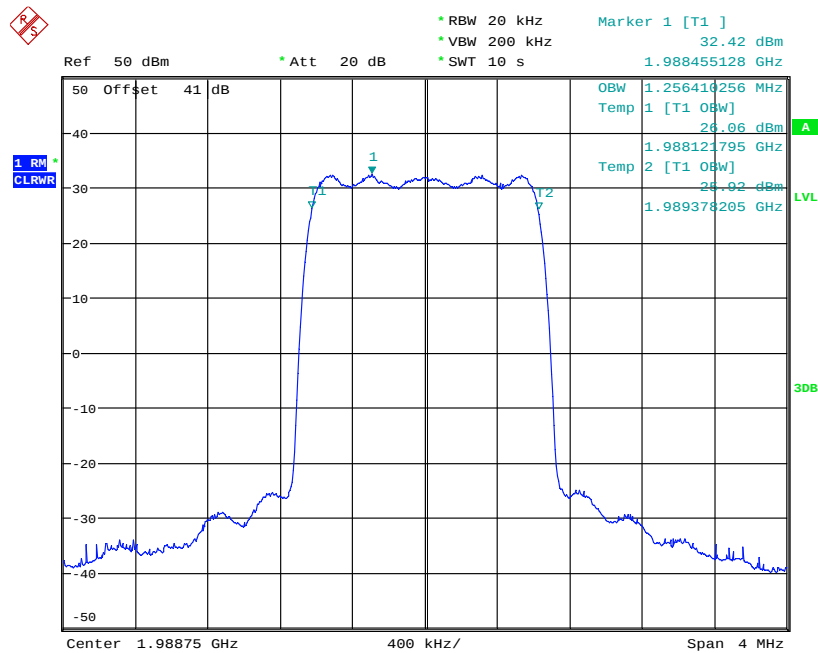
Product Service

Configuration 1 - Mode 2



Date: 28.FEB.2013 07:35:21

Configuration 1 - Mode 3



Date: 28.FEB.2013 08:22:17



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

RUS 01 B2 / KRC 118 66/2, S/N: D164655167

2.5.3 Date of Test and Modification State

28 February and 07 March 2013 – 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 emission bandwidth shall be used for the resolution bandwidth up to 1MHz away from the block edge. For Single Carrier and Multi Carrier, a resolution bandwidth of 20kHz was used up to 1MHz away from the band edges. 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 reduce measurement bandwidth. Spectrum analyser detector was set as RMS.

The EUT was tested at it's maximum power level. The path loss measured and entered as a reference level offset.

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

Configuration 1 - Mode 1
 - Mode 3
 - Mode 7
 - Mode 8

2.5.6 Environmental Conditions

	28 February 2013	07 March 2013
Ambient Temperature	26.5°C	24.5°C
Relative Humidity	38.2%	37.0%

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.

QPSK

Single Carrier

Configuration 1 - Mode 1 and 3

Band Edge Frequency	Edge Test with QPSK modulation Channel No./Frequency
Bottom 1930 MHz	Channel: 25 Frequency: 1931.25 MHz
Top 1990 MHz	Channel: 1175 Frequency: 1988.75 MHz

Multi Carrier (1x2)

Configuration 1 - Mode 7 and 8

Band Edge Frequency	Edge Test with QPSK modulation Channel No./Frequencies
Bottom 1930 MHz	Channel: 25 & 75 Frequency: 1931.25 & 1933.75 MHz
Top 1990 MHz	Channel: 1125 & 1175 Frequency: 1986.25 & 1988.75 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 outside of ranges shown in the above tables shall not be made available to the end user.



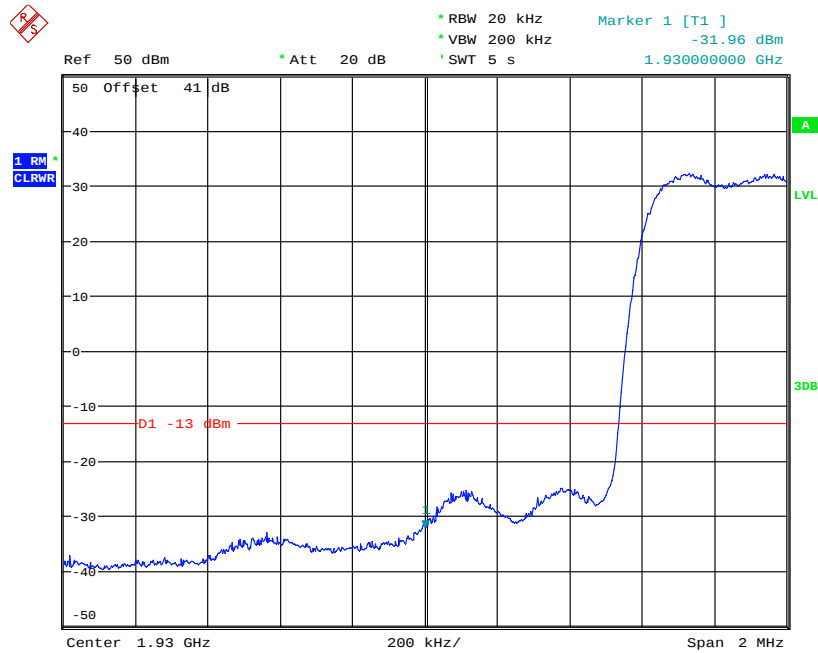
Product Service

The test results are shown below

QPSK

Single Carrier

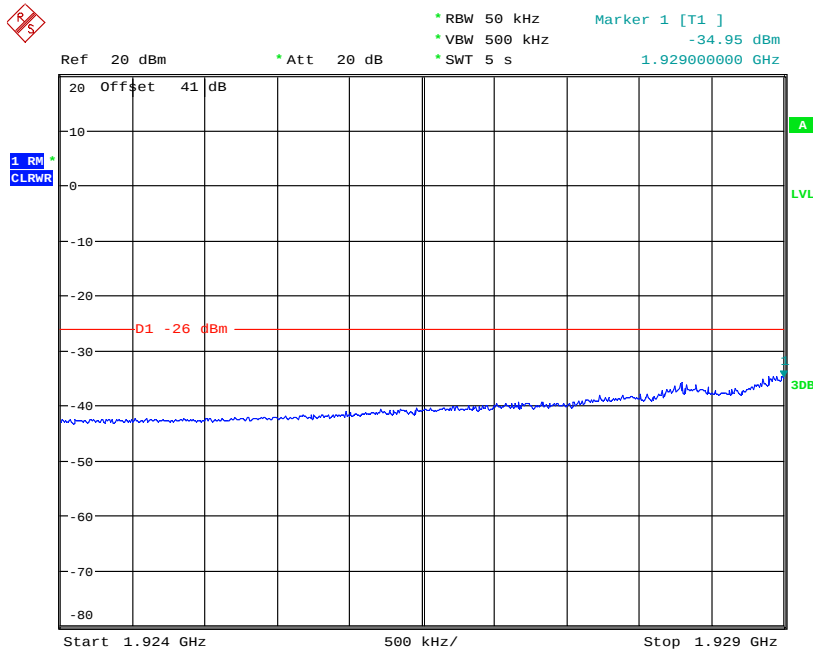
Configuration 1 - Mode 1



Date: 28.FEB.2013 06:40:44

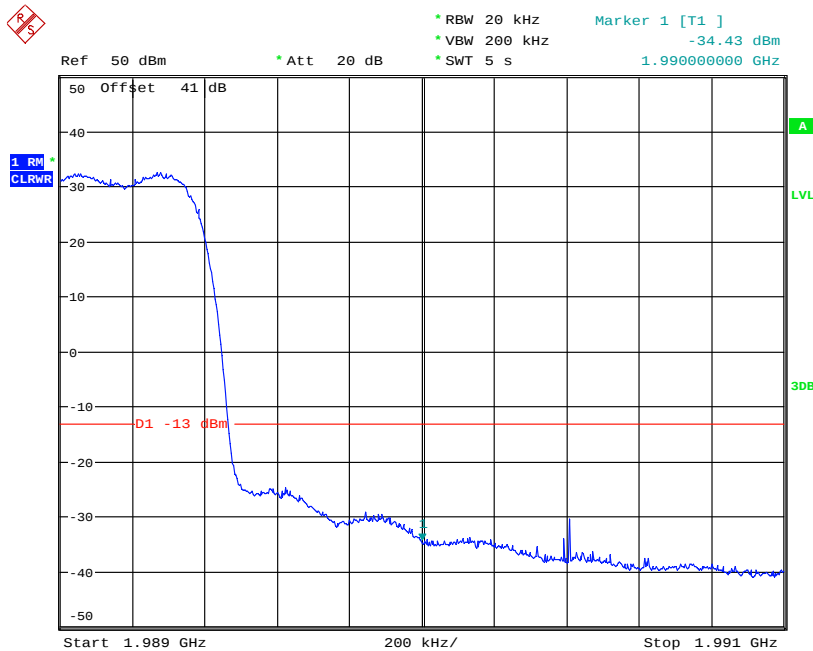


Product Service



Date: 28.FEB.2013 06:45:02

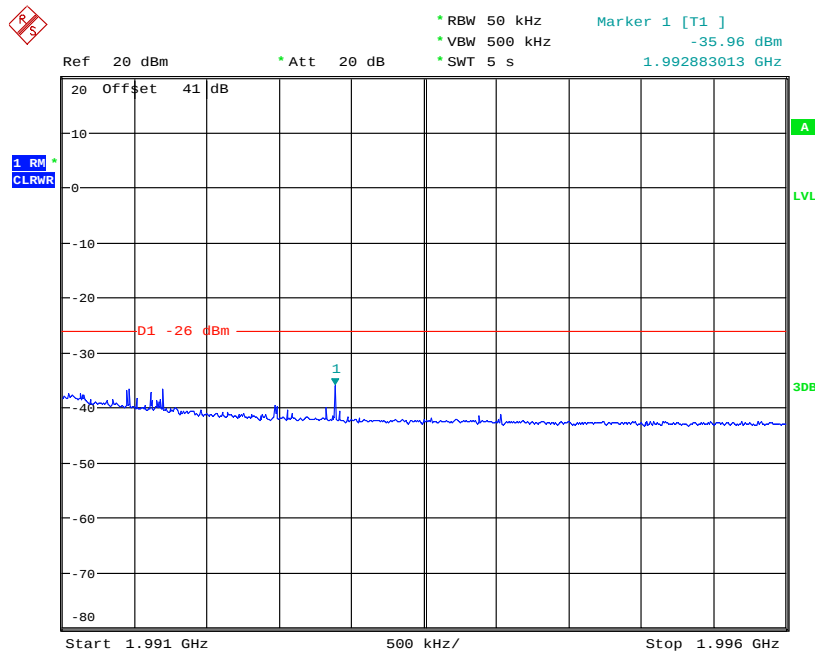
Configuration 1 - Mode 3



Date: 28.FEB.2013 08:29:43



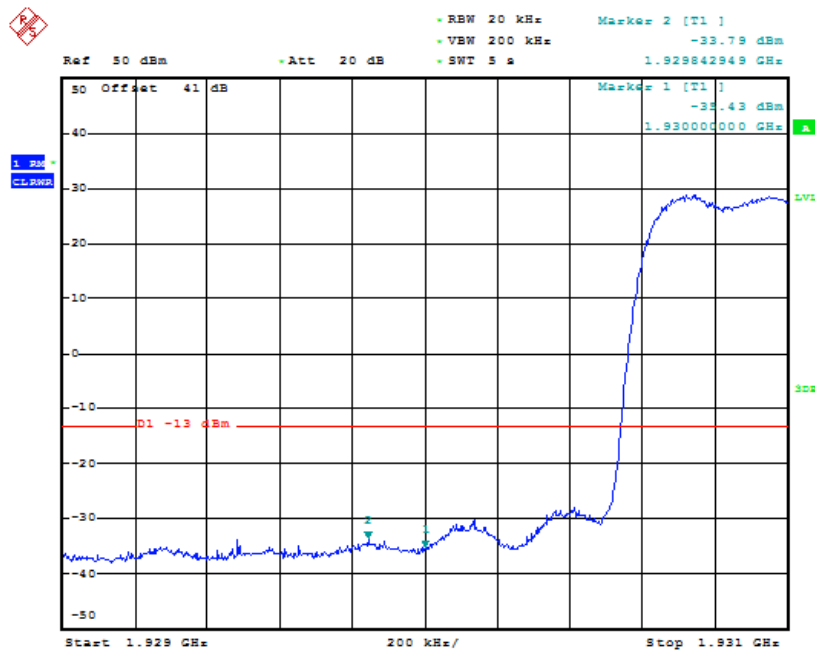
Product Service



Date: 28.FEB.2013 08:32:40

Multi Carrier (1x2)

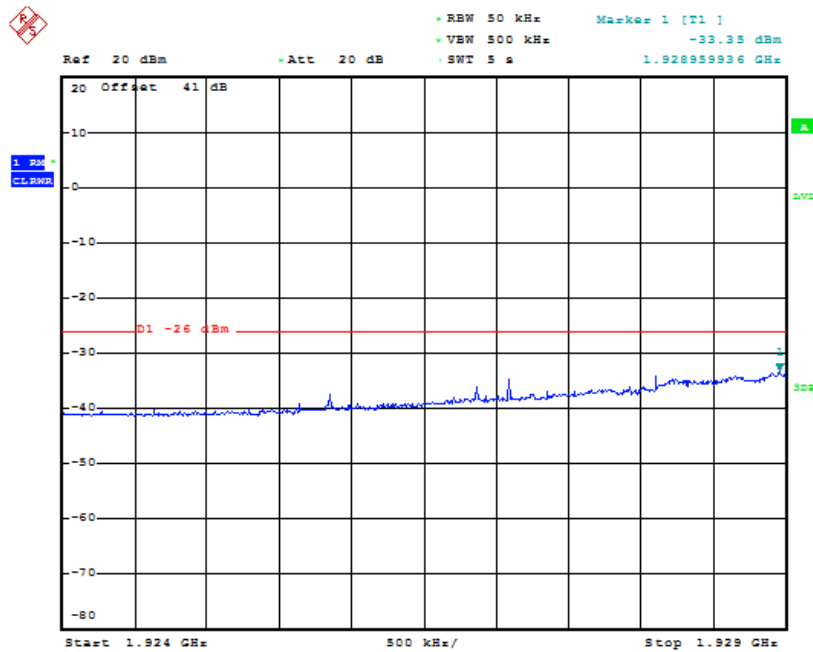
Configuration 1 - Mode 7



Date: 7.MAR.2013 10:21:57

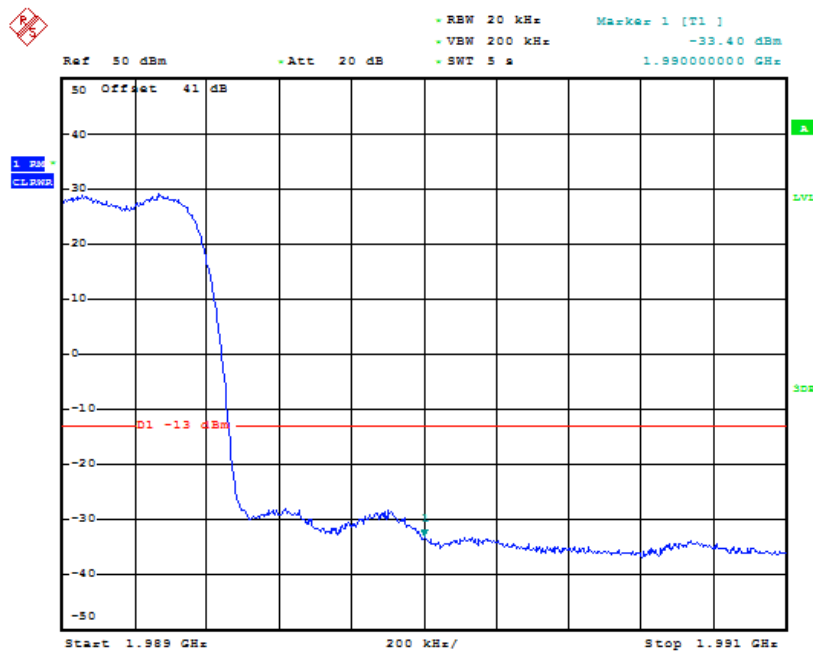


Product Service



Date: 7.MAR.2013 10:19:34

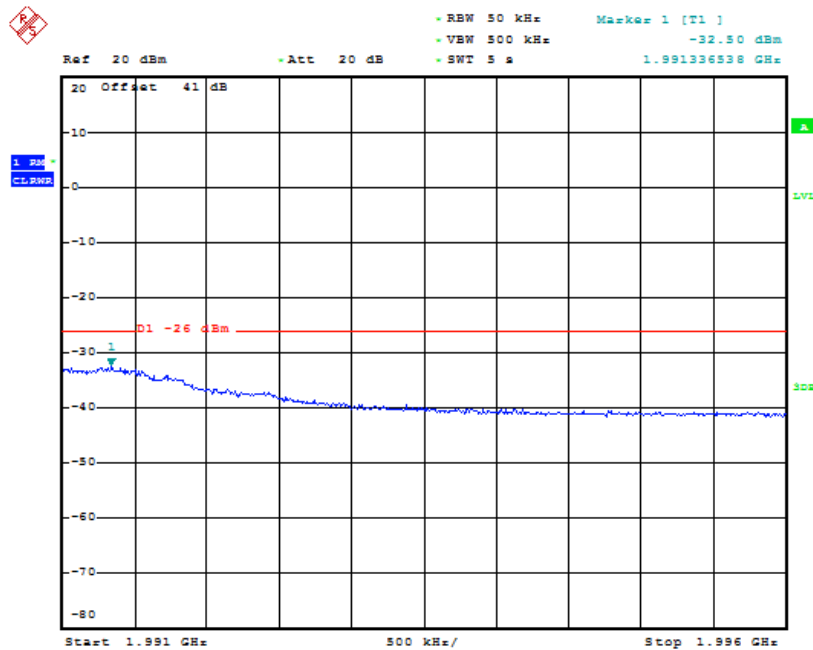
Configuration 1 – Mode 8



Date: 7.MAR.2013 10:37:51



Product Service



Date: 7.MAR.2013 10:38:54

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.



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

RUS 01 B2 / KRC 118 66/2, S/N: D164655167

2.6.3 Date of Test and Modification State

22 and 26 March 2013 – 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 – 25GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz – 25GHz, 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:

$$E_{(v/m)} = (30 \times 1.64 \times 69.02)^{0.5} / 3 = 19.424V/m = 145.8dB\mu V/m$$

As per 24.238(a) the spurious emission must be attenuated by $43 + 10\log(P_o)$ dB this gives:

$$43 + 10\log(69.02) = 61.4dB$$

Therefore the limit at 3m measurement distance is:

$$145.8 - 61.4 = 84.4 \text{ dB}\mu V/m$$

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 6
 - Mode 11

2.6.6 Environmental Conditions

	22 March 2013	26 March 2013
Ambient Temperature	27.5°C	23.0°C
Relative Humidity	28.0%	30.0%



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

QPSK

Single Carrier

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

8PSK

Single Carrier

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

No emissions were detected within 20dB of the limit.

16QAM

Single Carrier

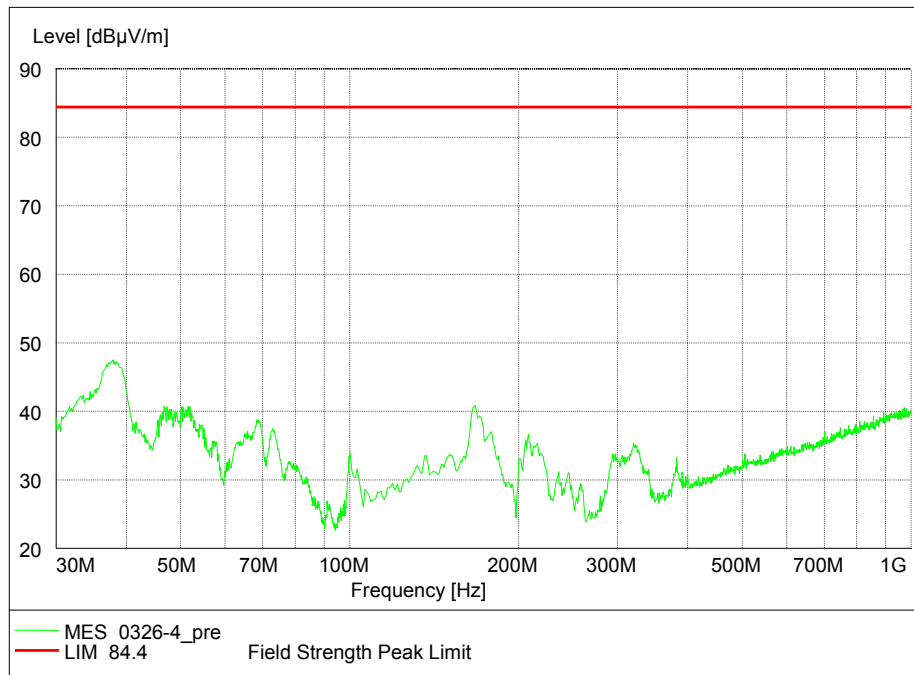
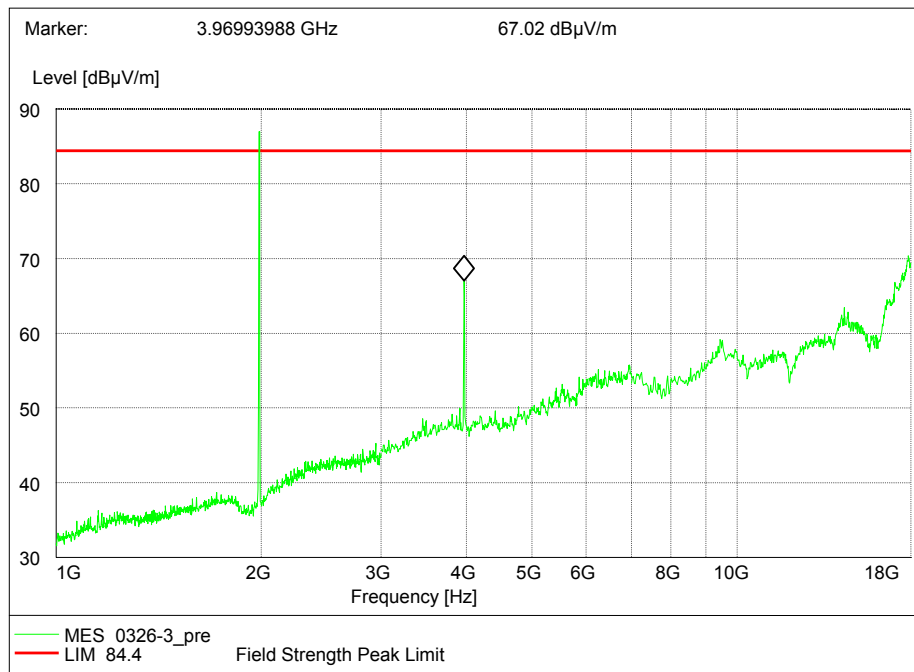
Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

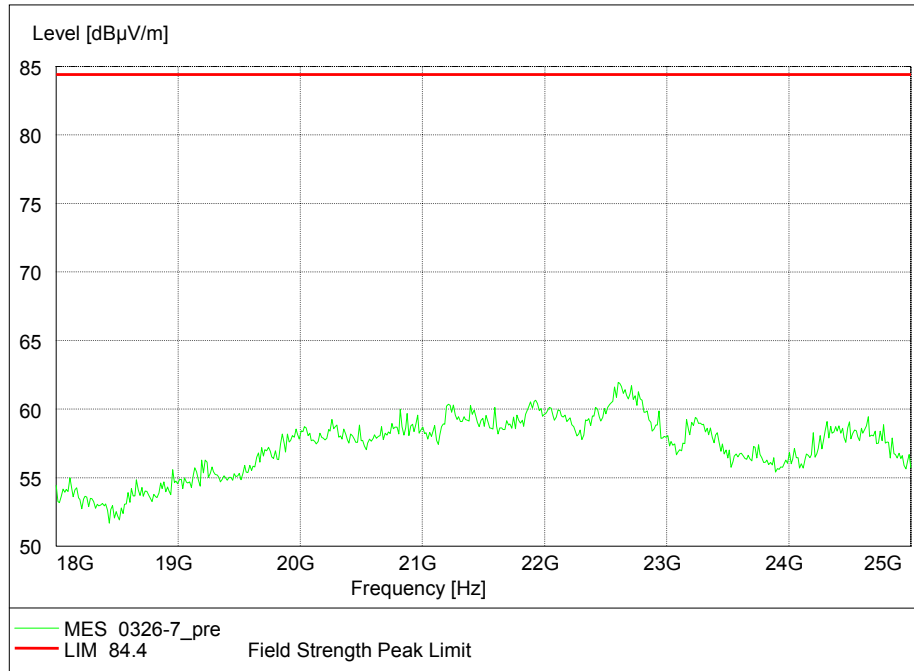
Multi Carrier (1x2)

8PSK

Configuration 1 - Mode 6

30MHz to 1GHz1GHz to 18GHz

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

18GHz to 25GHzMulti Carrier (1x4)8PSKConfiguration 1 – Mode 11

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.



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

RUS 01 B2 / KRC 118 66/2, S/N: D164655167

2.7.3 Date of Test and Modification State

06 and 07 March 2013 – 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 25GHz. The EUT was set to transmit on maximum power. The EUT was tested on Bottom, Middle and Top channels. The resolution was set to 1MHz for 9kHz to 25GHz 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 highest internal frequency.

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

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

2.7.6 Environmental Conditions

	06 March 2013	7 March 2013
Ambient Temperature	22.5°C	24.5°C
Relative Humidity	34.0%	37.0%



Product Service

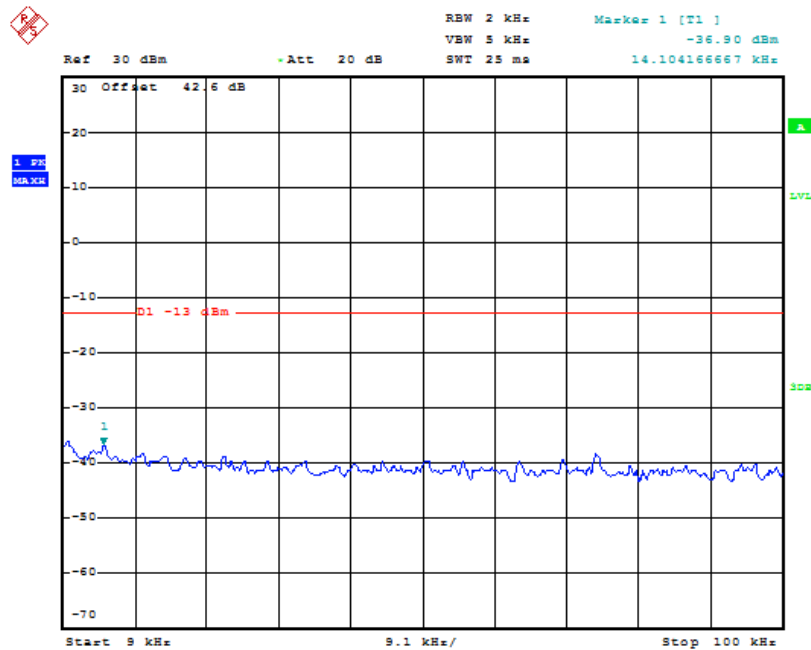
2.7.7 Test Results

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:

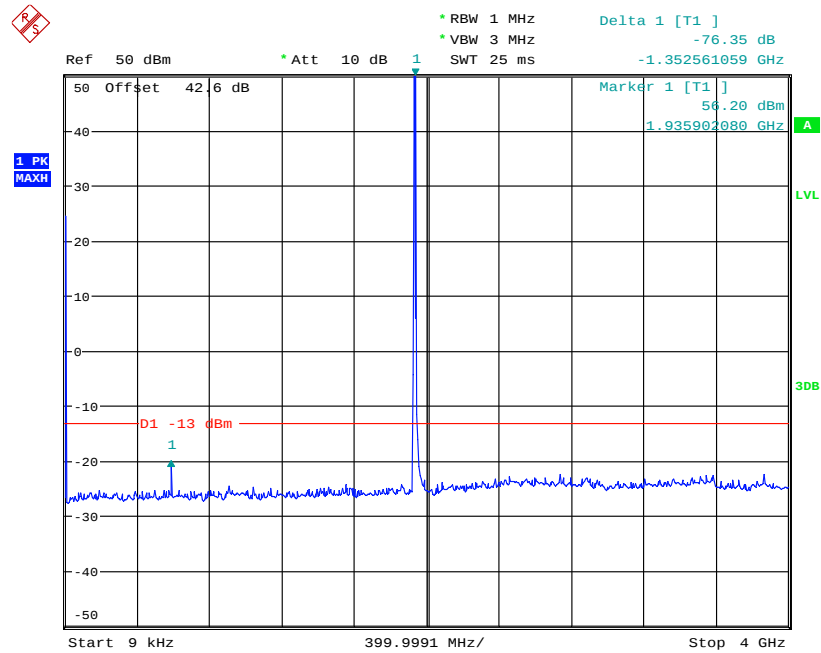
The emissions at 9kHz on the plots was not generated by the test object. A complementary measurement with a smaller Span showed that it was related to the LO feedthrough.



Date: 6.MAR.2013 06:19:57



Product Service

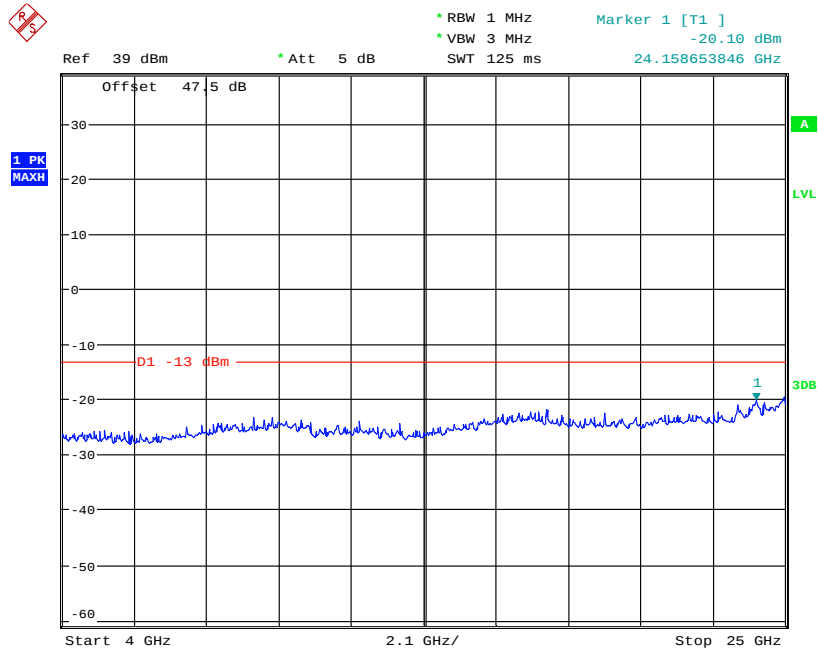
QPSK**Single Carrier****Configuration - Mode 1****9kHz to 4GHz**

Date: 6.MAR.2013 06:29:48

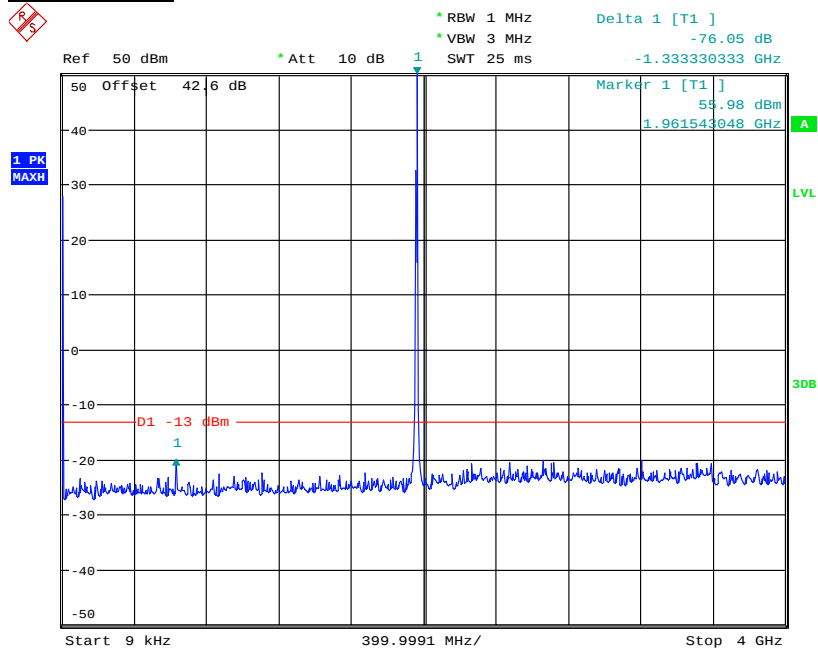
Note: The emission beyond the limit is the operating frequency.



Product Service

4GHz to 25GHz

Date: 6.MAR.2013 06:34:31

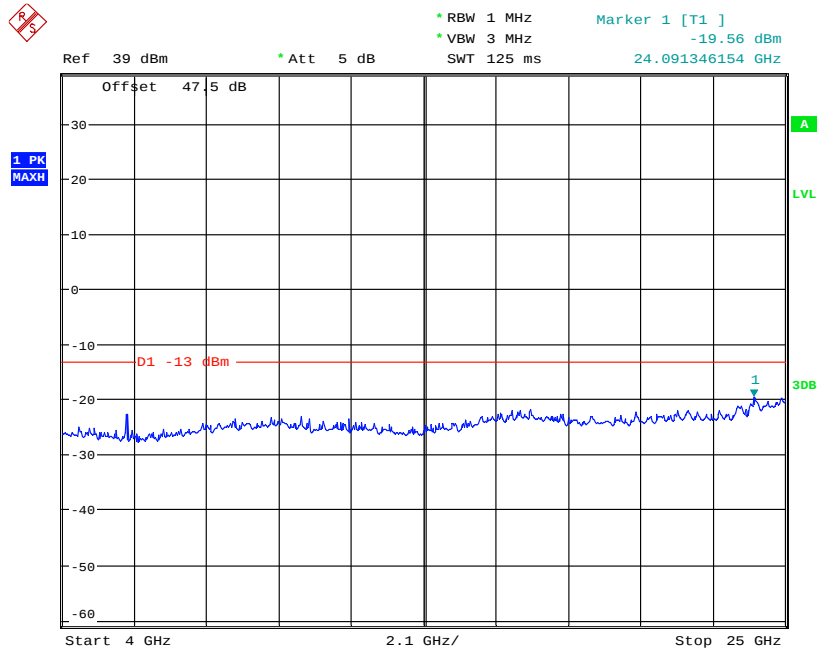
Configuration 1 - Mode 29kHz to 4GHz

Date: 6.MAR.2013 06:55:48

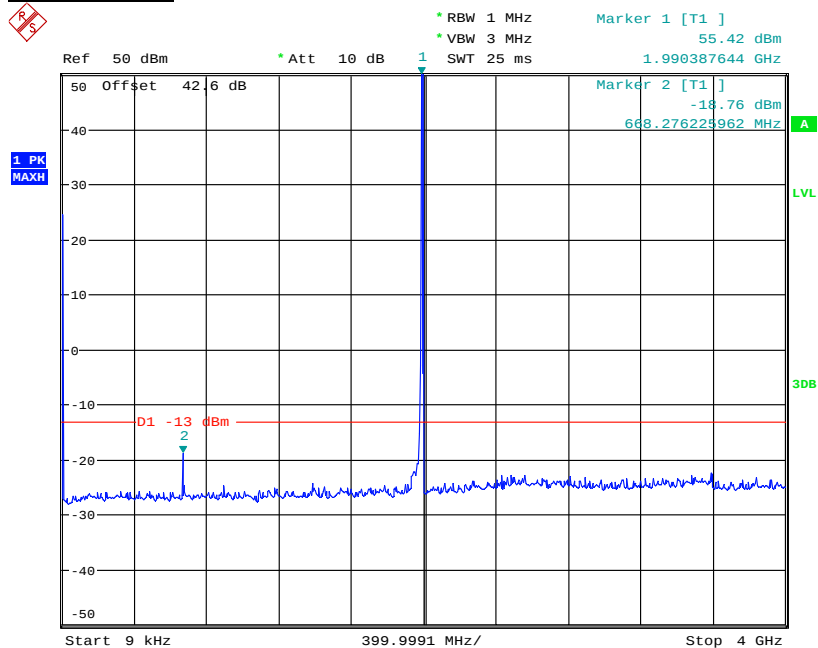
Note: The emission beyond the limit is the operating frequency.



Product Service

4GHz to 25GHz

Date: 6.MAR.2013 06:53:44

Configuration 1 - Mode 39kHz to 4GHz

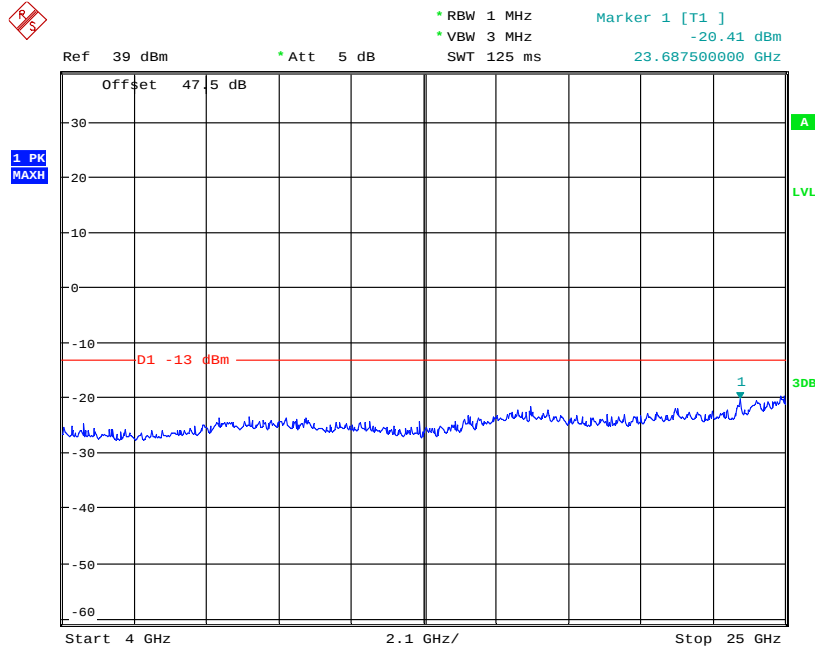
Date: 6.MAR.2013 07:14:53

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



Product Service

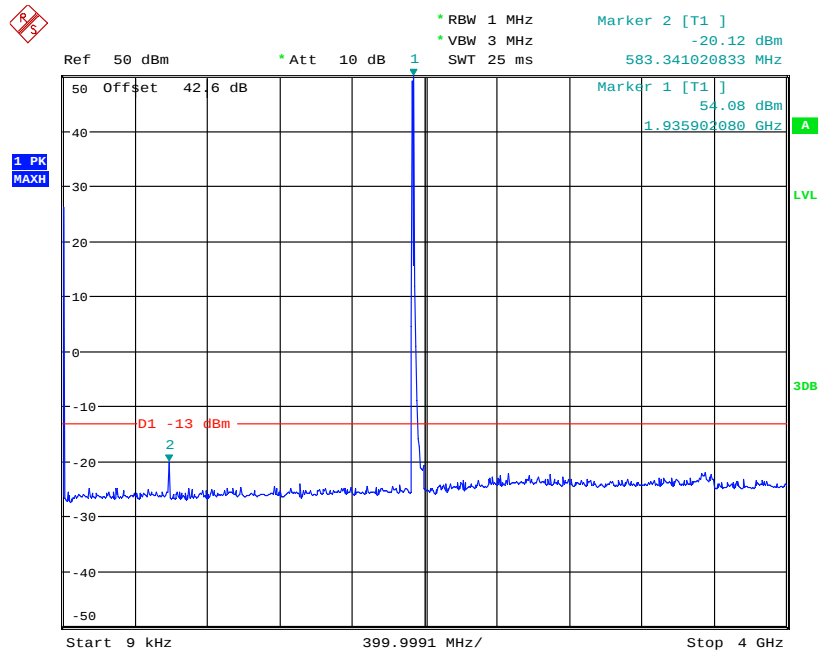
4GHz to 25GHz



Date: 6.MAR.2013 07:16:20



Product Service

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

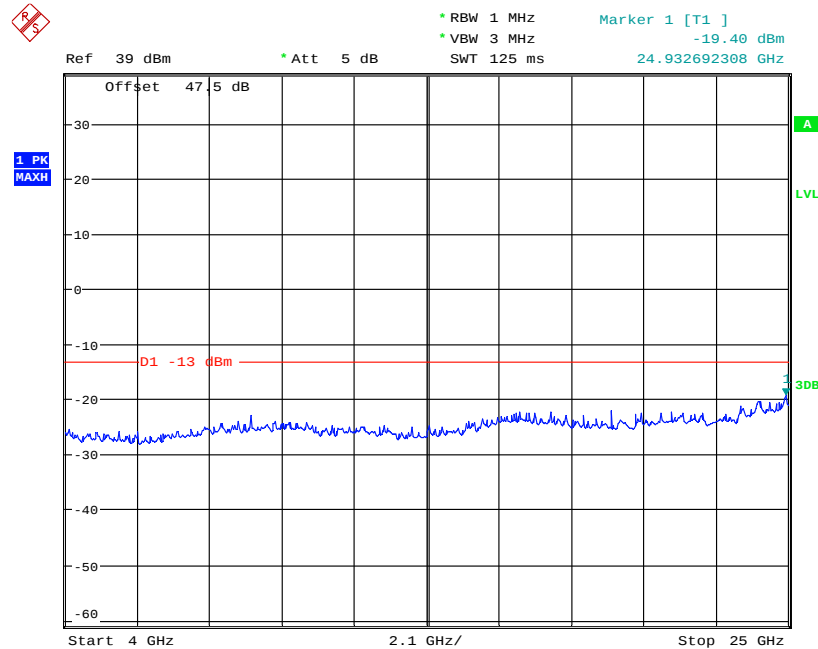
Date: 6.MAR.2013 08:54:16

Note: The emissions beyond the limit are the operating frequencies.



Product Service

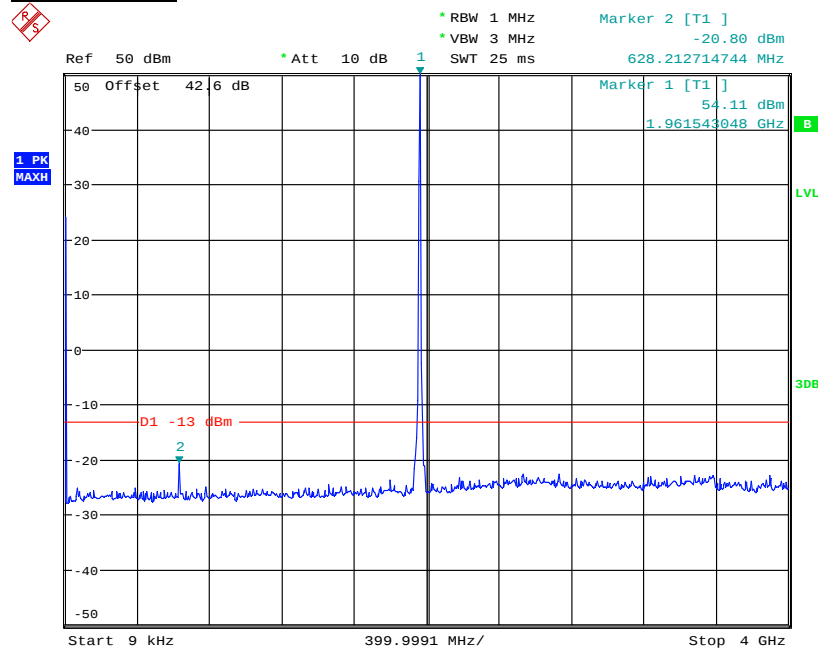
4GHz to 25GHz



Date: 6.MAR.2013 08:55:21

Configuration 1 - Mode 5

9kHz to 4GHz

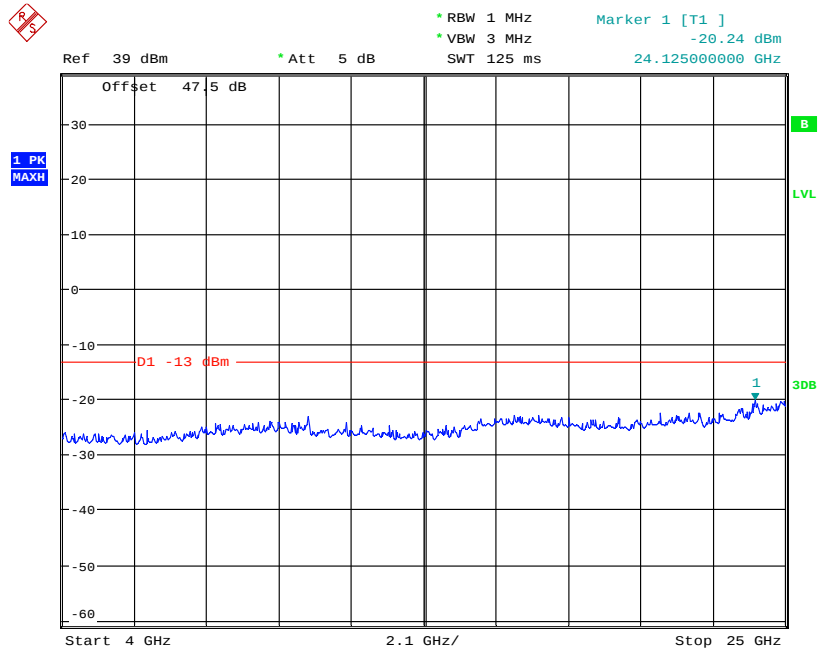


Date: 6.MAR.2013 08:06:33

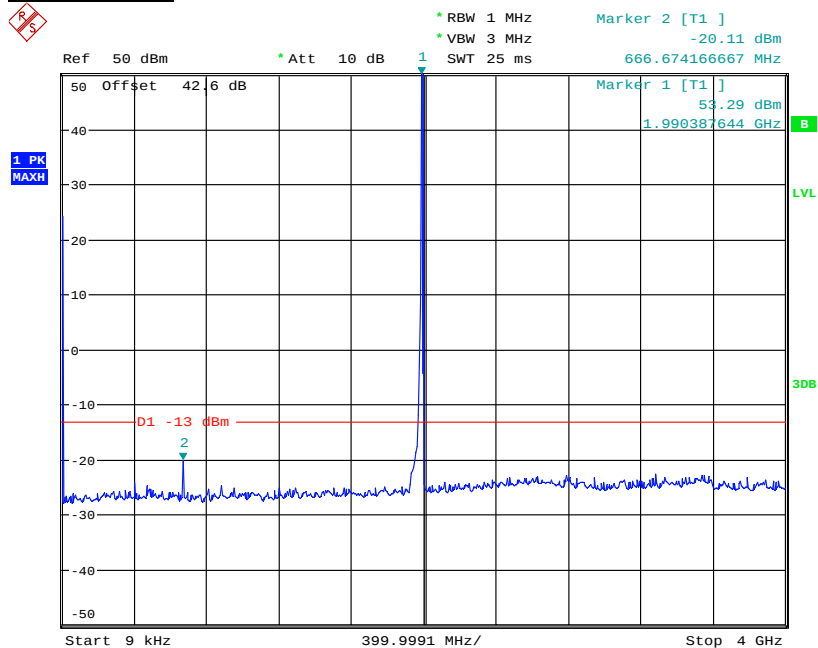
Note: The emissions beyond the limit are the operating frequencies.



Product Service

4GHz to 25GHz

Date: 6.MAR.2013 08:08:28

Configuration 1 - Mode 69kHz to 4GHz

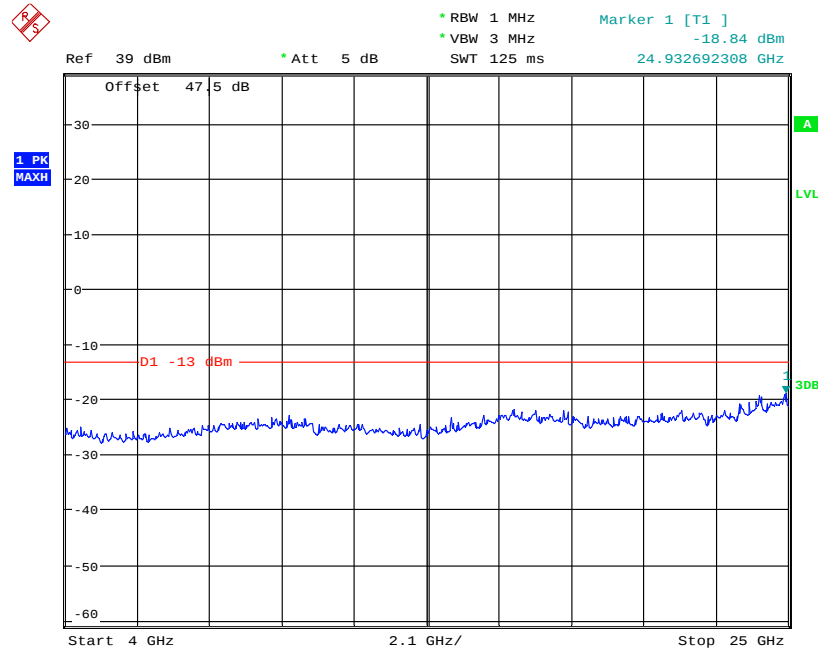
Date: 6.MAR.2013 07:41:41

Note: The emissions beyond the limit are the operating frequencies.



Product Service

4GHz to 25GHz



Date: 6.MAR.2013 07:34:33

Limit	-13dBm
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Remarks

The EUT does not exceed -13dBm at the frequency range of 9kHz to 25GHz.



Product Service

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
Section 2.1, 2.2, 2.3, 2.4, 2.5 and 2.7 – Maximum Conducted Output Power, Peak – Average Ratio, Modulation Characteristics, Occupied Bandwidth, Spurious Emissions at Antenna Terminals (± 1MHz) and Conducted Spurious Emissions.					
Spectrum Analyzer	Agilent	E4440A	MY46187580	12	24-Oct-2013
Spectrum Analyzer	Rohde & Schwarz	FSQ26	201123	12	09-Apr-2013
Power Meter	Rohde & Schwarz	NRP	102438	12	12-Apr-2013
Power Sensor	Rohde & Schwarz	NRP-Z51	102434	12	12-Aug-2013
Network Analyzer	Hewlett Packard	8720D	US36140166	12	06-Sep-2013
40 dB Attenuator	HJ	ATT-150W-40dB	8F42L12E017	-	O/P MON
40 dB Attenuator	Shanghai Huaxiang	DTS 80	090722014	-	O/P MON
Load	Shanghai Huaxiang	TFE5	090715057	-	O/P MON
Power Supply	Dahua	DH1716-5D	2008040041	-	O/P MON
Power Supply	Dahua	DH1716-5D	200360003	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	13-Dec-2013
Thermo-hygrometer	AZ Instruments	8705	9151655	12	16-Dec-2013
Section 2.6 – Radiated Spurious Emissions					
Load	Shanghai Huaxiang	TF100	09121648	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121605	-	O/P MON
EMI Receiver	Rohde & Schwarz	ESI 40	100015	12	19-Aug-2013
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	19-Aug-2013
Double-Ridged Wave-guide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2013
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	12	19-Aug-2013
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18m×16.88m × 9.60m	-	12	19-Aug-2013
Power Supply	Dahua	DH1716A-14	20080401	-	O/P MON
Power Supply	Dahua	DH1716-5D	200360003	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	13-Dec-2013
Thermo-hygrometer	AZ Instruments	8705	9151655	12	16-Dec-2013

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



Product Service

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*
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



4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

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