Product Service

Choose certainty.
Add value.

Report On

FCC and Industry Canada Testing of the
Ericsson AB RRUS 11 B5 / KRC 161 285/2

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8AKRC161285-2
IC ID: 287AB-AS1612852

Document 75923458 Report 03 Issue 1 September 2013

TÜV SÜD Product Service, Octagon House, Concorde Way, Segensworth North,
Fareham, Hampshire, United Kingdom, PO15 5RL
Tel: +44 (0) 1489 558100. Website: www.tuv-sud.co.uk

REPORT ON FCC and Industry Canada Testing of the Ericsson RRUS 11 B5 / KRC 161 285/2

Document 75923458 Report 03 Issue 1

September 2013

PREPARED FOR

Ericsson AB
Isafjordsgatan 10
SE-164 80
Stockholm
Sweden

PREPARED BY

G Zhao
Test Engineer

APPROVED BY

N Forsyth
Authorised Signatory

DATED 27 September 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 22 and Industry Canada RSS-132. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Zhao X Zhang

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Ericsson RRUS 11 B5 / KRC 161 285/2

Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRUS 11 B5 / KRC 161 285/2 to the requirements of FCC CFR 47 Part 22 and Industry Canada RSS-132.

Testing was carried out in support of a C2PC application for Grant of RRUS 11 B5 / KRC 161 285/2 for hardware update in CDMA mode. The manufacurer has declared that this hardware update does not affect the frequency stability, therefore this requirement was not tested.

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 11 B5
Part Number	KRC 161 285/2
IC Model Number	AS1612852
Serial Number(s)	CB4P587219
RBS Software	CXP102051/16 Rev R32BD
PIS Software	CXP9017316/1 Rev R39UL
Hardware Version	R2B
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 22: 2012 Industry Canada RSS-132 Issue 3: 2013
Incoming Release Date	Declaration of Build Status 16 July 2013
Order Number Date	PTP 26 June 2013
Start of Test	16 July 2013
Finish of Test	23 August 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

Product Service

1.2 BRIEF SUMMARY OF RESULTS

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

Configuration 1 – Remote Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 22	RSS-132 and RSS-GEN					
	22.913 (a)	5.4	Effective Radiated Power	869.88MHz		N/A	No integral antenna.
				881.52MHz		N/A	
				893.10MHz		N/A	
				869.88MHz+871.11MHz		N/A	
				881.52MHz+882.75MHz		N/A	
				891.87MHz+893.10MHz		N/A	
2.1	2.1046, 22.913 (a)	5.4	Maximum Peak Output Power - Conducted	869.88MHz	0	Pass	-
				881.52MHz	0	Pass	
				893.10MHz	0	Pass	
				869.88MHz+871.11MHz	0	Pass	
				881.52MHz+882.75MHz	0	Pass	
				891.87MHz+893.10MHz	0	Pass	
2.2	22.913 (a)	5.4	Peak – Average Ratio	869.88MHz	0	Pass	-
				881.52MHz	0	Pass	
				893.10MHz	0	Pass	
				869.88MHz+871.11MHz	0	Pass	
				881.52MHz+882.75MHz	0	Pass	
				891.87MHz+893.10MHz	0	Pass	
2.3	2.1047 (d)	5.2	Modulation Characteristics	869.88MHz		N/A	-
				881.52MHz	0	Pass	
				893.10MHz		N/A	
				869.88MHz+871.11MHz		N/A	
				881.52MHz+882.75MHz		N/A	
				891.87MHz+893.10MHz		N/A	

Product Service

Configuration 1 – Remote Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 22	RSS-132 and RSS-GEN					
2.4	2.1049, 22.917 (b)	RSS-Gen 4.6.1	Occupied Bandwidth	869.88MHz	0	Pass	-
				881.52MHz	0	Pass	
				893.10MHz	0	Pass	
				869.88MHz+871.11MHz		N/A	
				881.52MHz+882.75MHz		N/A	
				891.87MHz+893.10MHz		N/A	
2.5	2.1051, 22.917 (b)	5.5	Spurious Emissions at Antenna Terminals (±1MHz)	869.88MHz	0	Pass	-
				881.52MHz		N/A	
				893.10MHz	0	Pass	
				869.88MHz+871.11MHz	0	Pass	
				881.52MHz+882.75MHz		N/A	
				891.87MHz+893.10MHz	0	Pass	
2.6	2.1053, 22.917 (a)	5.5	Radiated Spurious Emissions	869.88MHz	0	Pass	-
				881.52MHz	0	Pass	
				893.10MHz	0	Pass	
				869.88MHz+871.11MHz		N/A	
				881.52MHz+882.75MHz	0	Pass	
				891.87MHz+893.10MHz		N/A	
2.7	2.1051, 22.917 (a)	5.5	Conducted Spurious Emissions	869.88MHz	0	Pass	-
				881.52MHz	0	Pass	
				893.10MHz	0	Pass	
				869.88MHz+871.11MHz		N/A	
				881.52MHz+882.75MHz	0	Pass	
				891.87MHz+893.10MHz		N/A	
	2.1055, 22.355	5.3	Frequency Stability Under Temperature Variations	869.88MHz		N/A	-
				881.52MHz		N/A	
				893.10MHz		N/A	
				869.88MHz+871.11MHz		N/A	
				881.52MHz+882.75MHz		N/A	
				891.87MHz+893.10MHz		N/A	

Product Service

Configuration 1 – Remote Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 22	RSS-132 and RSS-GEN					
	2.1055, 22.355	5.3	Frequency Stability Under Voltage Variations	869.88MHz		N/A	-
				881.52MHz		N/A	
				893.10MHz		N/A	
				869.88MHz+871.11MHz		N/A	
				881.52MHz+882.75MHz		N/A	
				891.87MHz+893.10MHz		N/A	

Configuration 1 – Remote Radio Equipment						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Comments
	FCC Part 15					
2.8	15.111	Receiver Spurious Emissions	869.88MHz	0	Pass	This test is shown for information only.
			881.52MHz	0	Pass	
			893.10MHz	0	Pass	
			869.88MHz+871.11MHz		N/A	
			881.52MHz+882.75MHz		N/A	
			891.87MHz+893.10MHz		N/A	

N/A – Not Applicable

Product Service

1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Remote Radio Equipment
MANUFACTURER	Ericsson AB
PRODUCT NAME	RRUS 11 B5
PART NUMBER	KRC 161 285/2
IC Model Number	AS1612852
SERIAL NUMBER(s)	CB4P587219
HARDWARE VERSION	R2B
RBS SOFTWARE	CXP102051/16 Rev R32BD
PIS SOFTWARE	CXP9017316/1 Rev R39UL
TRANSMITTER OPERATING RANGE	TX: 869MHz - 894MHz RX: 824MHz - 849MHz
MODULATIONS	QPSK, 8PSK,16QAM
ITU DESIGNATION OF EMISSION	1M25F9W
CHANNEL BANDWIDTH	1.25 MHz
OUTPUT POWER (RMS) (W or dBm)	Single Carrier: 1 x 46.0dBm per port (1 x 40W per port) Multi Carrier (x 2): 2 x 43.0.dBm per port (2 x 20W per port)
OUTPTU POWER TOLERANCE	± 1.0dB
ANTENNA	No dedicated antenna, handled during licensing
NUMBER OF ANTENNA PORTS	2 TX/ RX ports
SUPPORTED CONFIGURATION	Dual Single Carrier or Multi Carrier. Both RF chains are identical.
FCC ID	TA8AKRC161285-2
IC ID	287AB-AS1612852
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is the Radio Part of CDMA Base Station.

Signature 

Date 08 August 2013

D of B S Serial No 75923458/03

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) RRUS 11 B5 / KRC 161 285/2 is an Ericsson Radio Equipment working in the public mobile service 850MHz band which provides communication connections to CDMA850 network. The RRUS 11 B5 / KRC 161 285/2 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 22 and Industry Canada RSS-132.

The RRUS 11 B5 / KRC 161 285/2 supports CDMA with QPSK, 8PSK and 16QAM modulations at 850MHz. 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

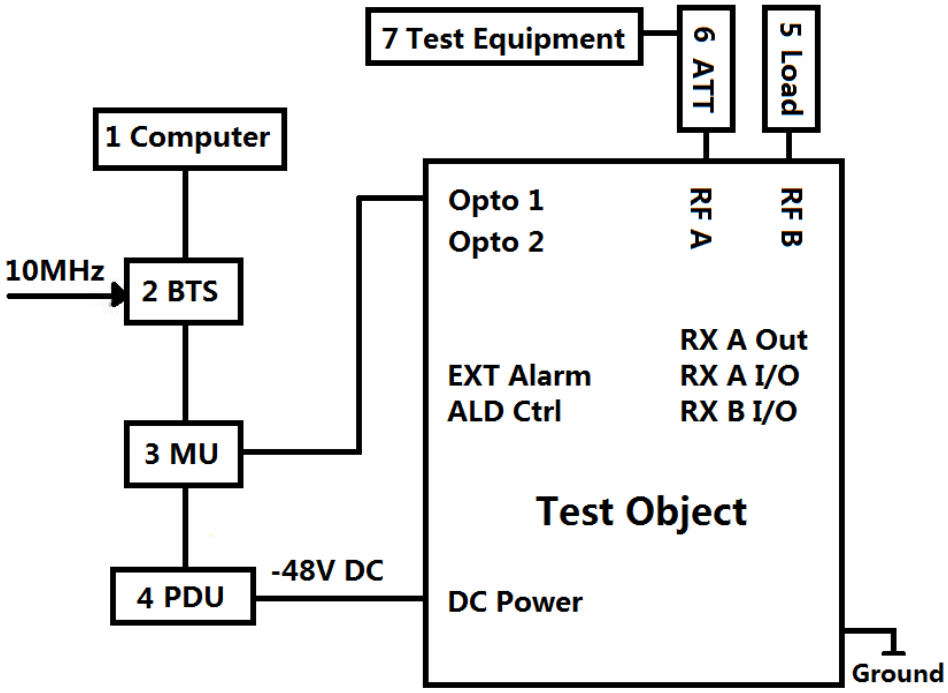
- 16QAM Modulation: High Rate Packet Data
  User Channels: 14
  Channel rate: 2457.6kbps

  Channel bandwidth: 1.25MHz

The EUT has two TX/RX ports and it can be configured to transmit with 850MHz single or multi carrier at both RF output connectors. All TX measurements were performed on the combined TX/RX output connector RF A. Limited complementary TX measurements were done at connector RF B to verify identical performance for both transmitter chains. 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.

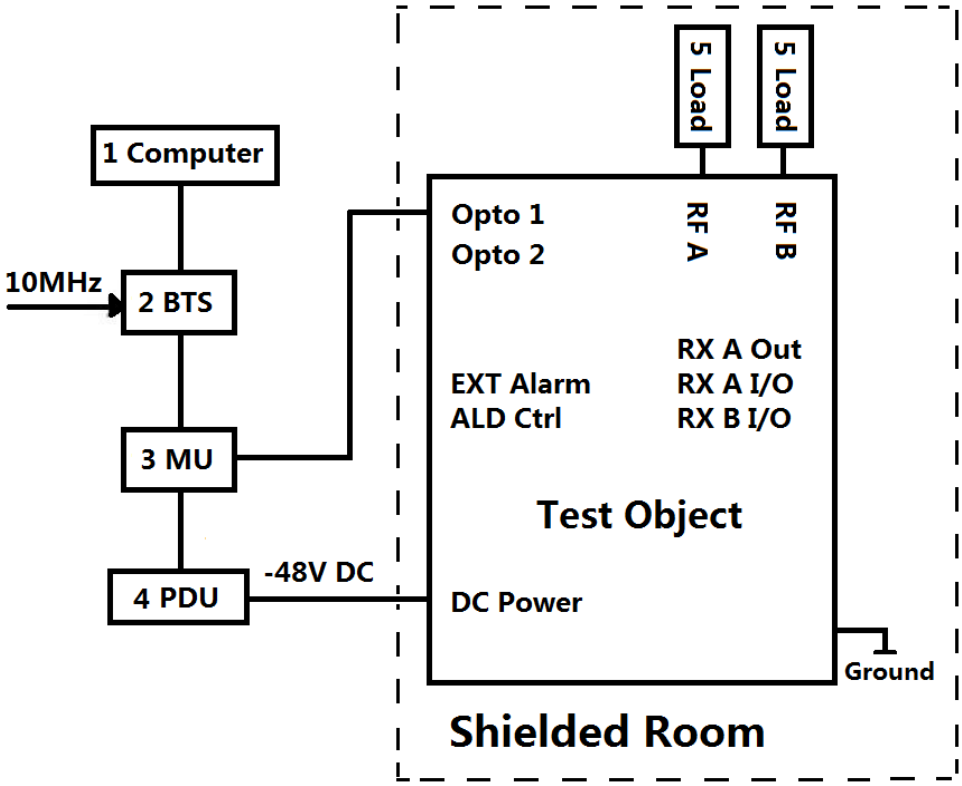
Test Setup, Conducted Measurement:



Product Name	Product Number	Version	Serial Number
RRUS 11 B5	KRC 161 285/2	R2B	CB4P587219

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP EliteBook 8460p	--	AP523464
2	DBA	NTLK90AAE5	09	NNTMPX00VD94
	XCEM-A	NTLK79AAE5	01	NNTMPX00JCKF
	AEM1302	NTLK85GAE5	07	NNTMPX00VRY4
	AEM1302	NTLK85GAE5	07	NNTMPX00RV3M
3	RBS 6601	BFL 901 009/1	--	--
	XMU 02 01	KDU137 745/1	R2A	C825513800
	SUP 6601	1/BFL 901 009/1	R3B	BR81262578
4	Power Supply	DH1716-5D	--	2008040041
	Power Supply	DH1716-5D	--	2008040050
5	Load	TF100	--	09121648
6	40dB Attenuator	48-40-43-LIM	--	BR5020
7	Power Meter	Rohde & Schwarz NRP2	--	101283
	Power Sensor	Rohde & Schwarz NRP-Z51	--	102312
	Spectrum Analyzer	FSQ26	--	100253

Test Setup, Radiated Measurement:



Product Name	Product Number	Version	Serial Number
RRUS 11 B5	KRC 161 285/2	R2B	CB4P587219

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP EliteBook 8460p	--	AP523464
2	DBA	NTLK90AAE5	09	NNTMPX00VD94
	XCEM-A	NTLK79AAE5	01	NNTMPX00JCKF
	AEM1302	NTLK85GAE5	07	NNTMPX00VRY4
	AEM1302	NTLK85GAE5	07	NNTMPX00RV3M
3	RBS 6601	BFL 901 009/1	--	--
	XMU 02 01	KDU137 745/1	R2A	C825513800
	SUP 6601	1/BFL 901 009/1	R3B	BR81262578
4	Power Supply	DH1716-5D	--	2008040041
	Power Supply	DH1716-5D	--	2008040050
5	Load	TF100	--	09121648
	Load	TF100	--	09121605

1.4.3 Modes of Operation

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

Mode 1 - Channel No. 1019: 869.88MHz (Bottom Channel)

Mode 2 - Channel No. 384: 881.52MHz (Middle Channel)

Mode 3 - Channel No. 770: 893.10MHz (Top Channel)

Mode 4 - Channel No. 1019 + 37: 869.88MHz + 871.11MHz (B and B+1.23MHz)

Mode 5 - Channel No. 384 + 425: 881.52MHz + 882.75MHz (M and M+1.23MHz)

Mode 6 - Channel No. 729 + 770: 891.87MHz + 893.10MHz (T-1.23MHz 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

Mod State 0 - No modifications were made to the EUT during testing.

1.8 ALTERNATIVE TEST SITE

Only Radiated Spurious Emission 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.

SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
Ericsson RRUS 11 B5 / KRC 161 285/2

2.1 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 22, Clause 22.913 (a)
Industry Canada RSS-132, Clause 5.4

2.1.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

2.1.3 Date of Test and Modification State

16, 17 and 18 July 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 22 and Industry Canada RSS-132.

Using a power meter and attenuator(s), the output power of the EUT was measured at the antenna terminal. The carrier power was measured with QPSK, 8PSK and 16QAM modulations.

The path loss was measured and entered to the power meter as a reference level offset to get the output power value directly.

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

2.1.6 Environmental Conditions

	16 July 2013	17 July 2013	18 July 2013
Ambient Temperature	22.0°C	22.0°C	23.5°C
Relative Humidity	60.0%	59.5%	66.0%

2.1.7 Test Results

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

The test results are shown below

Single Carrier

Configuration 1 - Mode 1, 2 and 3

QPSK

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
1019 (Bottom)	869.88	45.97	39.54
384 (Middle)	881.52	46.02	39.99
770 (Top)	893.10	45.84	38.37

8PSK

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
1019 (Bottom)	869.88	46.00	39.81
384 (Middle)	881.52	46.04	40.18
770 (Top)	893.10	45.83	38.28

16QAM

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
1019 (Bottom)	869.88	46.00	39.81
384 (Middle)	881.52	46.07	40.46
770 (Top)	893.10	45.87	38.64

Multi Carrier (1x2)

Configuration 1 - Mode 4, 5 and 6

QPSK

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
1019 & 37	869.88 & 871.11	46.03	40.09
384 & 425	881.52 & 882.75	46.05	40.27
729 & 770	891.87 & 893.10	45.96	39.45

8PSK

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
1019 & 37	869.88 & 871.11	46.03	40.09
384 & 425	881.52 & 882.75	46.05	40.27
729 & 770	891.87 & 893.10	45.95	39.36

16QAM

Channel No.	Frequency (MHz)	Result (dBm) RMS	Result (W) RMS
1019 & 37	869.88 & 871.11	46.07	40.46
384 & 425	881.52 & 882.75	46.10	40.74
729 & 770	891.87 & 893.10	45.99	39.72

This unit is tested without antenna. ERP/EIRP compliance is addressed at the time of licensing, as required by the responsible FCC/IC Bureau(s).Licensee's are the required to take into account maximum allowed antenna gain used in combination with above power settings to prevent the radiated output power to exceed the limits.

Limit	≤820W or ≤+59.1dBm

Remarks

The EUT does not exceed 820W or 59.1dBm at the measured frequencies.

2.2 PEAK – AVERAGE RATIO

2.2.1 Specification Reference

FCC CFR 47 Part 22, Clause 22.913 (a)
Industry Canada RSS-132, Clause 5.4

2.2.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

2.2.3 Date of Test and Modification State

16, 17 and 18 July 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 22 and Industry Canada RSS-132.

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

The Peak to Average was measured with QPSK, 8PSK,16QAM using the test models described.

The spectrum analyzer Measurement bandwidth was set 50MHz for single and multi carrier, and the path loss measured was 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

2.2.6 Environmental Conditions

	16 July 2013	17 July 2013	18 July 2013
Ambient Temperature	22.0°C	22.0°C	23.5°C
Relative Humidity	60.0%	59.5%	66.0%

2.2.7 Test Results

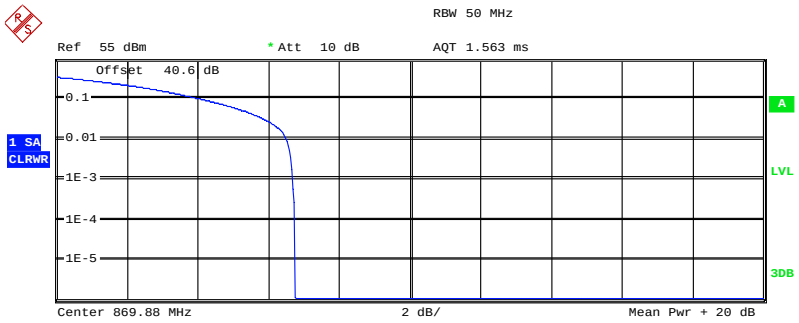
For the period of test the EUT met the requirements of FCC CFR 47 Part 22 for Peak – Average Ratio.

The test results are shown below.

Single Carrier

Configuration 1 - Mode 1

QPSK

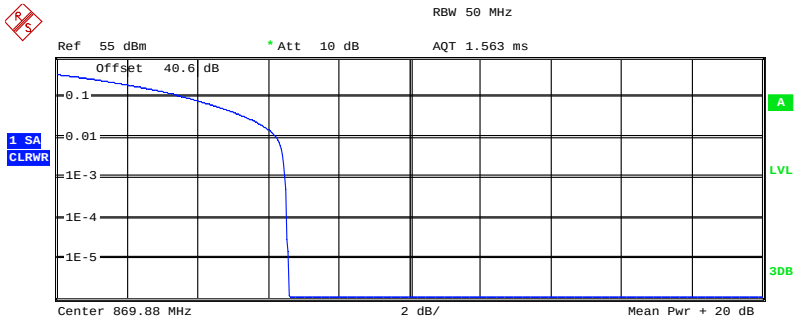


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.88 dBm
Peak	52.63 dBm
Crest	6.75 dB
10 %	4.10 dB
1 %	6.51 dB
.1 %	6.70 dB
.01 %	6.76 dB

Date: 18.JUL.2013 13:27:50

8PSK

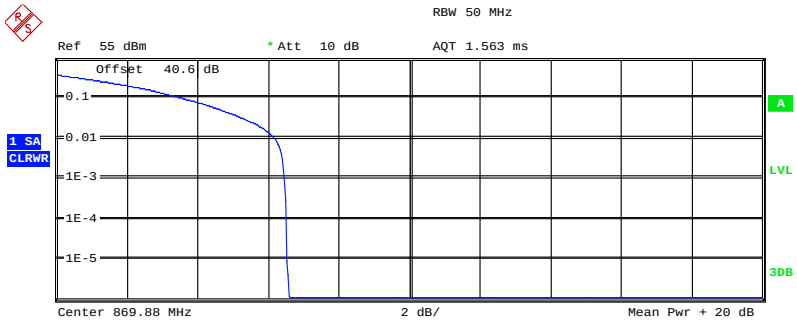


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.96 dBm
Peak	52.55 dBm
Crest	6.59 dB
10 %	3.72 dB
1 %	6.22 dB
.1 %	6.47 dB
.01 %	6.54 dB

Date: 16.JUL.2013 15:21:48

16QAM



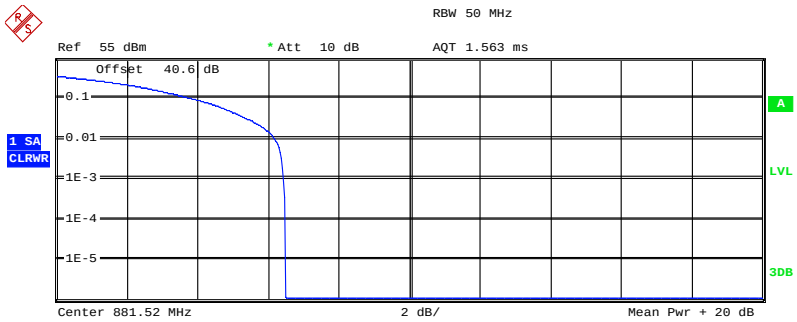
Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.96 dBm
Peak	52.55 dBm
Crest	6.59 dB
10 %	3.59 dB
1 %	6.19 dB
.1 %	6.47 dB
.01 %	6.54 dB

Date: 16.JUL.2013 16:14:04

Configuration 1 - Mode 2

QPSK

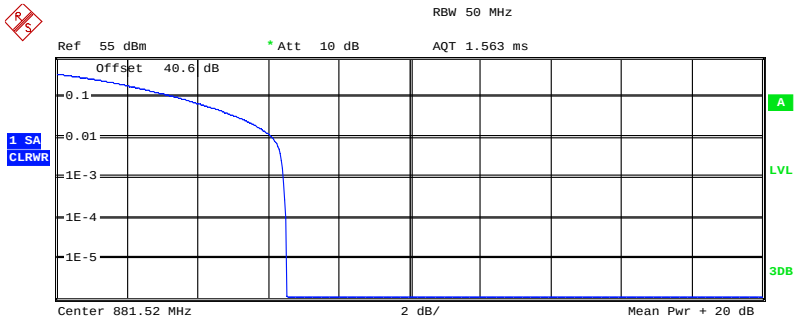


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	46.04 dBm
Peak	52.53 dBm
Crest	6.49 dB
10 %	3.88 dB
1 %	6.19 dB
.1 %	6.44 dB
.01 %	6.51 dB

Date: 17.JUL.2013 15:23:45

8PSK

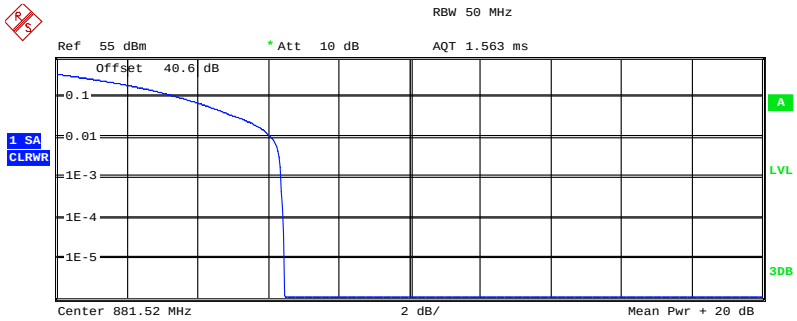


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.94 dBm
Peak	52.46 dBm
Crest	6.51 dB
10 %	3.46 dB
1 %	6.09 dB
.1 %	6.44 dB
.01 %	6.51 dB

Date: 17.JUL.2013 10:57:26

16QAM



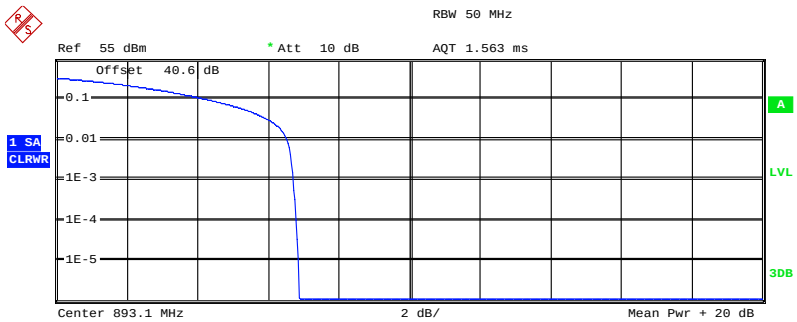
Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	46.09 dBm
Peak	52.53 dBm
Crest	6.44 dB
10 %	3.53 dB
1 %	6.09 dB
.1 %	6.38 dB
.01 %	6.44 dB

Date: 17.JUL.2013 11:46:33

Configuration 1 - Mode 3

QPSK

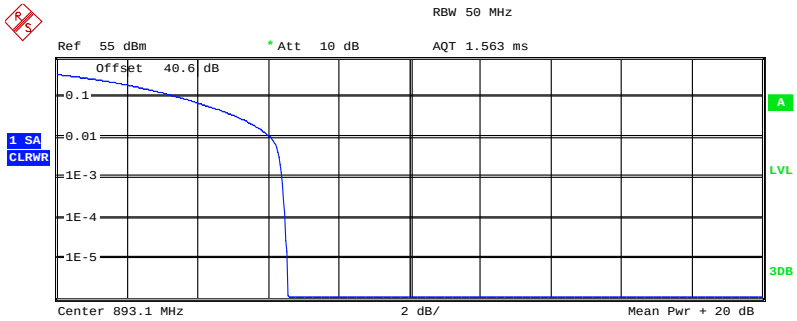


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.89 dBm
Peak	52.75 dBm
Crest	6.86 dB
10 %	4.33 dB
1 %	6.54 dB
.1 %	6.70 dB
.01 %	6.79 dB

Date: 18.JUL.2013 13:39:41

8PSK

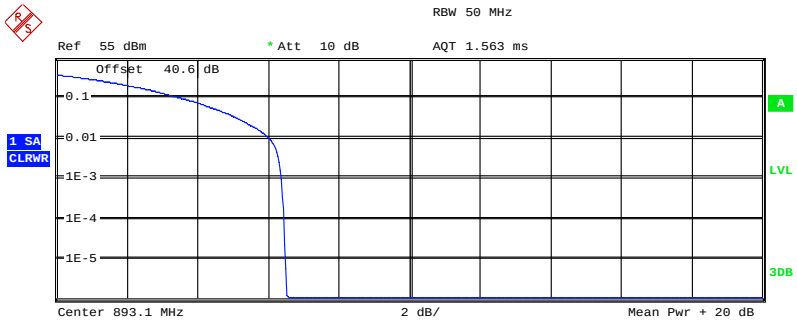


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.78 dBm
Peak	52.34 dBm
Crest	6.56 dB
10 %	3.53 dB
1 %	6.06 dB
.1 %	6.38 dB
.01 %	6.47 dB

Date: 17.JUL.2013 13:31:22

16QAM



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

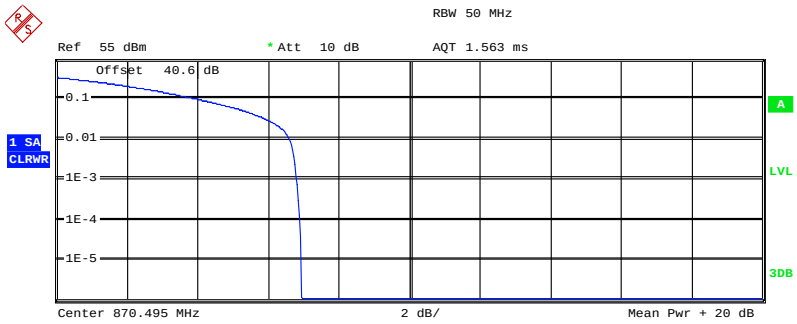
	Trace 1
Mean	45.80 dBm
Peak	52.34 dBm
Crest	6.54 dB
10 %	3.56 dB
1 %	6.03 dB
.1 %	6.38 dB
.01 %	6.44 dB

Date: 17.JUL.2013 13:43:55

Multi Carrier (1x2):

Configuration 1 - Mode 4

QPSK

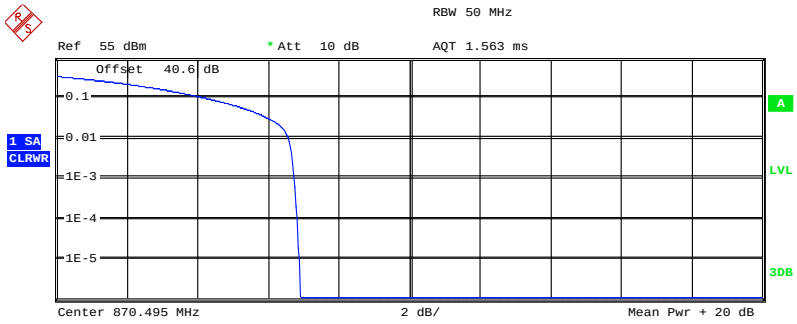


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.84 dBm
Peak	52.77 dBm
Crest	6.93 dB
10 %	4.04 dB
1 %	6.60 dB
.1 %	6.79 dB
.01 %	6.89 dB

Date: 18.JUL.2013 14:33:15

8PSK

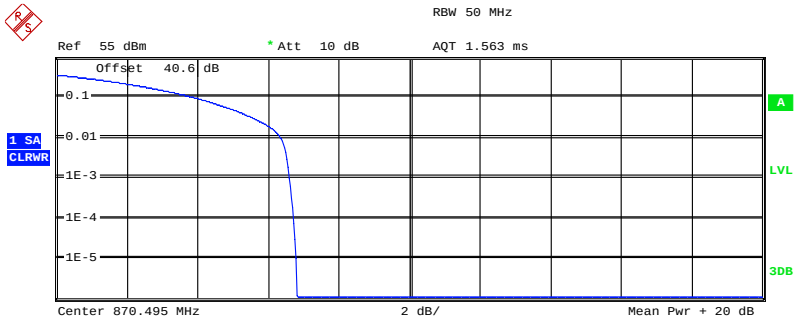


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.99 dBm
Peak	52.91 dBm
Crest	6.91 dB
10 %	4.26 dB
1 %	6.57 dB
.1 %	6.73 dB
.01 %	6.83 dB

Date: 18.JUL.2013 12:41:15

16QAM



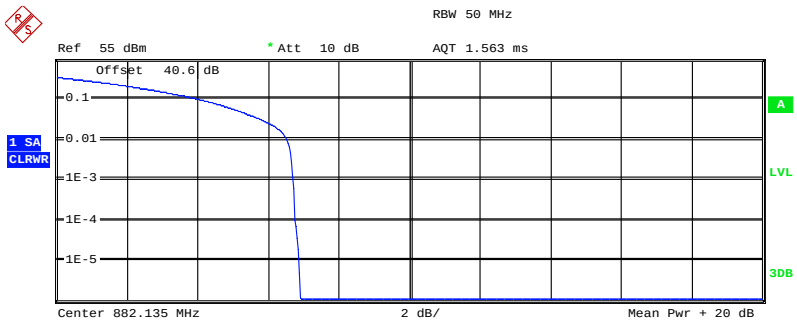
Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	46.04 dBm
Peak	52.84 dBm
Crest	6.80 dB
10 %	3.91 dB
1 %	6.35 dB
.1 %	6.60 dB
.01 %	6.73 dB

Date: 18.JUL.2013 13:06:02

Configuration 1 - Mode 5

QPSK

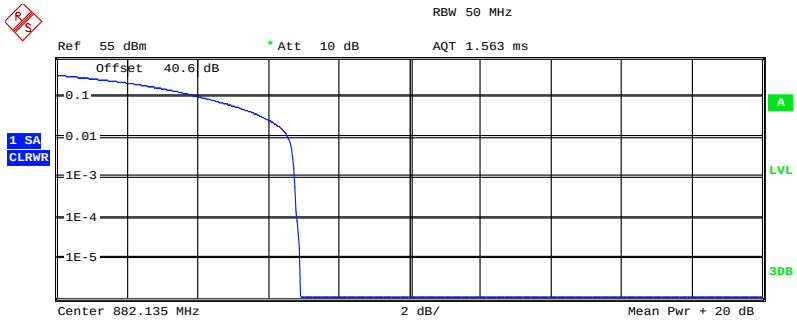


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	46.03 dBm
Peak	52.92 dBm
Crest	6.89 dB
10 %	4.10 dB
1 %	6.54 dB
.1 %	6.70 dB
.01 %	6.76 dB

Date: 18.JUL.2013 15:11:39

8PSK

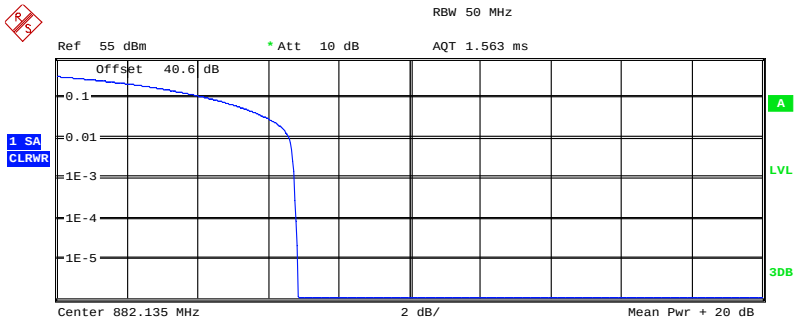


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	46.02 dBm
Peak	52.92 dBm
Crest	6.90 dB
10 %	4.17 dB
1 %	6.57 dB
.1 %	6.76 dB
.01 %	6.83 dB

Date: 18.JUL.2013 16:05:16

16QAM



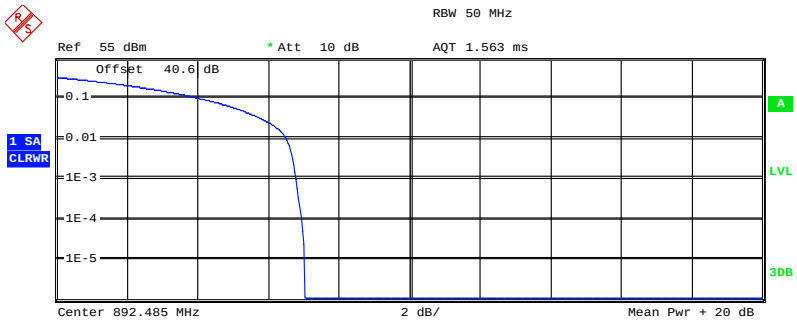
Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	46.09 dBm
Peak	52.92 dBm
Crest	6.83 dB
10 %	4.33 dB
1 %	6.60 dB
.1 %	6.73 dB
.01 %	6.79 dB

Date: 18.JUL.2013 16:17:25

Configuration 1 - Mode 6

QPSK

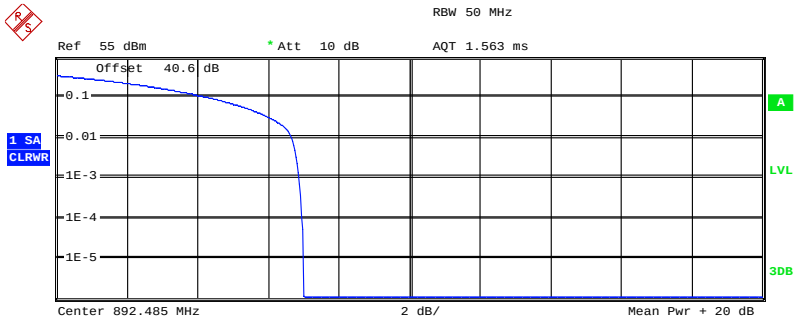


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.83 dBm
Peak	52.87 dBm
Crest	7.04 dB
10 %	4.10 dB
1 %	6.51 dB
.1 %	6.79 dB
.01 %	6.96 dB

Date: 18.JUL.2013 15:28:10

16QAM

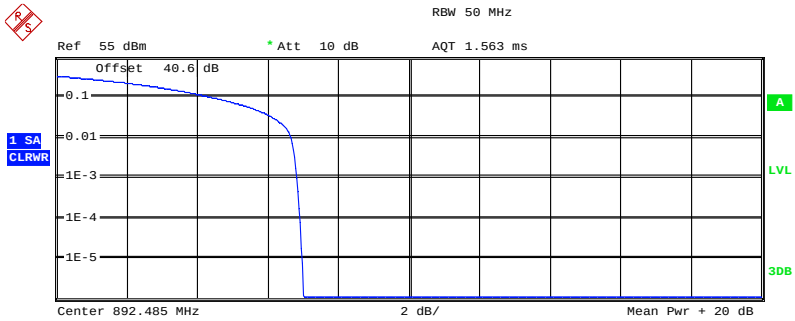


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.80 dBm
Peak	52.80 dBm
Crest	7.01 dB
10 %	4.33 dB
1 %	6.67 dB
.1 %	6.86 dB
.01 %	6.96 dB

Date: 18.JUL.2013 13:42:56

16QAM



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 37.9MHz

	Trace 1
Mean	45.87 dBm
Peak	52.87 dBm
Crest	7.00 dB
10 %	4.46 dB
1 %	6.67 dB
.1 %	6.83 dB
.01 %	6.92 dB

Date: 18.JUL.2013 14:02:14

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-132 Clause 5.2

2.3.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

2.3.3 Date of Test and Modification State

18 July 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-132.

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

	18 July 2013
Ambient Temperature	23.5°C
Relative Humidity	66.0%

2.3.6 Test Result

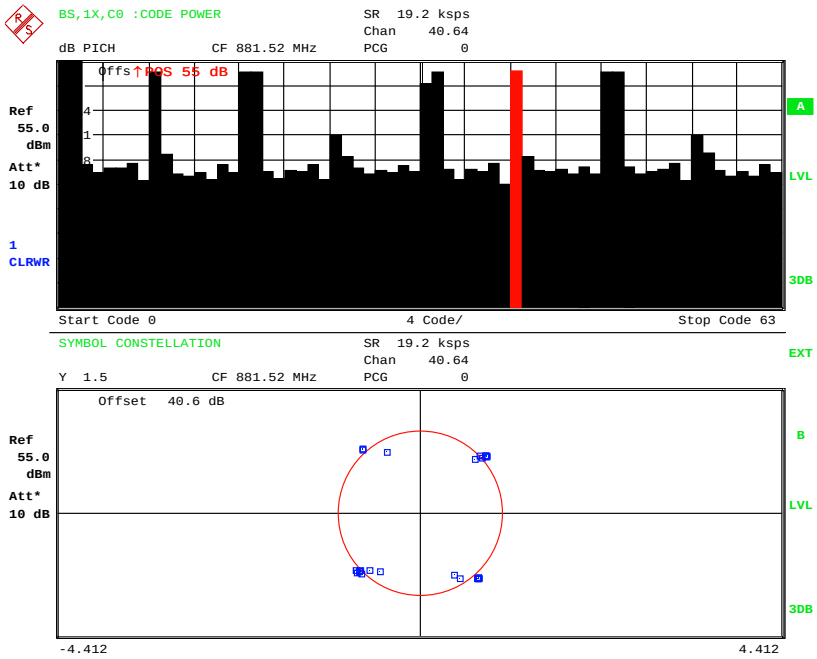
Plots are shown on the following showing the EUT transmitting with all of the modulations:

The test results are shown below

Single Carrier

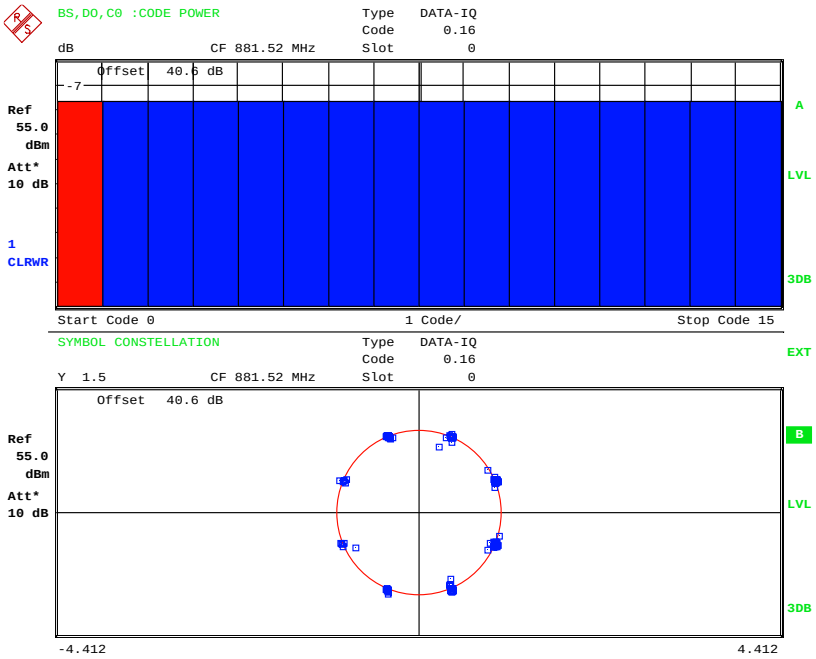
Configuration 1 - Mode 2

EUT transmitting with QPSK modulation:



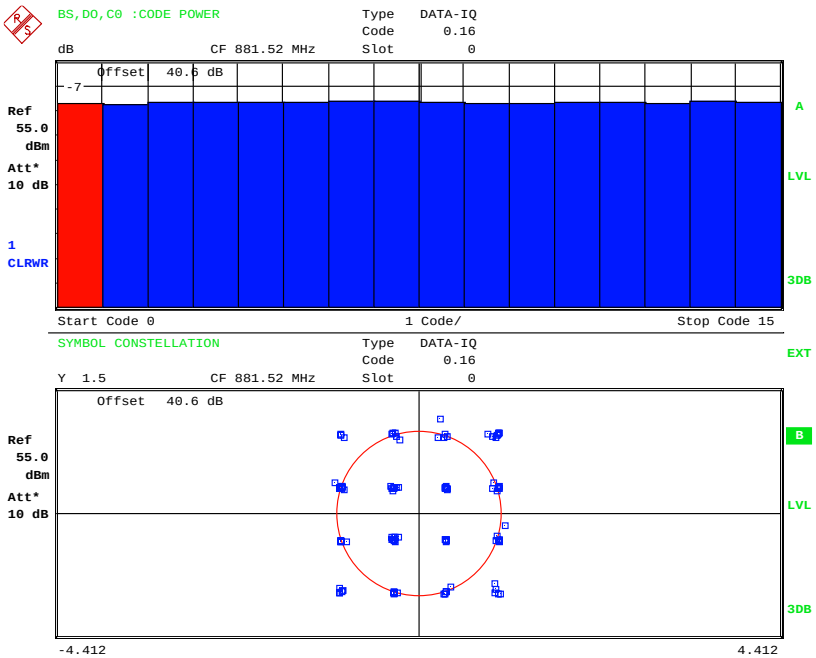
Date: 18.JUL.2013 17:18:27

EUT transmitting with 8PSK modulation:



Date: 18.JUL.2013 16:55:08

EUT transmitting with 16QAM modulation:



Date: 18.JUL.2013 17:02:05

2.4 OCCUPIED BANDWIDTH

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

2.4.3 Date of Test and Modification State

17 July 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 22 and Industry Canada RSS-GEN.

The EUT was transmitting at maximum power, modulated using QPSK as the representative test modulation. A resolution bandwidth of 20kHz and a video bandwidth of 200kHz were used for test.

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

	17 July 2013
Ambient Temperature	22.0°C
Relative Humidity	59.5%

Product Service

2.4.7 Test Results

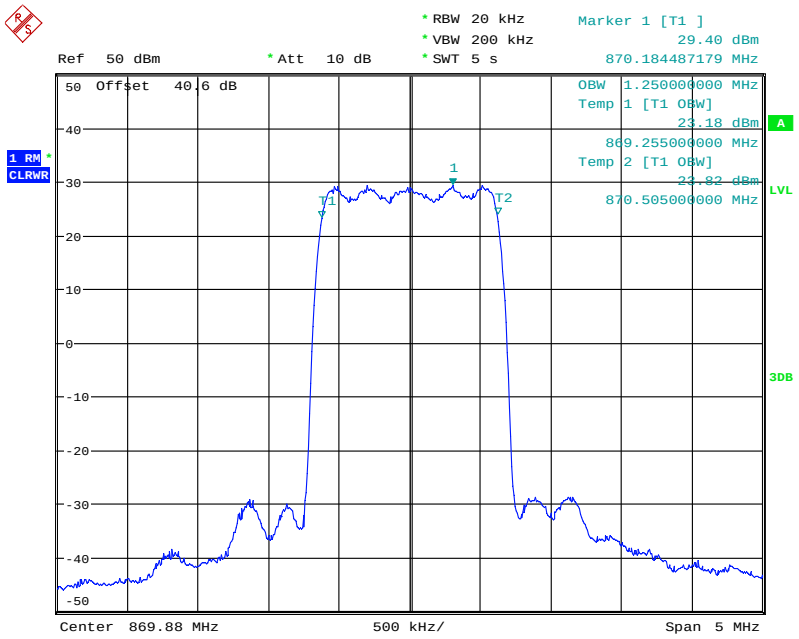
For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-GEN for Occupied Bandwidth.

The test results are shown below

Single Carrier

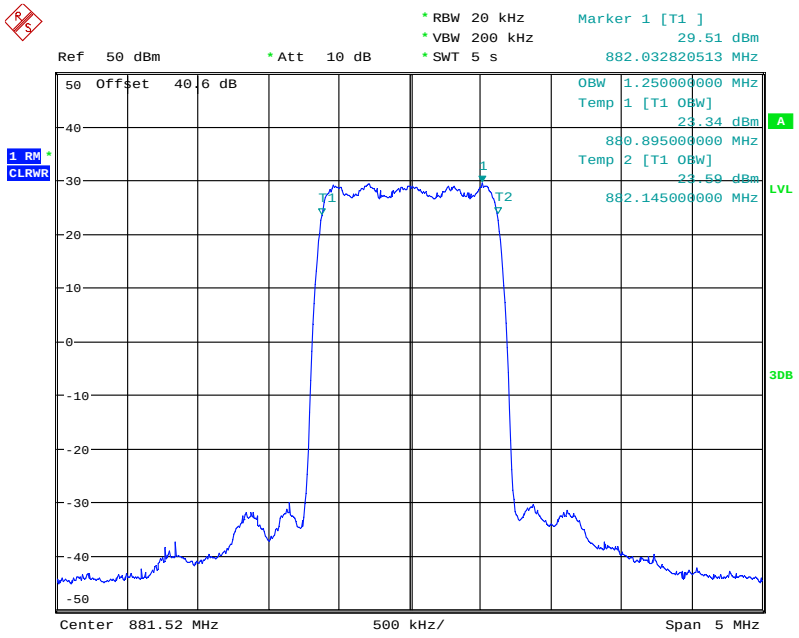
QPSK

Configuration 1 - Mode 1



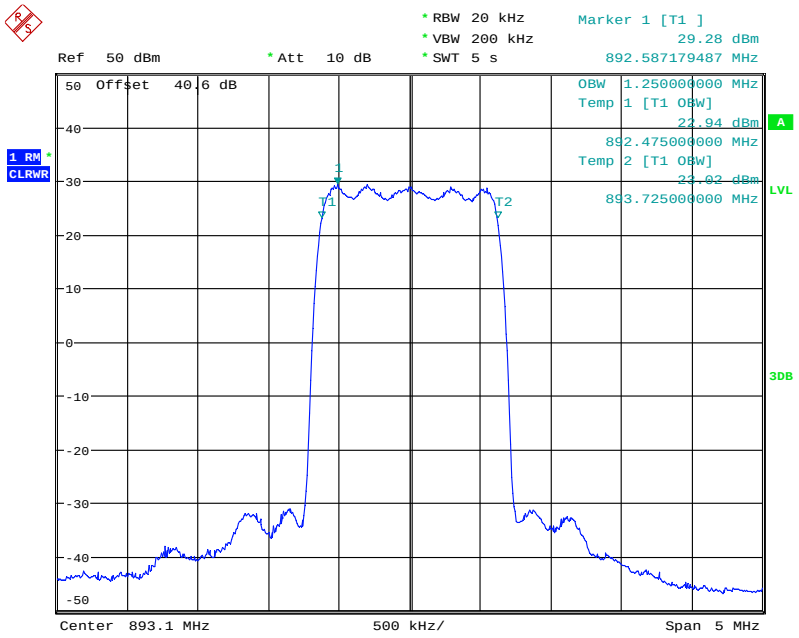
Date: 17.JUL.2013 14:33:58

Configuration 1 - Mode 2



Date: 17.JUL.2013 15:22:17

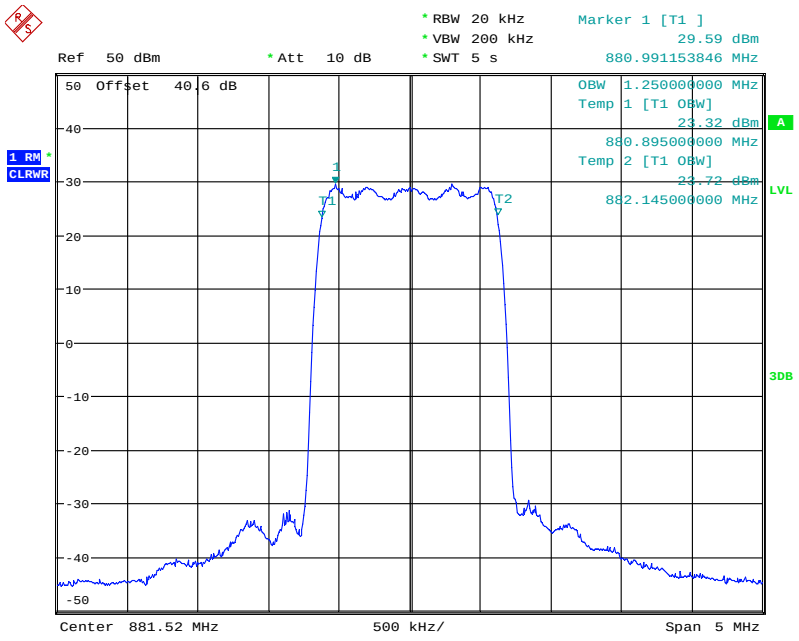
Configuration 1 - Mode 3



Date: 17.JUL.2013 15:37:04

8PSK

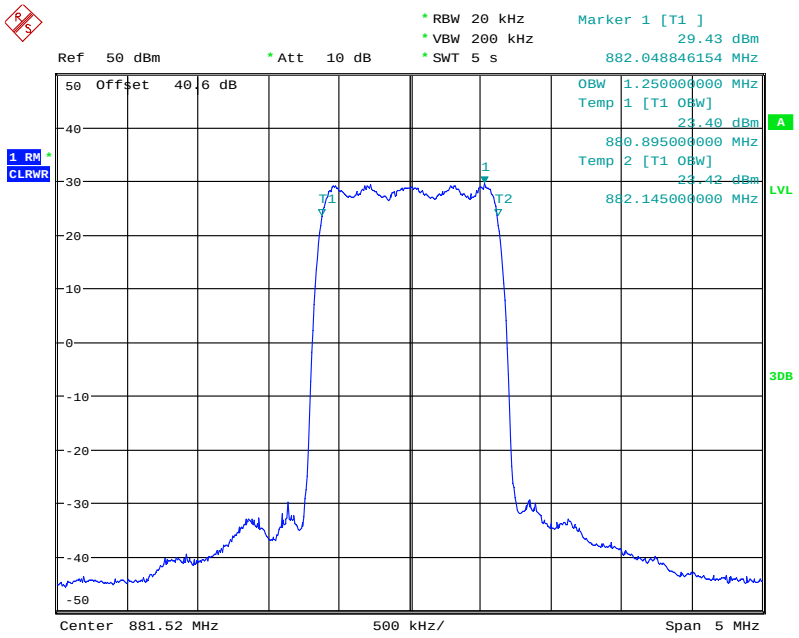
Configuration 1 - Mode 2



Date: 17.JUL.2013 11:02:13

16QAM

Configuration 1 - Mode 2



Date: 17.JUL.2013 11:45:18

2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (±1MHz)

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 22, Clause 22.917 (b)
Industry Canada RSS-132 Clause 5.5

2.5.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

2.5.3 Date of Test and Modification State

17 and 18 July 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 22 and Industry Canada RSS-132.

In accordance with 22.917(b), at least 1% of the emission bandwidth should be used for the frequencies offset up to 1MHz away from the block edge. A resolution bandwidth of 20kHz was used up to 1MHz away from the band edges. According to the FCC rules, a RBW of 100kHz for measurements of emissions > 1MHz away from the band edges. Spectrum analyser detector was set as RMS.

The EUT was tested at it's maximum power level, modulated using QPSK as the representative test modulation. 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 4
- Mode 6

2.5.6 Environmental Conditions

	17 July 2013	18 July 2013
Ambient Temperature	22.0°C	23.5°C
Relative Humidity	59.5%	66.0%

2.5.7 Test Results

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

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./Frequencies	RBW / VBW (kHz)	Limit (dB)
Bottom 869 MHz	Channel: 1019 Frequency: 869.88 MHz	20 / 200	-13.0
Top 894 MHz	Channel: 770 Frequency: 893.10 MHz	20 / 200	-13.0

Multi Carrier (1x2)

Configuration 1 - Mode 7 and 8

Band Edge Frequency	Edge Test with QPSK modulation Channel No./Frequencies	RBW / VBW (kHz)	Limit (dB)
Bottom 869 MHz	Channel: 1019 & 37 Frequency: 869.88 & 871.11 MHz	20 / 200	-13.0
Top 894 MHz	Channel: 729 & 770 Frequency: 891.87 & 893.10 MHz	20 / 200	-13.0

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.

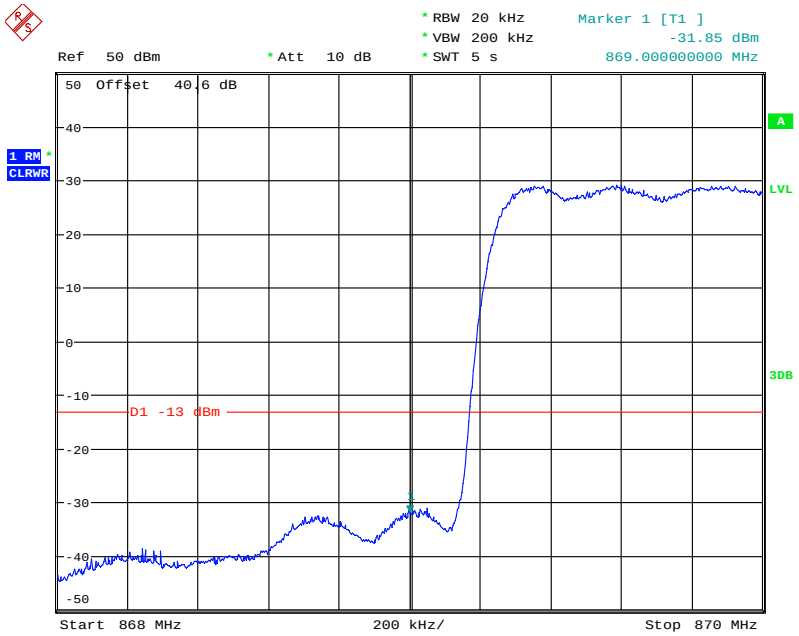
The channels outside of those shown in the table above were not tested at lower power levels to determine a level at which compliance would be achieved. Therefore, to maintain compliance, only the channels shown in the table above shall be used.

The test results are shown below

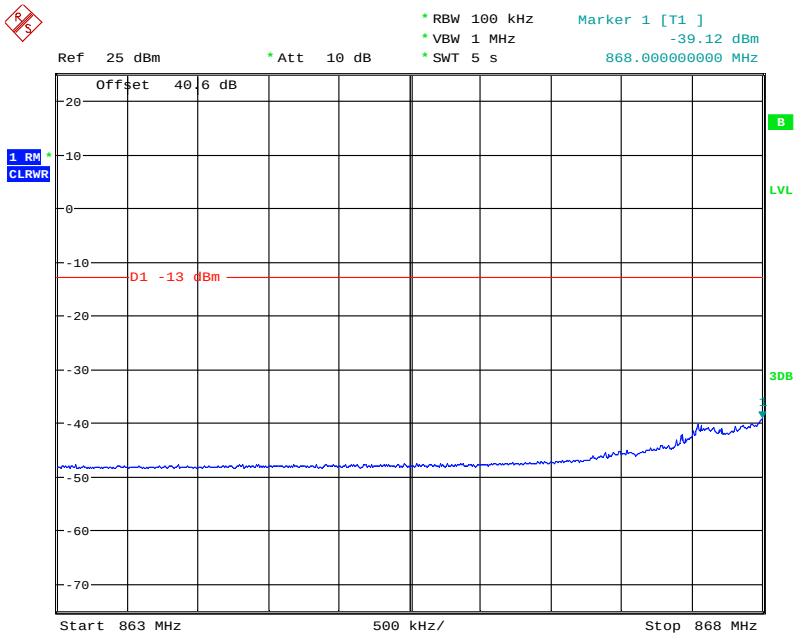
QPSK

Single Carrier

Configuration 1 - Mode 1

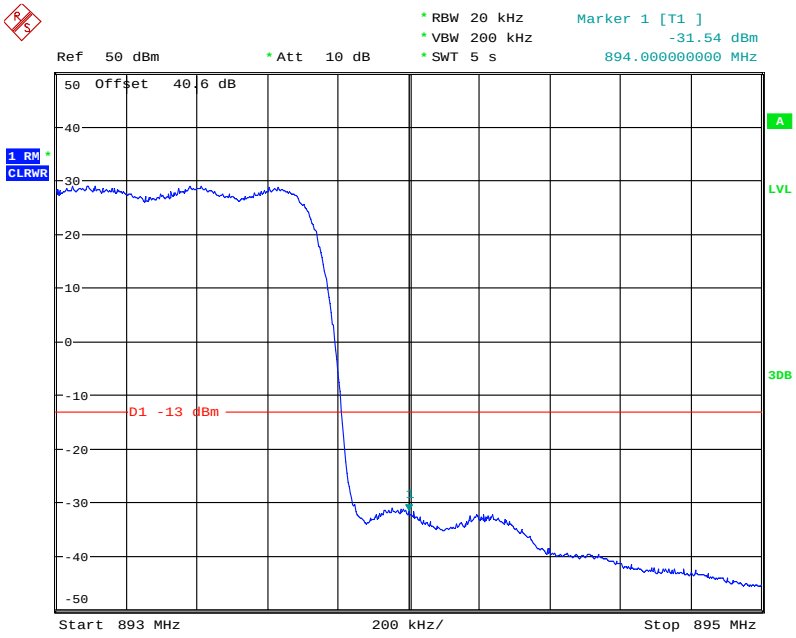


Date: 17.JUL.2013 14:26:33

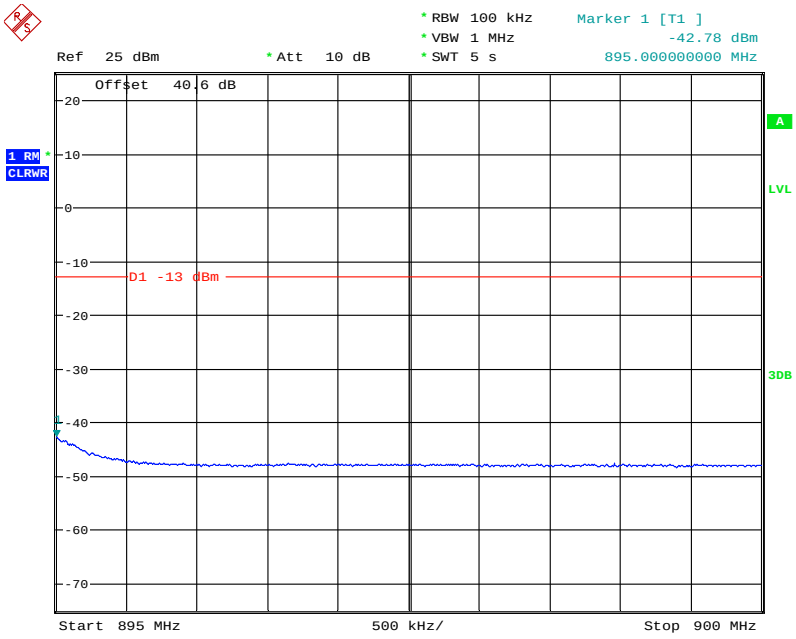


Date: 17.JUL.2013 14:27:35

Configuration 1 - Mode 3



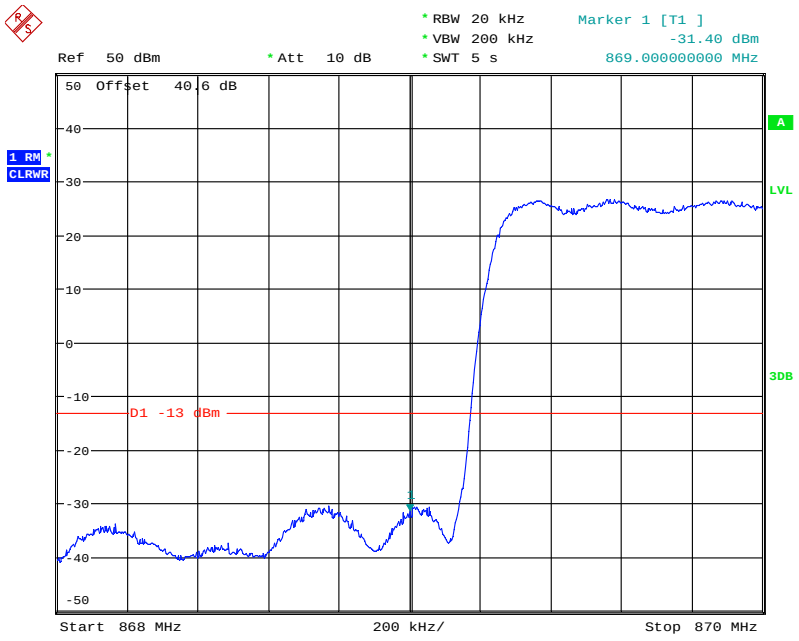
Date: 17.JUL.2013 15:37:54



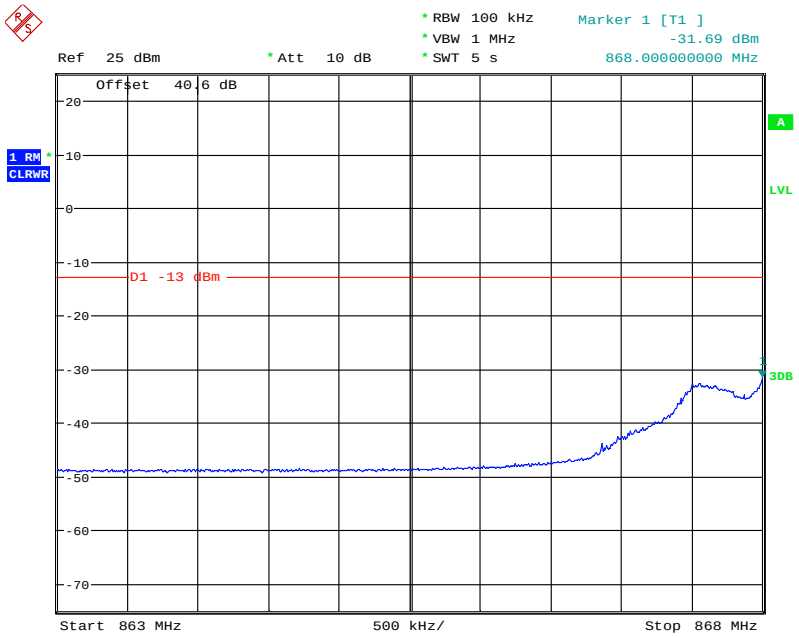
Date: 17.JUL.2013 15:38:33

Multi Carrier (1x2)

Configuration 1 - Mode 4

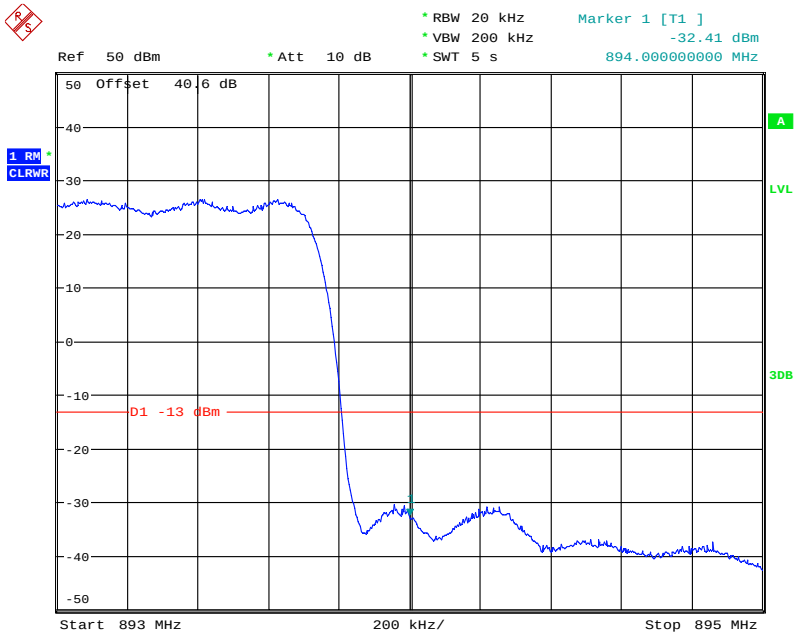


Date: 18.JUL.2013 14:30:14

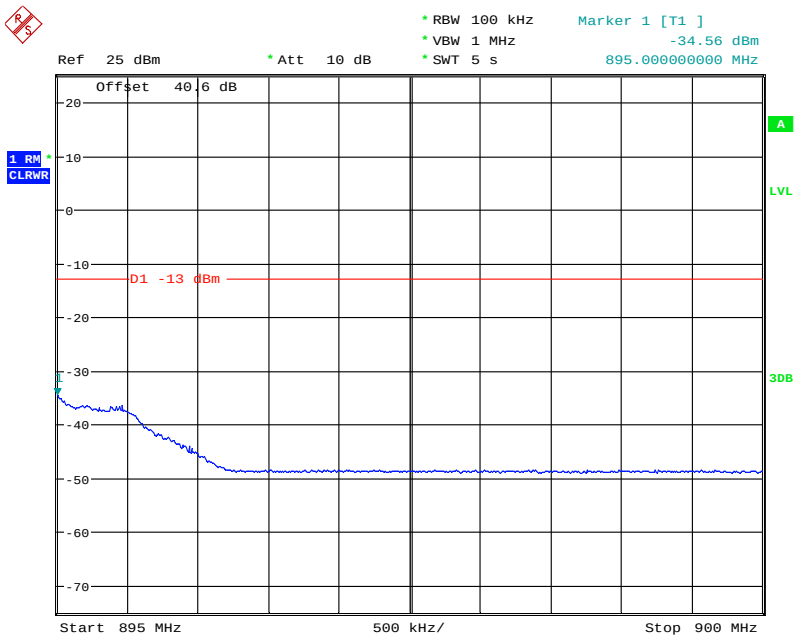


Date: 18.JUL.2013 14:31:16

Configuration 1 – Mode 6



Date: 18.JUL.2013 15:26:41



Date: 18.JUL.2013 15:25:58

Limit

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

2.6 RADIATED SPURIOUS EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1053
FCC CFR 47 Part 22, Clause 22.917 (a)
Industry Canada RSS-132, Clause 5.5

2.6.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

2.6.3 Date of Test and Modification State

21 and 23 August 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 22 and Industry Canada RSS-132.

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

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

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

The measurements were performed at a 3m distance unless otherwise stated.

The limits for Spurious Emissions have been calculated, as shown below using the following formula:

Field Strength of Carrier - (43 + 10Log (P)) dB

Where:
Field Strength is measured in dBµV/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:

$E_{(v/m)}=(30 \times 1.64 \times 38.28)^{0.5} / 3 = 14.47V/m = 143.2dB\mu V/m$

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

43 + 10log(38.28) = 58.8dB

Therefore the limit at 3m measurement distance is:

143.2 – 58.8 = 84.4 dBµV/m

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

The test was performed with the EUT 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 5

2.6.6 Environmental Conditions

	21 August 2013	23 August 2013
Ambient Temperature	23.0°C	23.5°C
Relative Humidity	54.0%	53.0%

2.6.7 Test Results

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

The test results are shown below

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

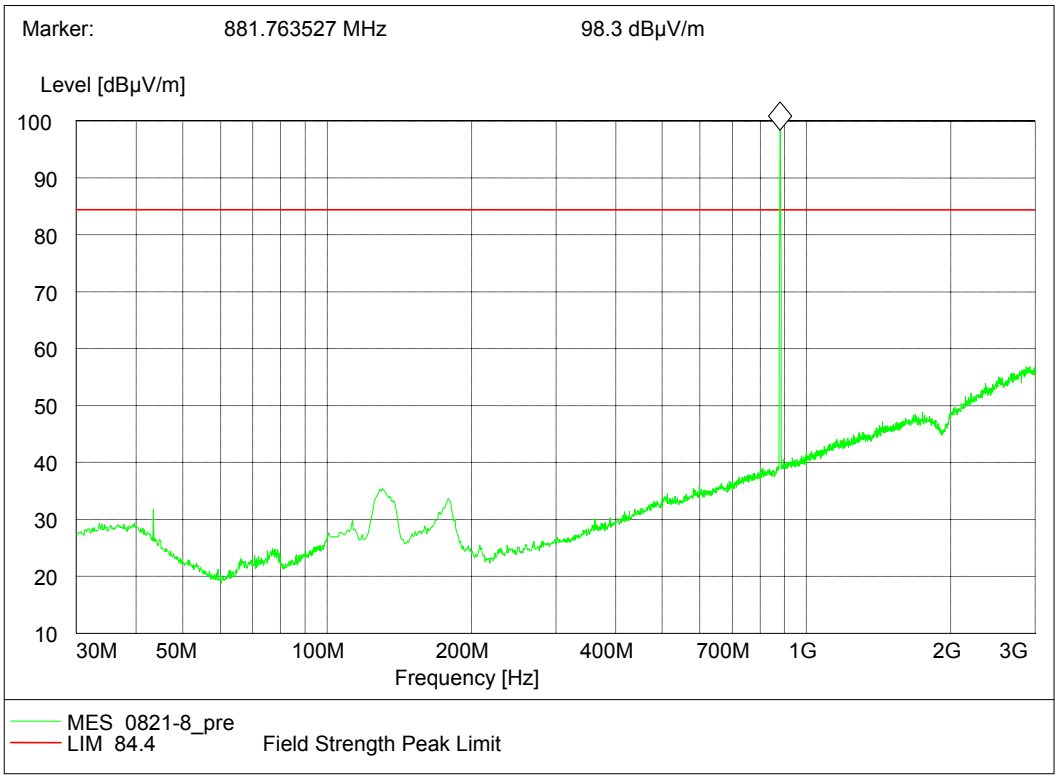
Single Carrier

Configuration 1 - Mode 1

No emissions were detected within 20dB of the limit.

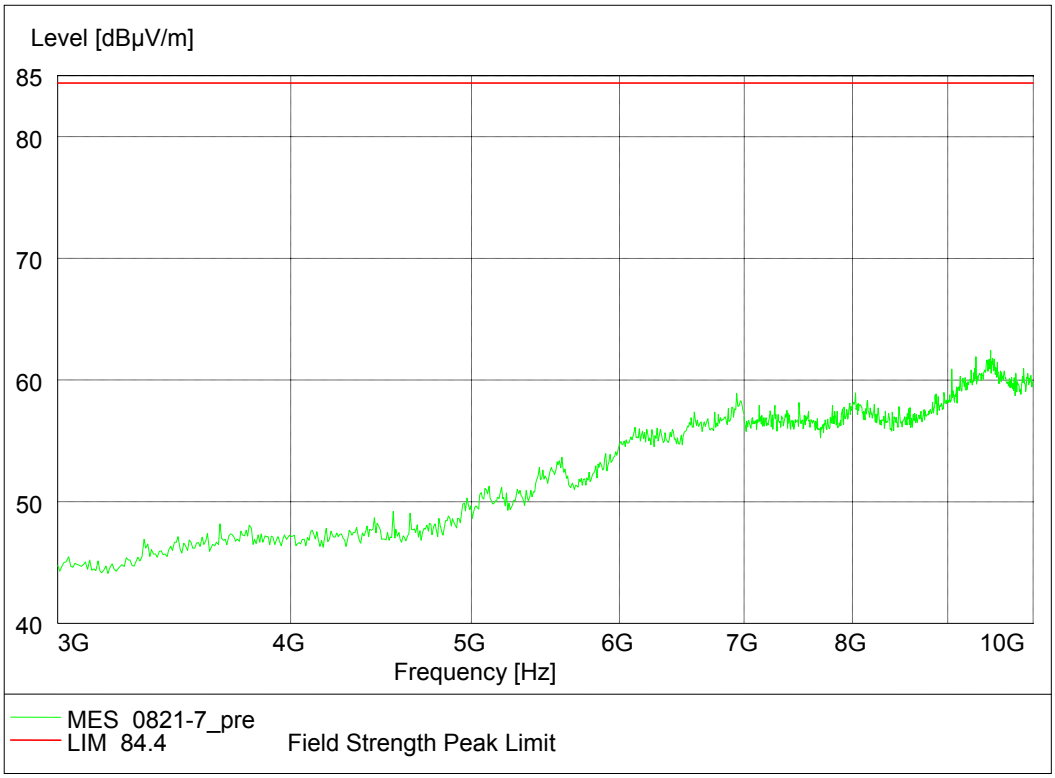
Configuration 1 - Mode 2

30MHz to 3GHz



Note: The emission marked is the oeprating frequency.

3GHz to 10GHz



Configuration 1 - Mode 3

No emissions were detected within 20dB of the limit.

8PSK

Single Carrier

Configuration 1 - Mode 2

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)

QPSK

Configuration 1 - Mode 5

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 22, Clause 22.917 (a)
Industry Canada RSS-132, Clause 5.5

2.7.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

2.7.3 Date of Test and Modification State

17 and 18 July 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 22 and Industry Canada RSS-132.

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 9kHz to 10GHz. The EUT was set to transmit on maximum power. The EUT was tested on Bottom, Middle and Top channels. The resolution was set to 100kHz for 9kHz to 10GHz thus meeting the requirements of FCC CFR 47 Part 22, Clause 22.917 (b) and Industry Canada RSS-132, Clause 5.5. 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.

Measurements were made up to the 10^{th} harmonic of the highest carrier frequency at least.

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

Configuration 1 - Mode 1
- Mode 2
- Mode 3
- Mode 5

2.7.6 Environmental Conditions

	17 July 2013	18 July 2013
Ambient Temperature	22.0°C	23.5°C
Relative Humidity	59.5%	66.0%

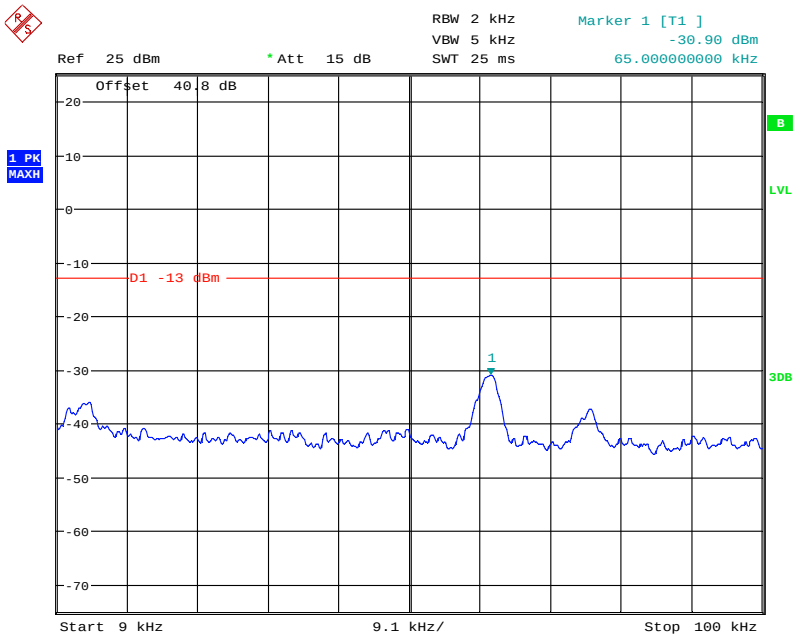
2.7.7 Test Results

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

The test results are shown below

Remark:

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

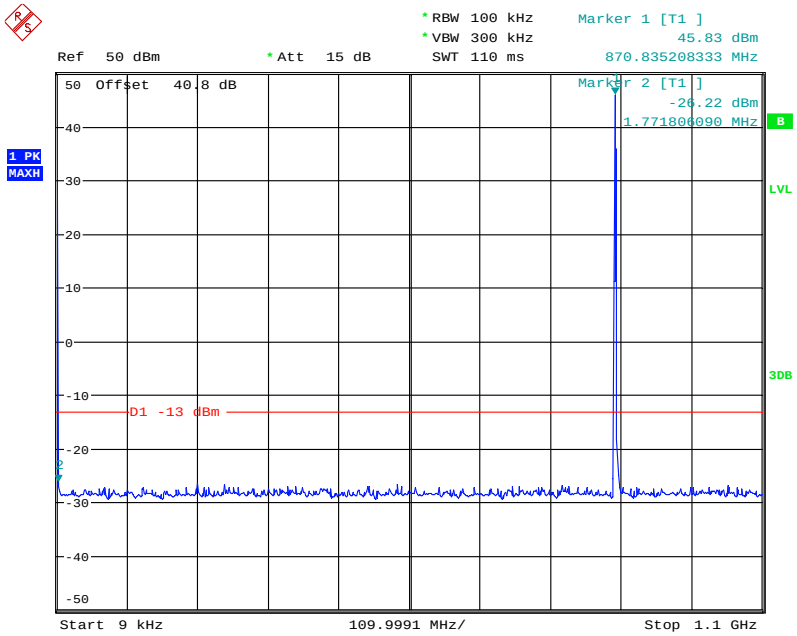


QPSK

Single Carrier

Configuration - Mode 1

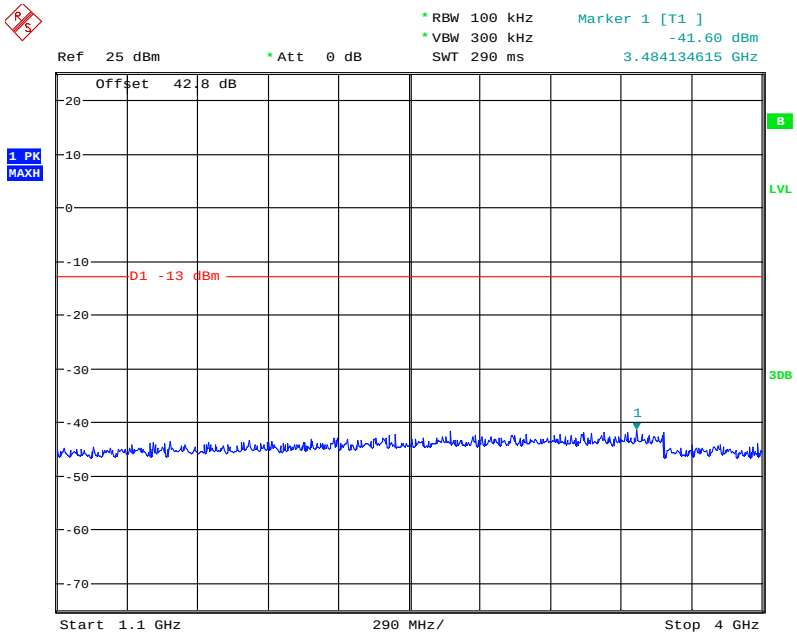
9kHz to 1.1GHz



Date: 17.JUL.2013 14:37:31

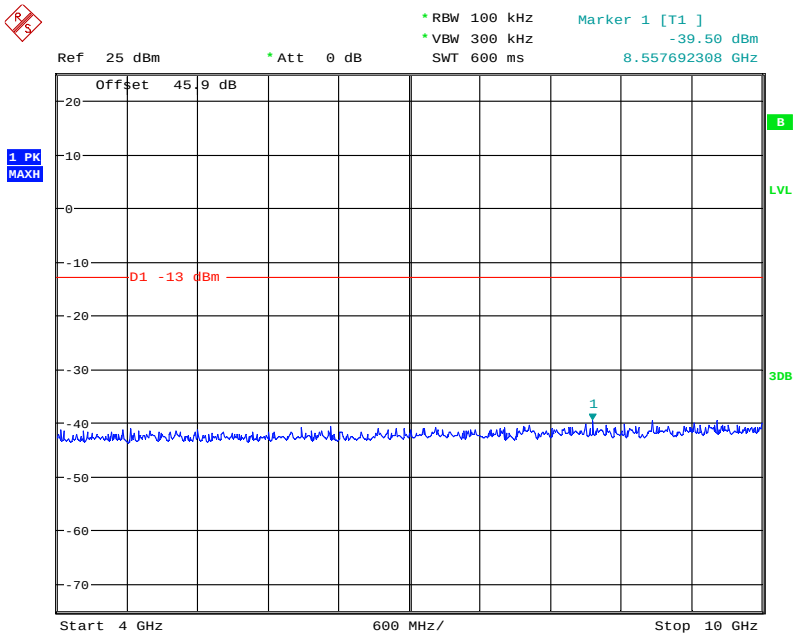
Note: The emission beyond the limit is the operating frequency.

1.1GHz to 4GHz



Date: 17.JUL.2013 14:39:23

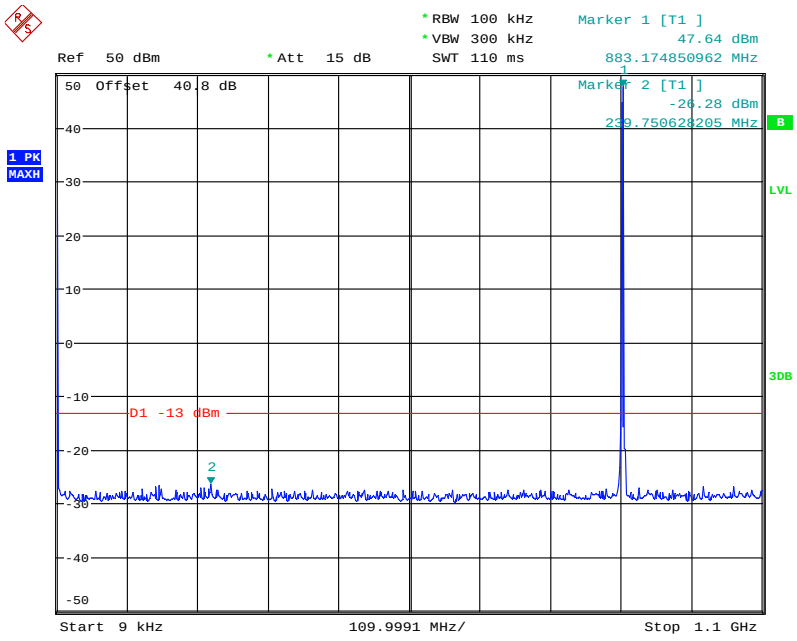
4GHz to 10GHz



Date: 17.JUL.2013 14:38:34

Configuration 1 - Mode 2

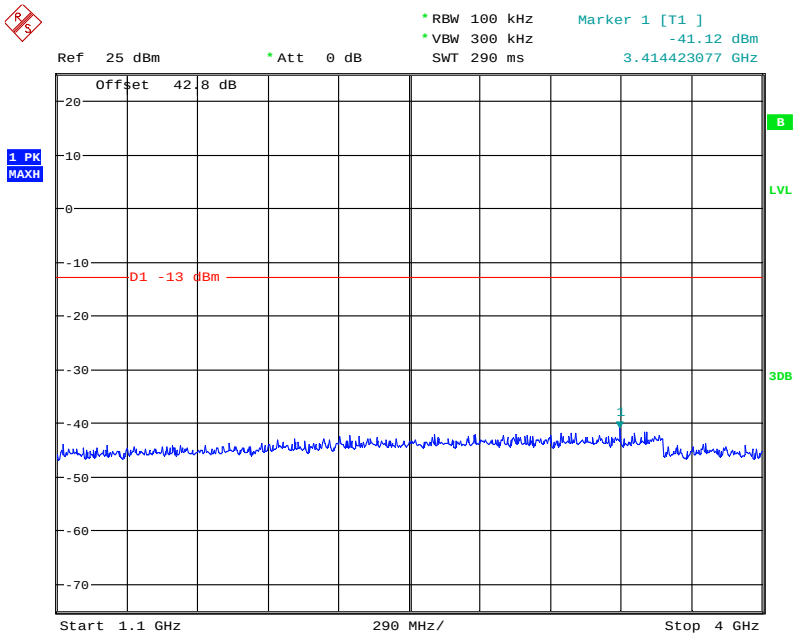
9kHz to 1.1GHz



Date: 17.JUL.2013 15:21:25

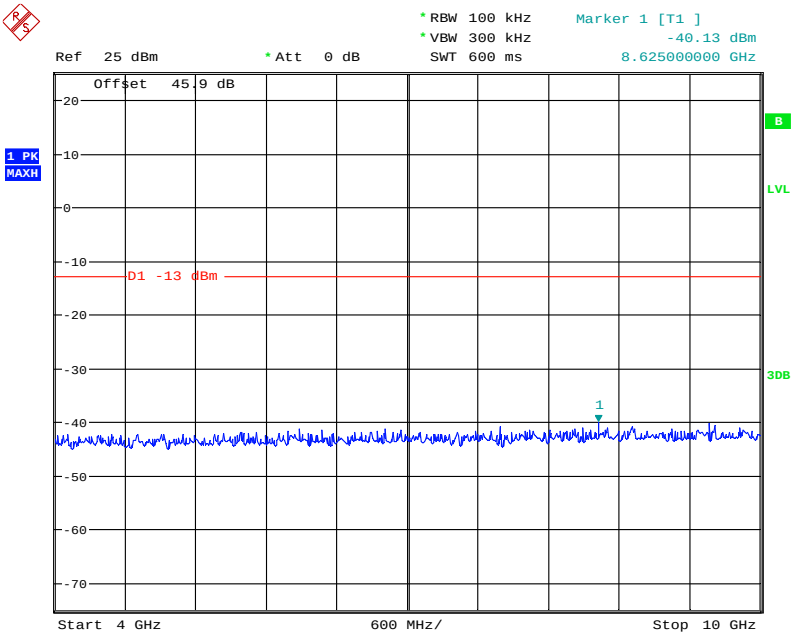
Note: The emission beyond the limit is the operating frequency.

1.1GHz to 4GHz



Date: 17.JUL.2013 15:13:19

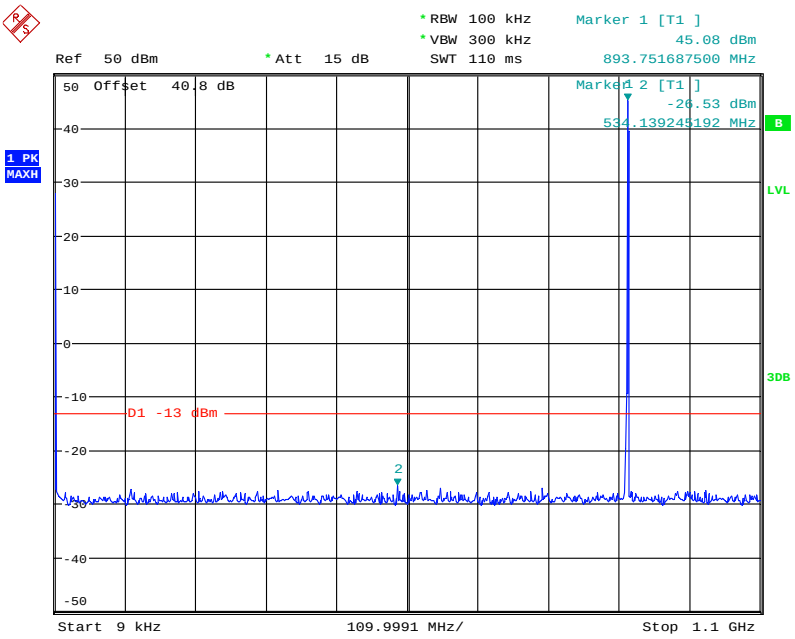
4GHz to 10GHz



Date: 17.JUL.2013 15:18:38

Configuration 1 - Mode 3

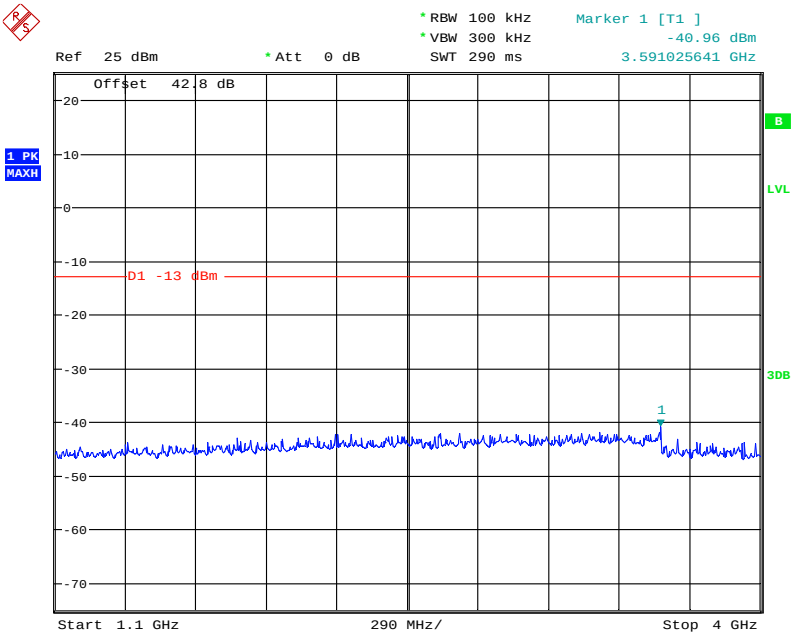
9kHz to 1.1GHz



Date: 17.JUL.2013 15:39:31

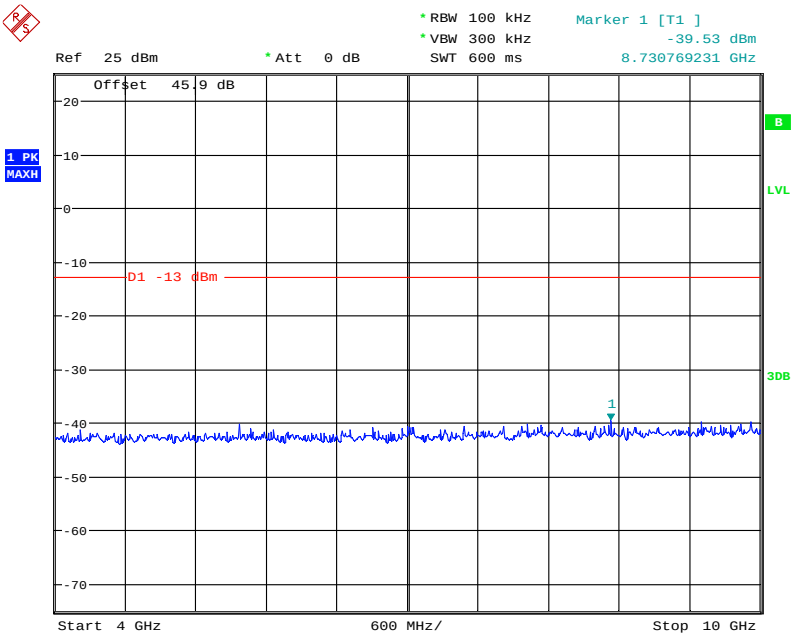
Note: The emissions beyond the limit are the operating frequencies.

1.1GHz to 4GHz



Date: 17.JUL.2013 15:43:29

4GHz to 10GHz

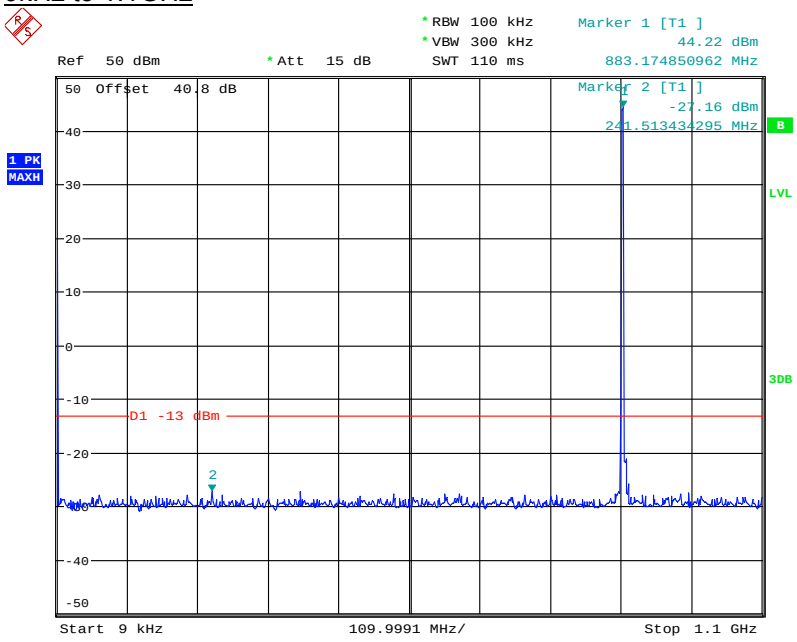


Date: 17.JUL.2013 15:41:47

Multi Carrier (1x2)

Configuration 1 - Mode 5

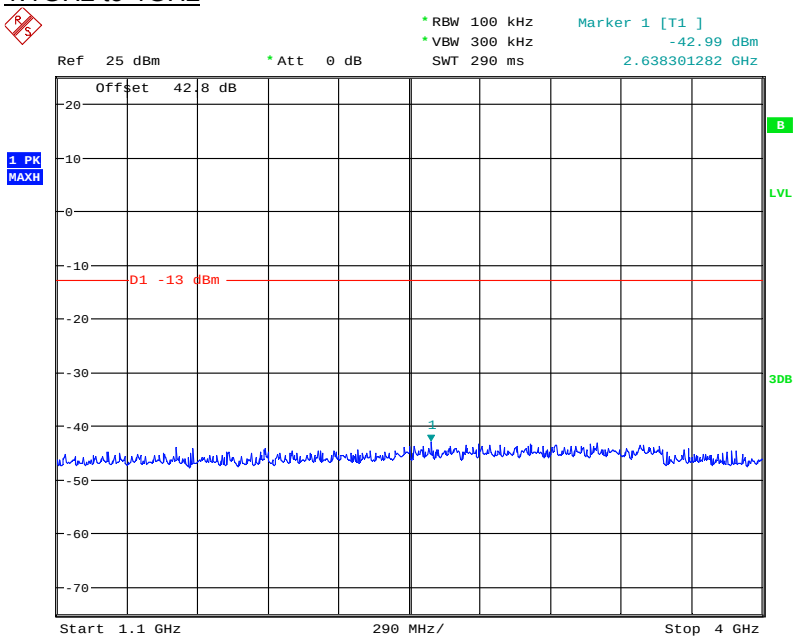
9kHz to 1.1GHz



Date: 18.JUL.2013 15:04:57

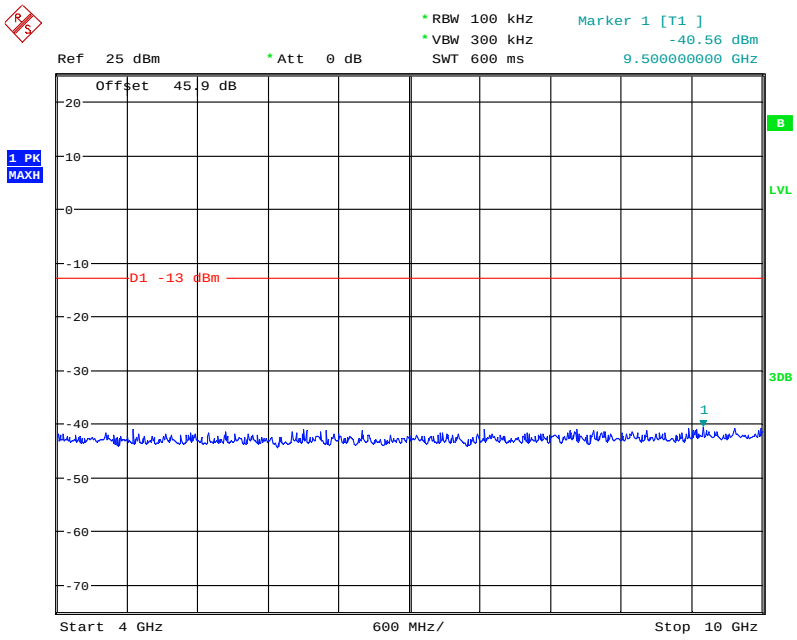
Note: The emissions beyond the limit are the operating frequencies.

1.1GHz to 4GHz



Date: 18.JUL.2013 15:13:18

4GHz to 10GHz



Date: 18.JUL.2013 15:10:33

Limit	-13dBm

Remarks

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

2.8 RECEIVER SPURIOUS EMISSIONS

2.8.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.111

2.8.2 Equipment Under Test

RRUS 11 B5 / KRC 161 285/2, S/N: CB4P587219

2.8.3 Date of Test and Modification State

17 July 2013 – 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 15.

In accordance with FCC CFR 47 Part 15 Clause 15.111, the receiver spurious emissions from the antenna terminal were measured. Measurments were performed on the antenna connector RF B. The EUT was set to transmitter mode on the TX connector RF A and during the measurement the RF A was terminated with match load, (50 Ohm).

The resolution was set to 1MHz in the frequency range 9kHz to 10GHz. 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 10GHz.

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

Measurements were made from 9kHz up to the 5th harmonic of the highest carrier frequency at least.

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

Configuration 1 - Mode 1
- Mode 2
- Mode 3

2.8.6 Environmental Conditions

	17 July 2013
Ambient Temperature	22.0°C
Relative Humidity	59.5%

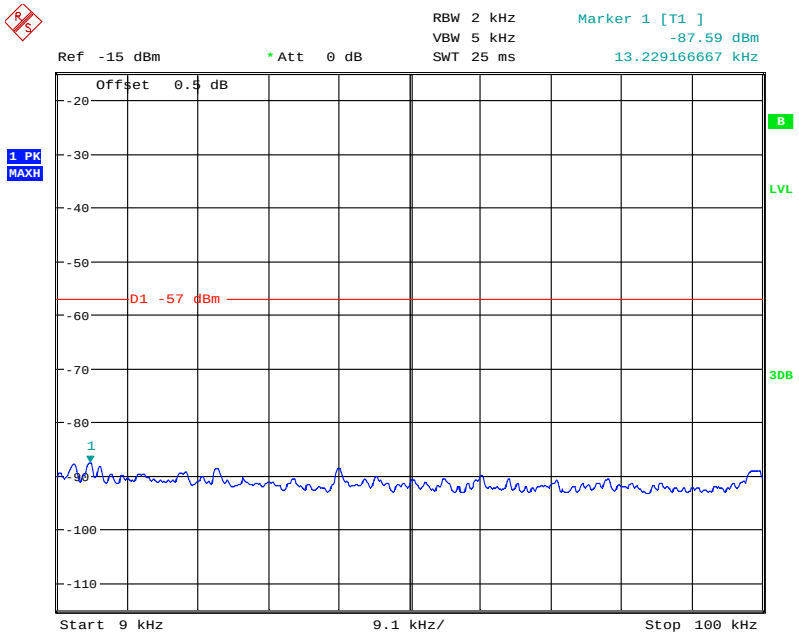
2.8.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 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 measruement with a smaller Span showed that it was related to the LO feedthrough.



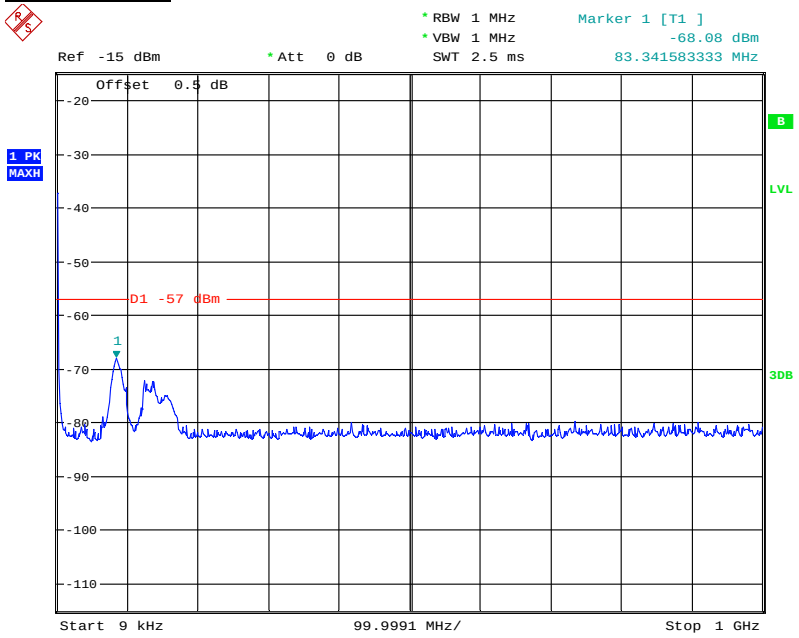
Date: 17.JUL.2013 11:30:04

QPSK

Single Carrier

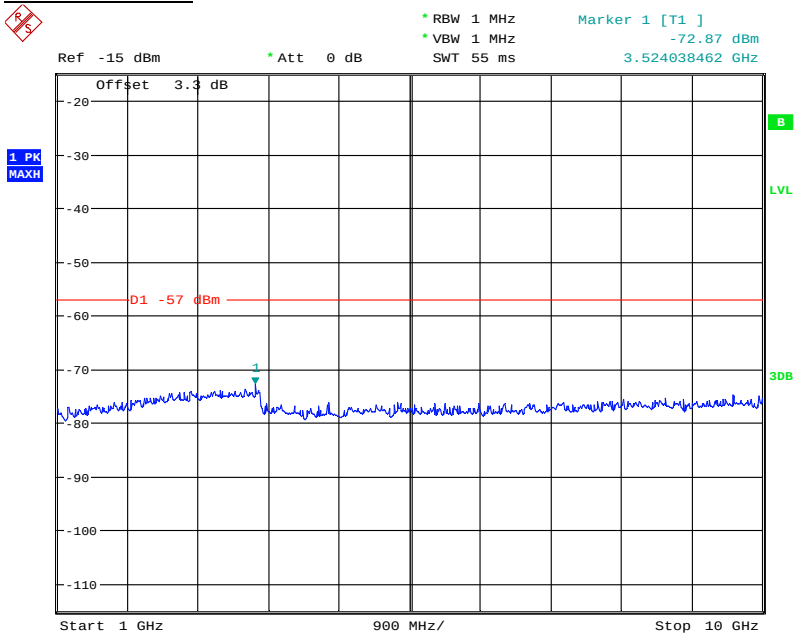
Configuration 1 - Mode 1

9kHz to 1GHz



Date: 17.JUL.2013 14:45:32

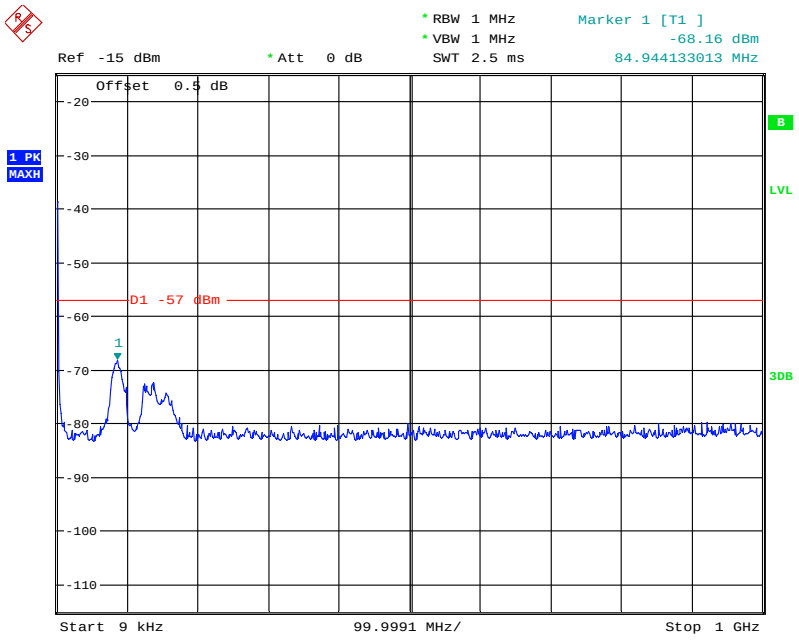
1GHz to 10GHz



Date: 17.JUL.2013 14:46:40

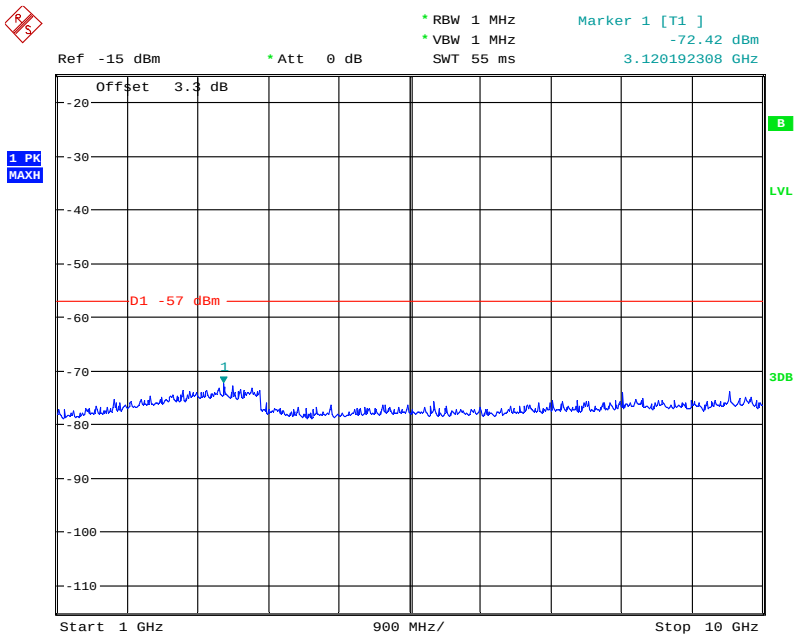
Configuration 1 – Mode 2

9kHz to 1GHz



Date: 17.JUL.2013 15:09:03

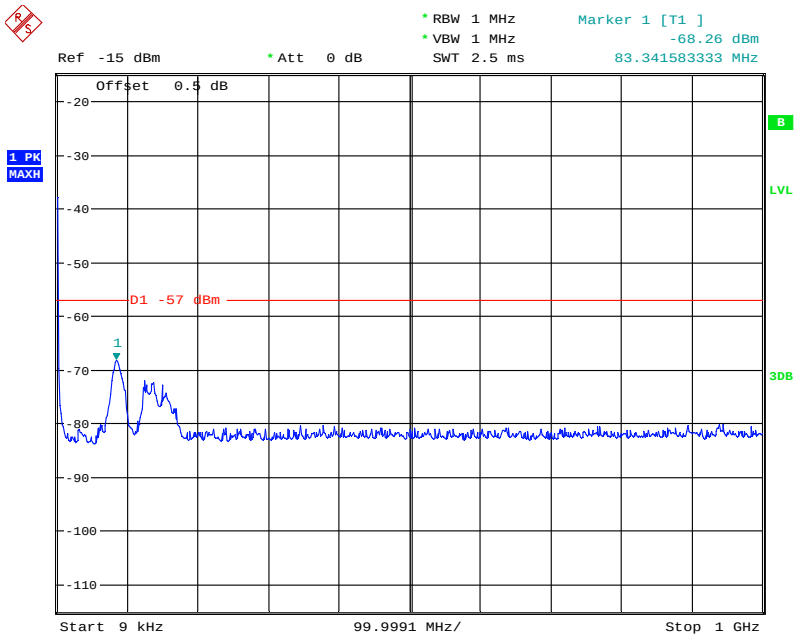
1GHz to 10GHz



Date: 17.JUL.2013 15:07:12

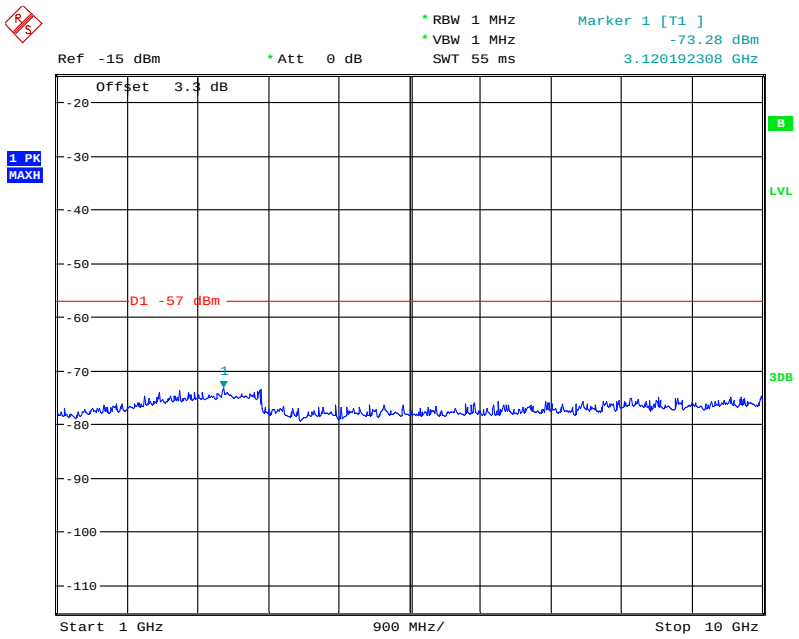
Configuration 1 - Mode 3

9kHz to 1GHz



Date: 17.JUL.2013 15:47:42

1GHz to 10GHz



Date: 17.JUL.2013 15:49:33

Limit	-57dBm

Remarks

The EUT does not exceed -57dBm at the frequency range of 9kHz to 10GHz.

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
Section 2.1, 2.2, 2.3, 2.4, 2.5, 2.7, 2.8 – Maximum Conducted Output Power, Peak – Average Ratio, Modulation Characteristics, Occupied Bandwidth, Spurious Emissions at Antenna Terminals (±1MHz), Conducted Spurious Emissions and Receiver Spurious Emission.					
Spectrum Analyser	Rohde & Schwarz	FSQ26	100253	12	31-Aug-2013
Power Meter	Rohde & Schwarz	NRP2	101283	12	12-Aug-2013
Power Sensor	Rohde & Schwarz	NRP-Z51	102312	12	12-Aug-2013
Network Analyzer	Agilent	8720D	US36140166	12	06-Sep-2013
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
Pass Filter	K&L	ULK 904 098/2	16	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121648	-	O/P MON
Power Supply	Dahua	DH1716-5D	2008040041	-	O/P MON
Power Supply	Dahua	DH1716-5D	2008040050	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	13-Dec-2013
Thermo-hygrometer	AZ Instruments	8705	9151655	12	16-Dec-2013
Section 2.8 – 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-2014
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	19-Aug-2014
Double-Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2014
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	12	19-Aug-2014
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18m×16.88 m×9.60m	-	12	19-Aug-2014
Power Supply	Dahua	DH1716-5D	2008040041	-	O/P MON
Power Supply	Dahua	DH1716-5D	2008040050	-	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

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	$<1x10^{-7}$
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

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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

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

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