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Report On

FCC and Industry Canada Testing of the
Ericsson RRUN19-22 / KRC 161 170/5

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FCC ID: WODGKRC161170-5
IC ID: 287AH-GG1611705

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November 2011



Product Service

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

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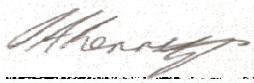
REPORT ON FCC and Industry Canada Testing of the
Ericsson RRUN19-22 / KRC 161 170/5

Document 75913999 Report 01 Issue 2

November 2011

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

PREPARED BY 
X Zhang
Test Engineer


S Bennett
Authorised Signatory

DATED 4 November 2011

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

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate compliance with FCC CFR 47: Part 24 and Industry Canada RSS-133. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s):


X Zhang


C Zhang





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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Ericsson RRUN19-22 / KRC 161 170/5



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRUN19-22 / KRC 161 170/5 to the requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133.

Testing was carried out in support of an application for Grant of Equipment Authorization in the name of RRUN19-22 / KRC 161 170/5.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Ericsson (China) Communications Company Ltd.
Product Name	RRUN19-22
Part Number	KRC 161 170/5
IC Model Number	GG1611705
Serial Number(s)	TD3G925968
Software Version	CXP1040007_05R31D
Hardware Version	R1E
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 24: 2010 Industry Canada RSS-133 issue 5: 2009
Incoming Release Date	Declaration of Build Status 17 March 2011
Order Number	PTP
Date	17 May 2011
Start of Test	21 September 2011
Finish of Test	20 October 2011
Name of Engineer(s)	X Zhang C Zhang
Related Document(s)	ANSI C63.4: 2009 FCC CFR 47 Part 2: 2010 Industry Canada RSS-GEN Issue 3: 2010



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 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					
2.1	2.1046, 24.232 (a)	6.4	Effective Radiated Power	1930.2MHz		N/A	No integral antenna.
				1960.0MHz		N/A	
				1989.8MHz		N/A	
2.2	24.232 (d)	6.4	Maximum Peak Output Power - Conducted	1930.2MHz	0	Pass	
				1960.0MHz	0	Pass	
				1989.8MHz	0	Pass	
2.3	2.1047 (d)	6.2	Modulation Characteristics	1930.2MHz		N/A	
				1960.0MHz	0	Pass	
				1989.8MHz		N/A	
2.4	2.1049, 24.238 (b)	RSS-Gen 4.6.1	Occupied Bandwidth	1930.2MHz		N/A	
				1960.0MHz	0	Pass	
				1989.8MHz		N/A	
2.5	2.1051, 24.238 (b)	6.5	Spurious Emissions at Antenna Terminals ($\pm 1\text{MHz}$)	1930.4MHz	0	Pass	The channel adjacent to the lower and higher band-edge cannot be used. The lowest usable channel is 513(1930.4MHz), the highest usable channel is 809(1989.6MHz)
				1960.0MHz		N/A	
				1989.6MHz	0	Pass	
2.6	2.1053, 24.238 (a)	6.5	Radiated Spurious Emissions	1930.2MHz	0	Pass	
				1960.0MHz	0	Pass	
				1989.8MHz	0	Pass	
2.7	2.1051, 24.238 (a)	6.5	Conducted Spurious Emissions	1930.2MHz	0	Pass	
				1960.0MHz	0	Pass	
				1989.8MHz	0	Pass	
2.8	2.1055, 24.235	6.3	Frequency Stability Under Temperature Variations	1930.2MHz		N/A	
				1960.0MHz	0	Pass	
				1989.8MHz		N/A	
2.9	2.1055, 24.235	6.3	Frequency Stability Under Voltage Variations	1930.2MHz		N/A	
				1960.0MHz	0	Pass	
				1989.8MHz		N/A	



Configuration 1 – Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 24	RSS-133 and RSS-GEN					
2.10	-	6.6	Receiver Spurious Emissions	1930.2MHz	0	Pass	
				1960.0MHz	0	Pass	
				1989.8MHz	0	Pass	

N/A – Not Applicable



1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Equipment
MANUFACTURER	Ericsson (China) Communications Company Ltd.
PRODUCT NAME	RRUN19-22
PART NUMBER	KRC 161 170/5
IC Model Number	GG1611705
SERIAL NUMBER	TD3G925968
HARDWARE VERSION	R1E
SOFTWARE VERSION	CXP1040007_05R31D
TRANSMITTER OPERATING RANGE	TX: 1930.4MHz - 1989.6MHz RX: 1850.4MHz - 1909.6MHz
MODULATIONS	GMSK, 8-PSK, 16QAM, 32QAM, AQPSK
INTERMEDIATE FREQUENCIES	--
ITU DESIGNATION OF EMISSION	241KGXW 241KG7W
OUTPUT POWER (RMS) (W or dBm)	GMSK: 43.0dBm 8-PSK: 39.7dBm 16QAM: 38.3dBm 32QAM: 37.9dBm AQPSK: 39.6dBm
OUTPUT POWER TOLERANCE	±1dB
FCC ID	WODGKRC161170-5
IC ID	287AH-GG1611705
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is a Radio Equipment of GSM Base Station.

Signature

Date

27 October 2011

D of B S Serial No

75913999/01

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



1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) RRUN19-22 / KRC 161 170/5 is an Ericsson Radio Equipment working in the public mobile service 1900MHz band which provides communication connections to GSM1900 network. The RRUN19-22 / KRC 161 170/5 operates from a -48V DC supply.

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



Equipment Under Test



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 RRUN19-22 / KRC 161 170/5 supports GMSK, 8-PSK, 16QAM, 32QAM and AQPSK modulations at 1900MHz. The EUT includes a maximum of two TRX's. All RF conducted TX tests were performed on one TRX RF output connector and the RX test was performed on the other TRX connector.

The settings below were found to be representative for all modes when several settings with the different modulations were tested to find the worst case setting. The settings were used for all measurements if not otherwise noted:

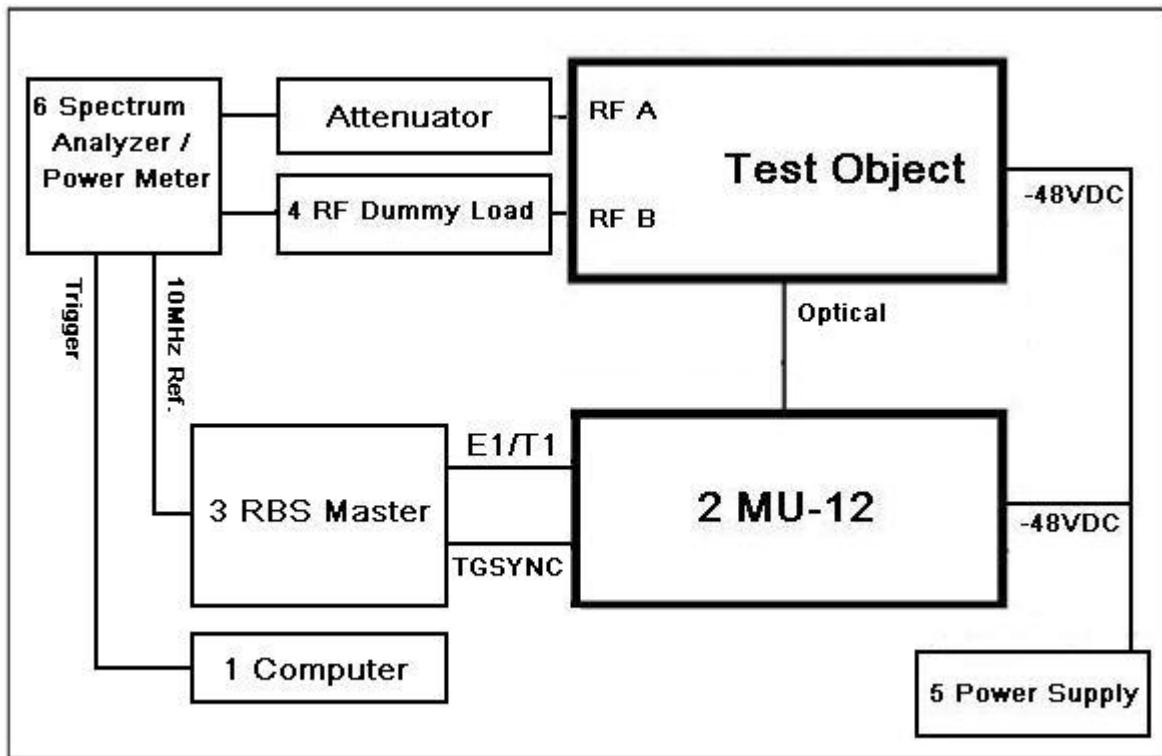
- GMSK and 8-PSK Modulations

The complete testing was performed with the EUT transmitting at maximum RF power level with all timeslots active unless otherwise stated. For AQPSK modulation, the SCPIR is 0dB.

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



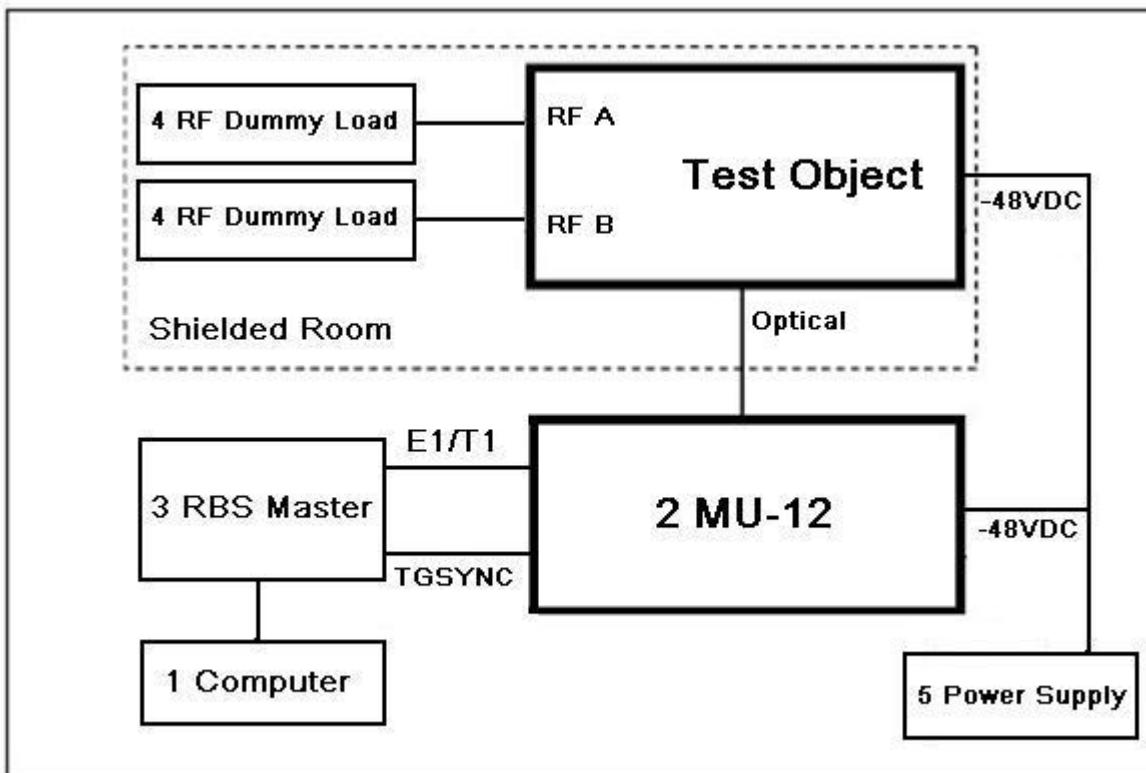
Test Setup, Conducted Measurement:



Test Object	Part Number	Version	Serial Number
Radio Part	RRUN19-22 / KRC 161 170/5	R1E	TD3G925968

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP Compaq	--	CNG5390CH3
2	MU-12	BFE 899 10/2	R2B	C84F899878
3	RBS Master	LPY 107 1007/3	R1C	T01E050909
4	Load	TF100	--	09121603
5	Power Supply	DH1716-5D	--	2008040003
	Power Supply	DH1716A-10	--	20080401
6	Power Meter	NRP	--	102624
	Thermal Power Sensor	NRP-Z21	--	101644
	Spectrum Analyzer	FSQ26	--	100253
	Spectrum Analyzer	MXA N9020A	--	MY50200544

Test Setup, Radiated Measurement:



Test Object	Part Number	Version	Serial Number
Radio Part	RRUN19-22 / KRC 161 170/5	R1E	TD3G925968

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP Compaq	--	CNG5390CH3
2	MU-12	BFE 899 10/2	R2B	C84F899878
3	RBS Master	LPY 107 1007/3	R1C	T01E050909
4	Load	TF100	--	09121603
	Load	TF150	--	06081422
5	Power Supply	DH1716-5D	--	2008040003



1.4.3 Modes of Operation

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

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

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

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

Mode 4 - ARFCN 513: 1930.4 MHz

Mode 5 - ARFCN 809: 1989.6 MHz

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

Testing has been performed under the following site registrations:

FCC Accreditation 910917:
The State Radio Monitoring Centre, No.80 Beilishi Road Xicheng District Beijing, China.

Industry Canada Accreditation 7308A:
The State Radio Monitoring Centre, No.80 Beilishi Road Xicheng District Beijing, China.



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SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
Ericsson RRUN19-22 / KRC 161 170/5



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

RRUN19-22 / KRC 161 170/5, S/N: TD3G925968

2.1.3 Date of Test and Modification State

21 September 2011 – Modification State 0

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

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

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

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

Configuration 1 - Mode 1
 - Mode 2
 - Mode 3

2.1.6 Environmental Conditions

21 September 2011

Ambient Temperature 24.0°C

Relative Humidity 36.8%



2.1.7 Test Results

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

The test results are shown below

Configuration 1 - Mode 1, 2 and 3

GMSK; Rated Output Power: 43.0dBm

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
Bottom	1930.2	41.5	42.56	18.03
Middle	1960.0	41.5	42.55	17.99
Top	1989.8	41.5	42.55	17.99

8-PSK: Rated Output Power: 39.7dBm

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
Bottom	1930.2	41.5	39.31	8.53
Middle	1960.0	41.5	39.31	8.53
Top	1989.8	41.5	39.33	8.57

16QAM: Rated Output Power: 38.3dBm

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
Bottom	1930.2	41.5	37.62	5.78
Middle	1960.0	41.5	37.63	5.79
Top	1989.8	41.5	37.68	5.86

32QAM: Rated Output Power: 37.9dBm

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
Bottom	1930.2	41.5	37.41	5.51
Middle	1960.0	41.5	37.40	5.50
Top	1989.8	41.5	37.40	5.50

AQPSK: Rated Output Power: 39.6dBm

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
Bottom	1930.2	41.5	39.28	8.47
Middle	1960.0	41.5	39.27	8.45
Top	1989.8	41.5	39.27	8.45

Limit	≤100W or ≤+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

RRUN19-22 / KRC 161 170/5, S/N: TD3G925968

2.2.3 Date of Test and Modification State

21 and 22 September 2011 – Modification State 0

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 24 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 path loss is measured and entered as a reference level offset.

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

Configuration 1 - Mode 1
 - Mode 2
 - Mode 3

2.2.6 Environmental Conditions

	21 September 2011	22 September 2011
Ambient Temperature	24.0°C	25.2°C
Relative Humidity	36.8%	31.0%



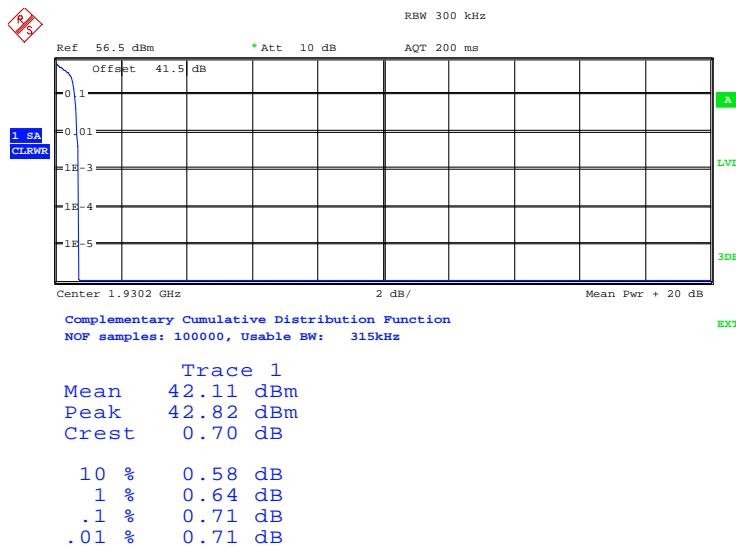
2.2.7 Test Results

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.

GMSK

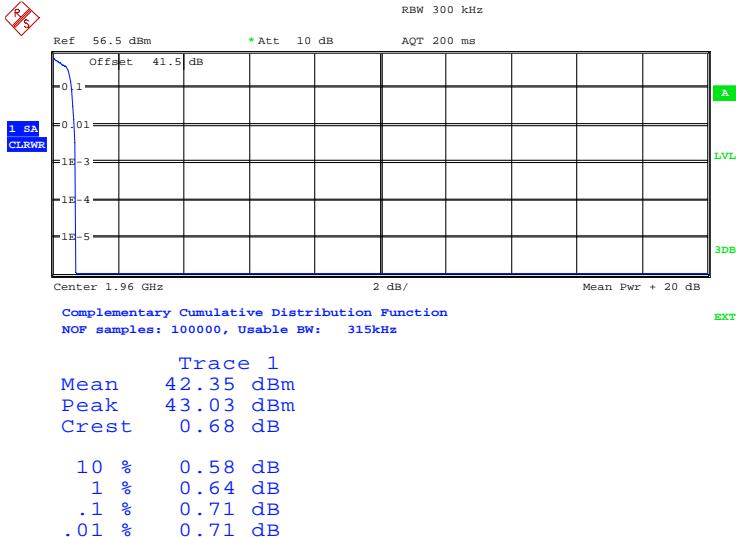
Configuration 1 - Mode 1



Date: 21.SEP.2011 17:00:06

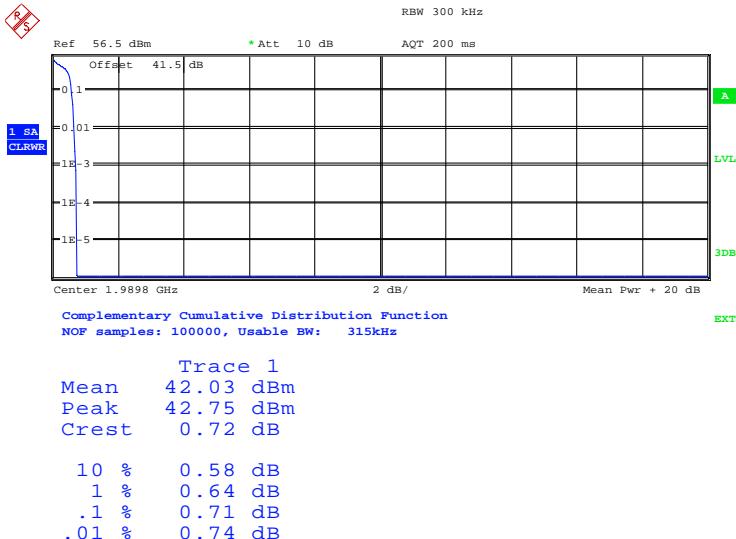


Configuration 1 - Mode 2

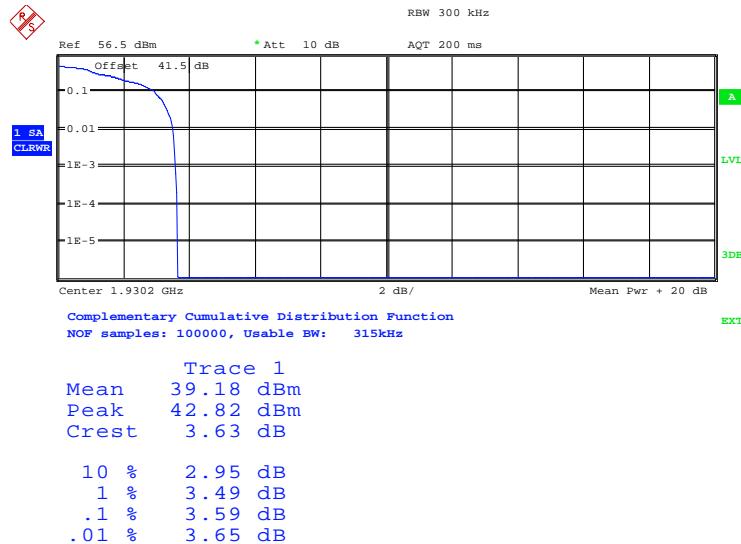


Date: 22.SEP.2011 09:50:09

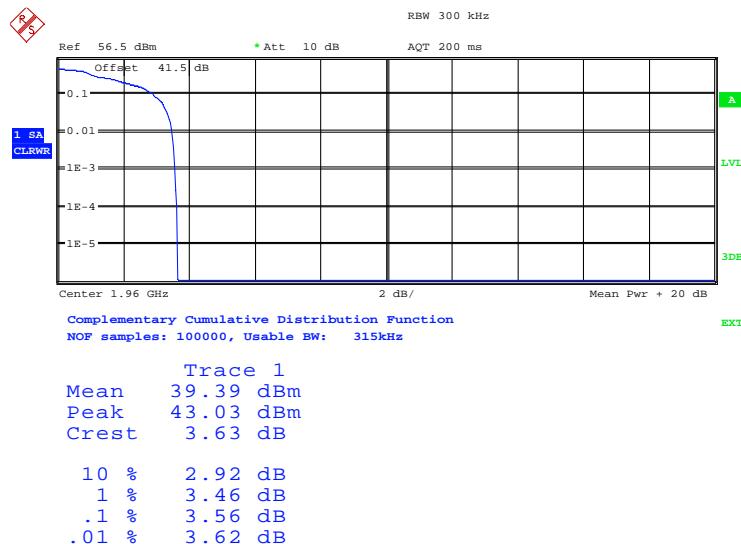
Configuration 1 - Mode 3



Date: 21.SEP.2011 17:02:41

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

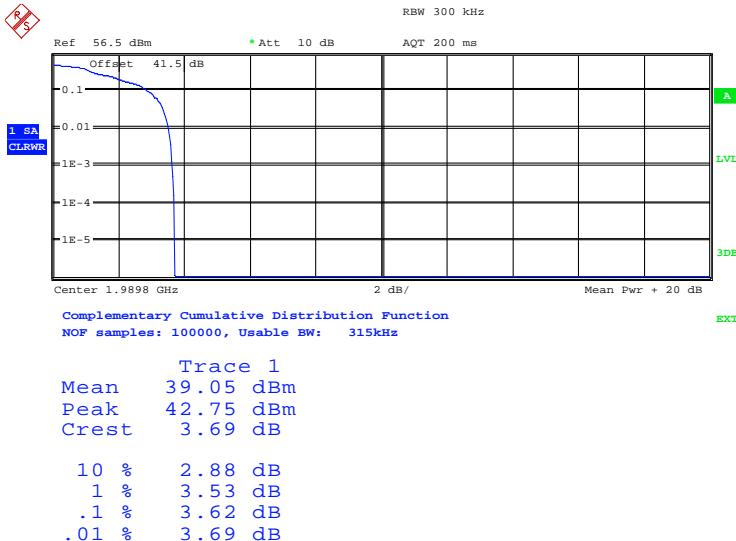
Date: 21.SEP.2011 16:56:15

Configuration 1 - Mode 2

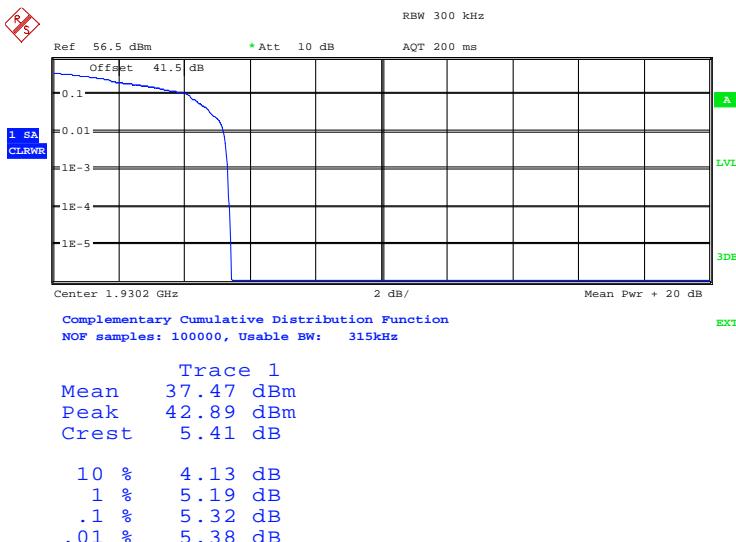
Date: 22.SEP.2011 10:16:39



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Configuration 1 - Mode 3

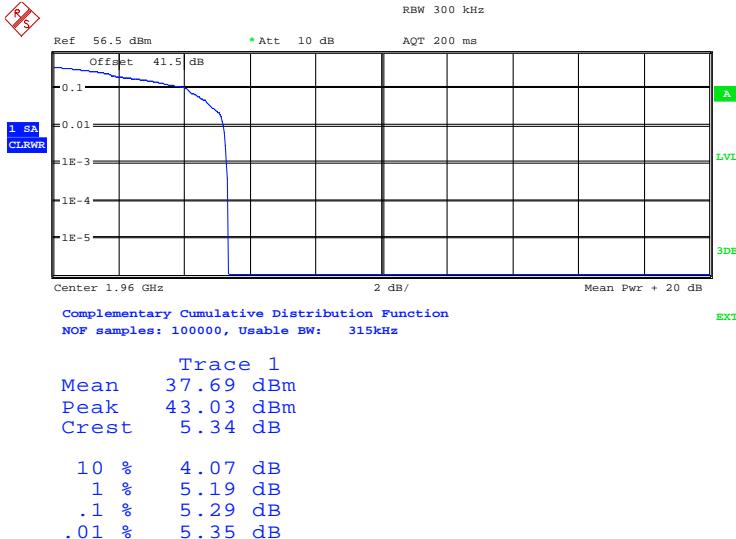
Date: 21.SEP.2011 16:49:08

16QAMConfiguration 1 - Mode 1

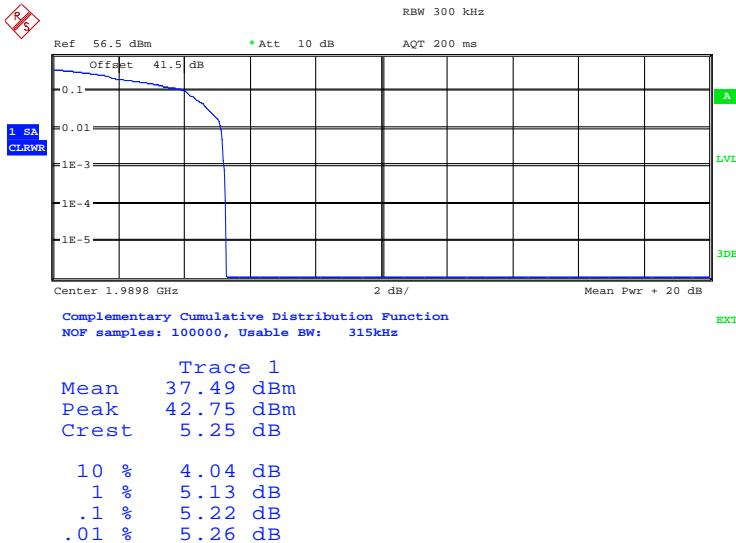
Date: 21.SEP.2011 16:44:55



Product Service

Configuration 1 - Mode 2

Date: 21.SEP.2011 16:41:51

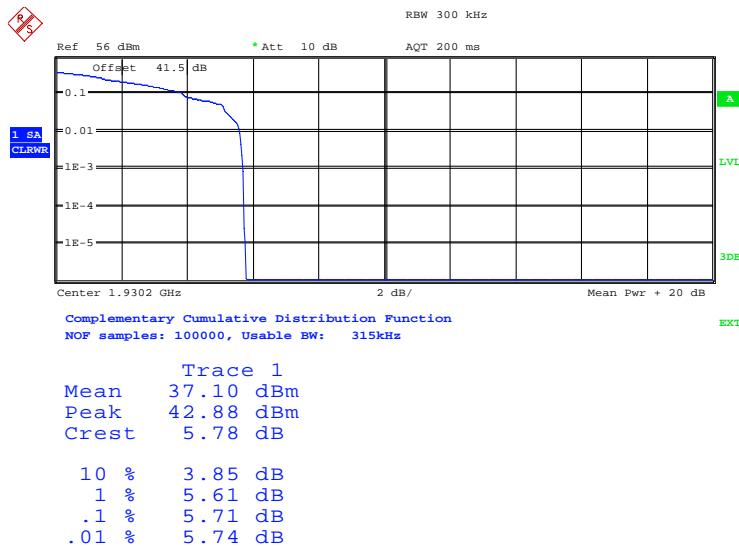
Configuration 1 - Mode 3

Date: 21.SEP.2011 16:46:07



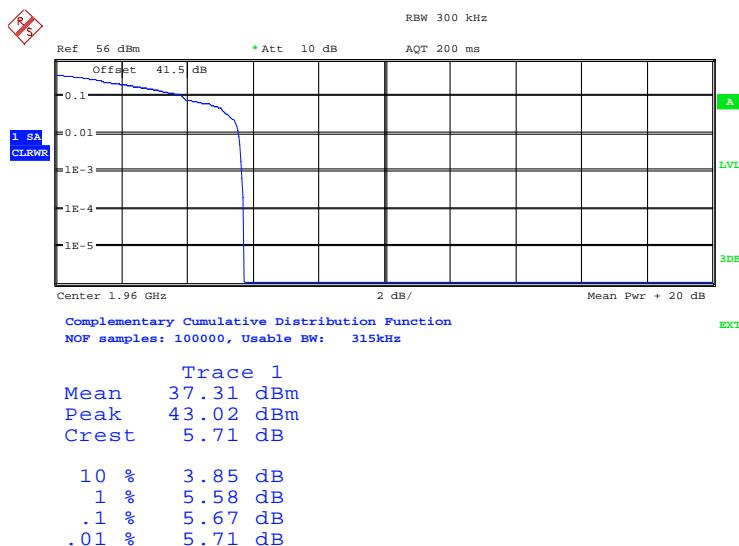
32QAM

Configuration 1 - Mode 1



Date: 21.SEP.2011 16:00:38

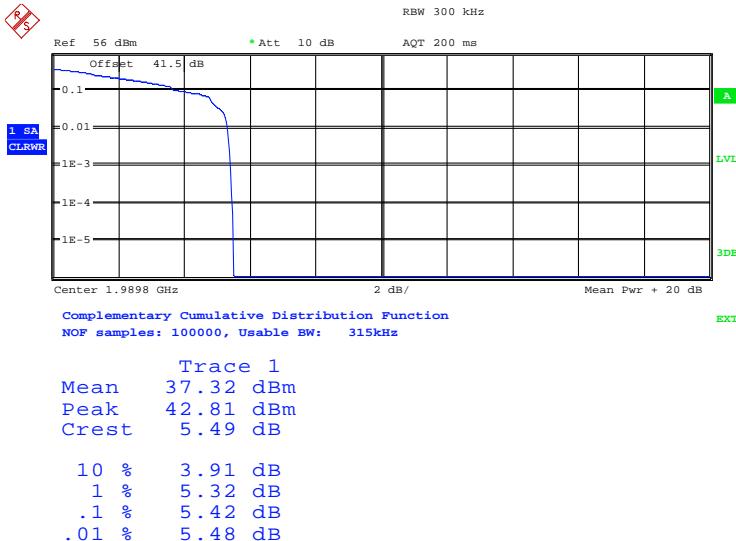
Configuration 1 - Mode 2



Date: 21.SEP.2011 16:01:58



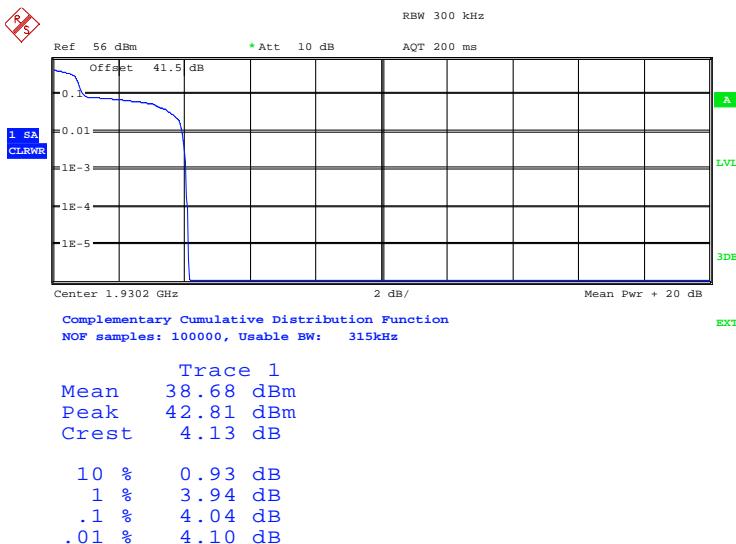
Configuration 1 - Mode 3



Date: 21.SEP.2011 15:59:16

AQPSK

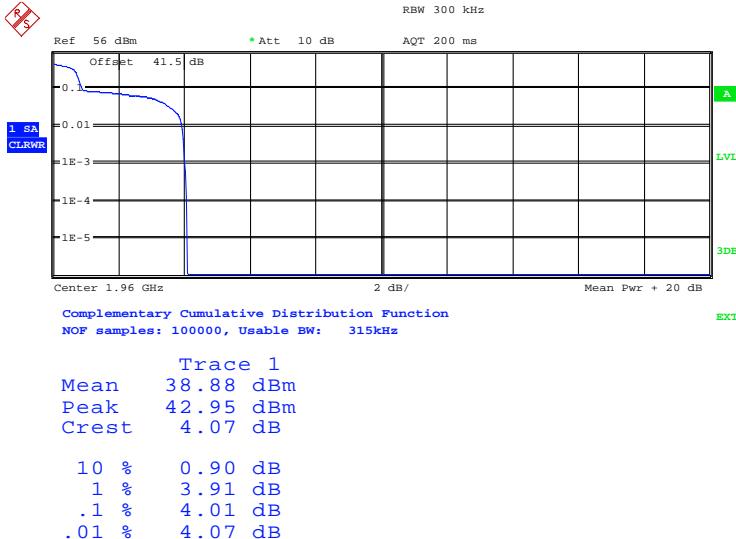
Configuration 1 - Mode 1



Date: 21.SEP.2011 15:24:05

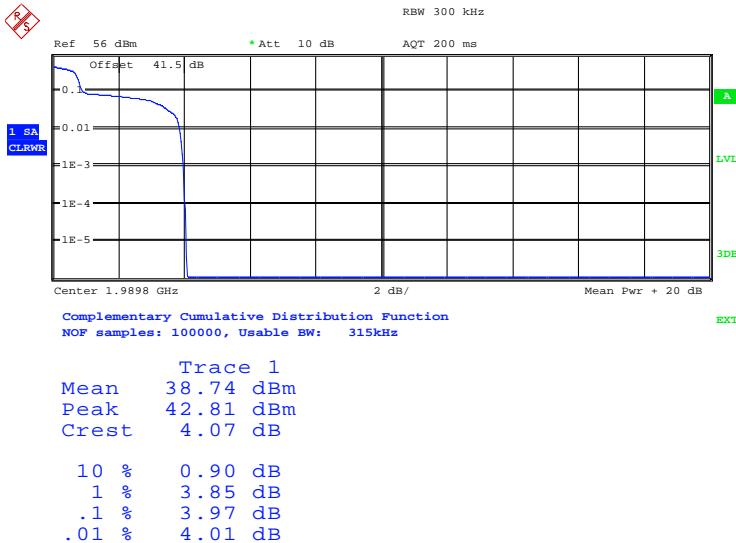


Configuration 1 - Mode 2



Date: 21.SEP.2011 15:25:59

Configuration 1 - Mode 3



Date: 21.SEP.2011 15:55:31

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

RRUN19-22 / KRC 161 170/5, S/N: TD3G925968

2.3.3 Date of Test and Modification State

23 September 2011 – Modification State 0

2.3.4 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Industry Canada RSS-133.

Connect the TX output connector RF A to a spectrum analyzer with an attenuator. The other connector was terminated within a 50 Ohm load. The EUT was controlled to transmit maximum power level with all timeslots active. Measure and record the constellation of the EUT by the spectrum analyzer.

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

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

Configuration 1 - Mode 2

2.3.5 Environmental Conditions

23 September 2011

Ambient Temperature 25.1°C

Relative Humidity 35.8%



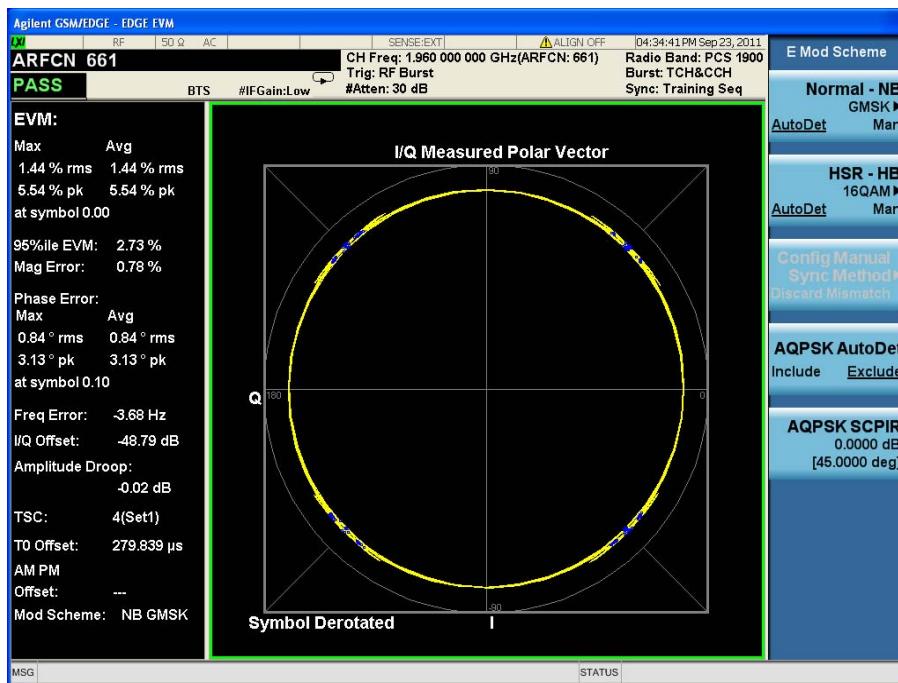
2.3.6 Test Results

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

The test results are shown below

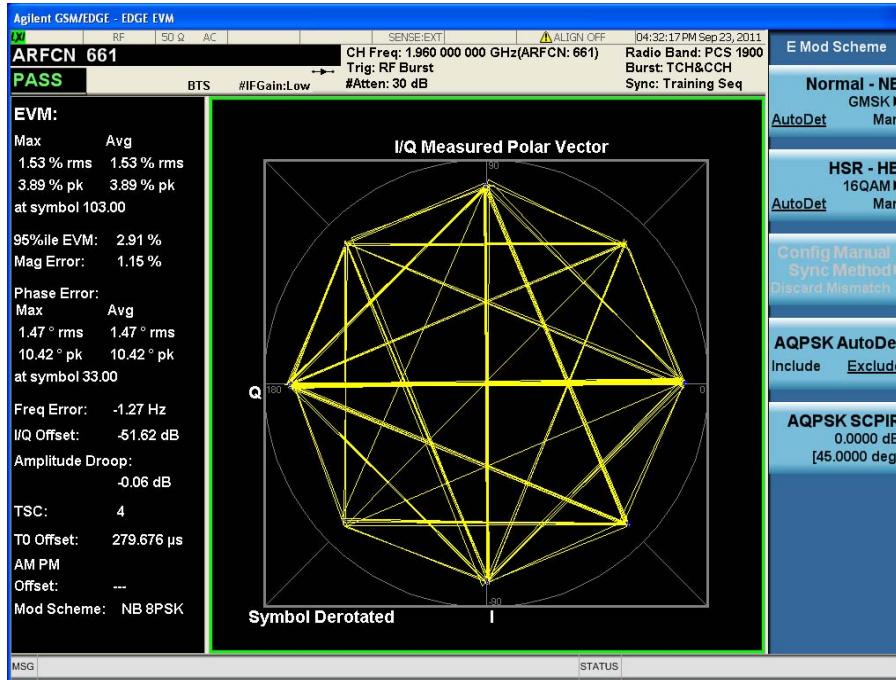
Configuration 1 - Mode 2

GMSK

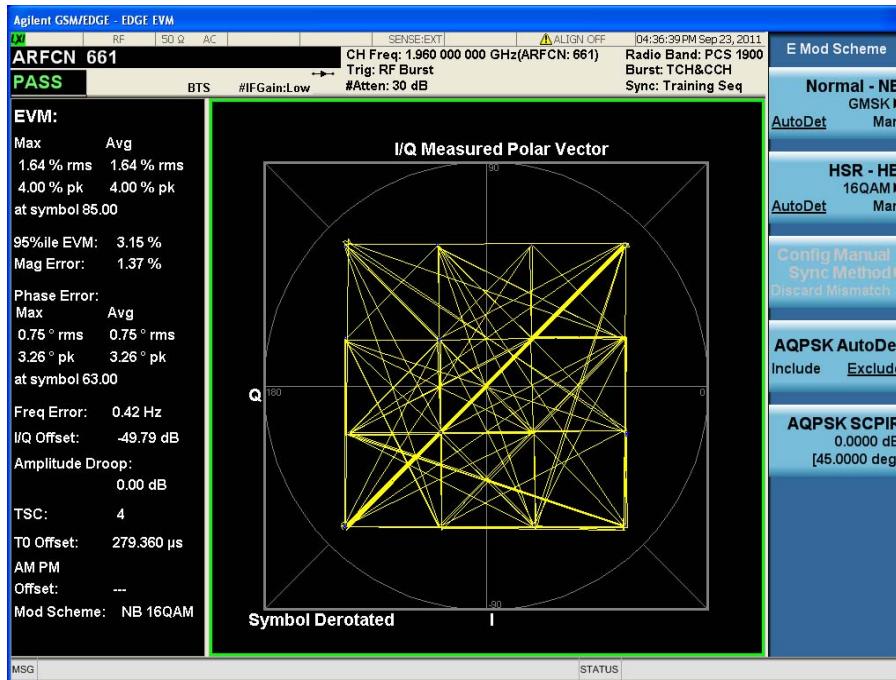




8-PSK

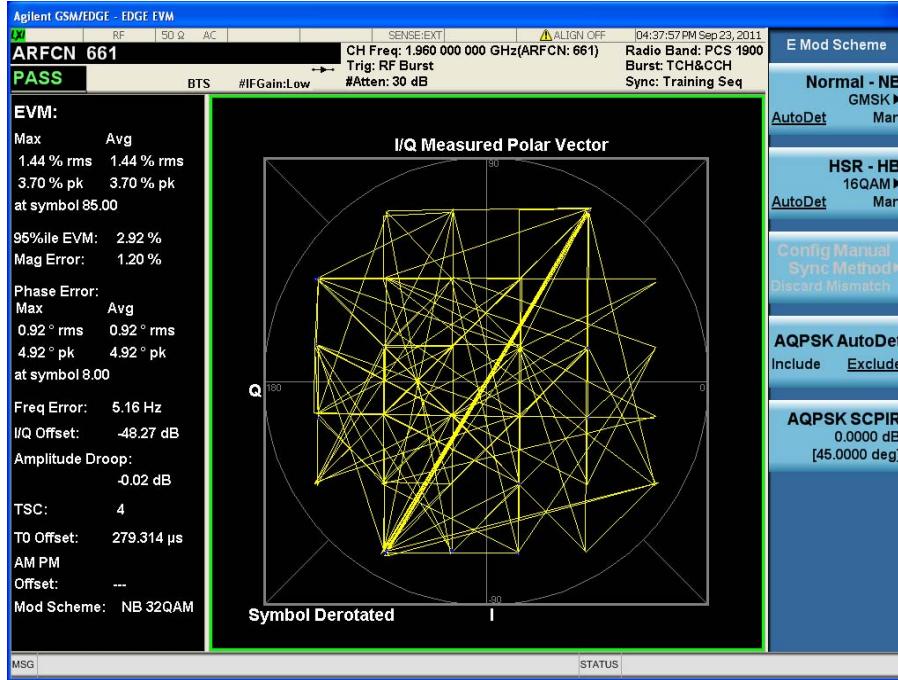


16QAM

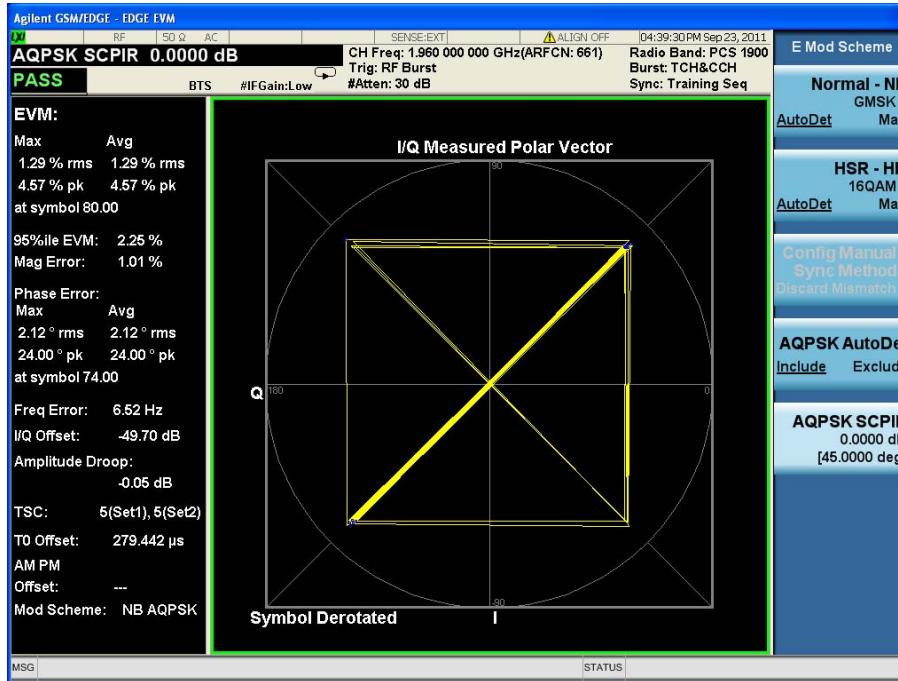




32QAM



AQPSK





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

RRUN19-22 / KRC 161 170/5, S/N: TD3G925968

2.4.3 Date of Test and Modification State

21 and 22 September 2011 – Modification State 0

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-GEN.

The EUT was transmitting at maximum power level with all timeslots active. Using a resolution bandwidth of 3kHz and a video bandwidth of 30kHz. The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

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

Configuration 1 - Mode 2

2.4.6 Environmental Conditions

	21 September 2011	22 September 2011
Ambient Temperature	24.0°C	25.2°C
Relative Humidity	36.8%	31.0%



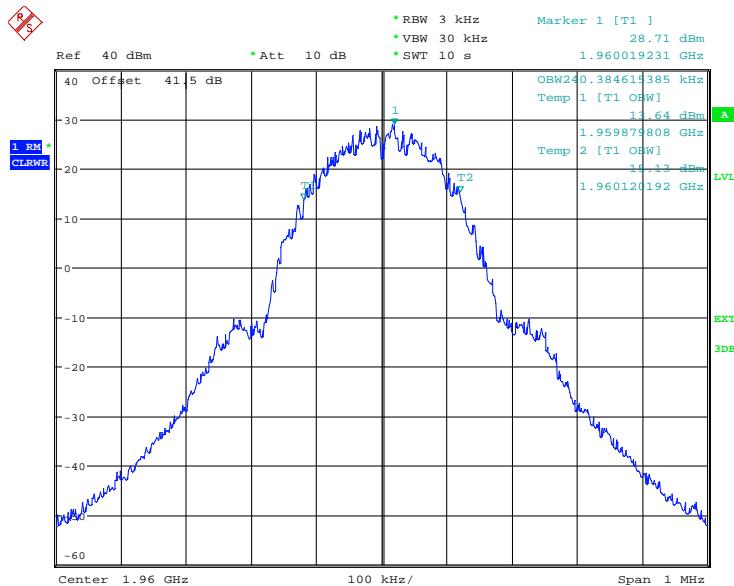
2.4.7 Test Results

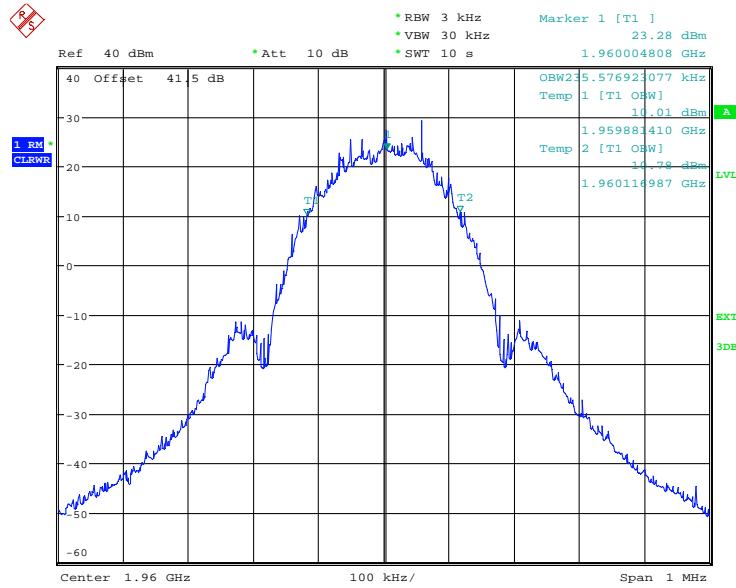
For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-GEN for Occupied Bandwidth.

The test results are shown below

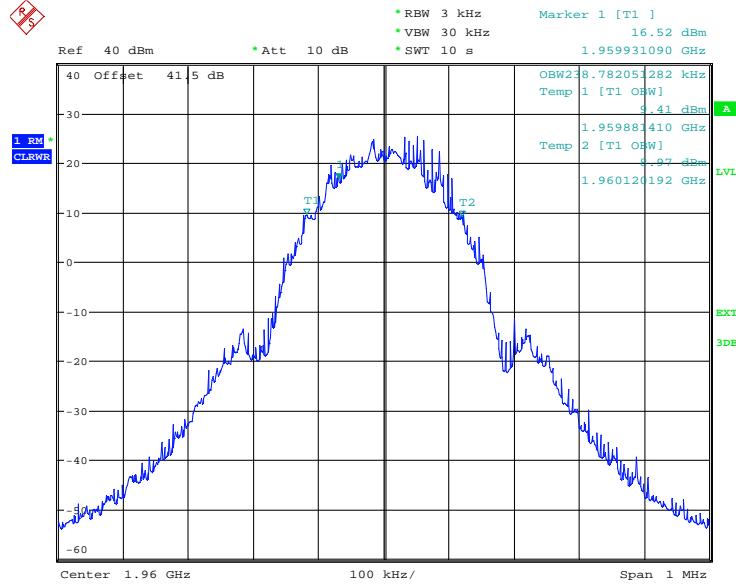
Configuration 1 - Mode 2

GMSK

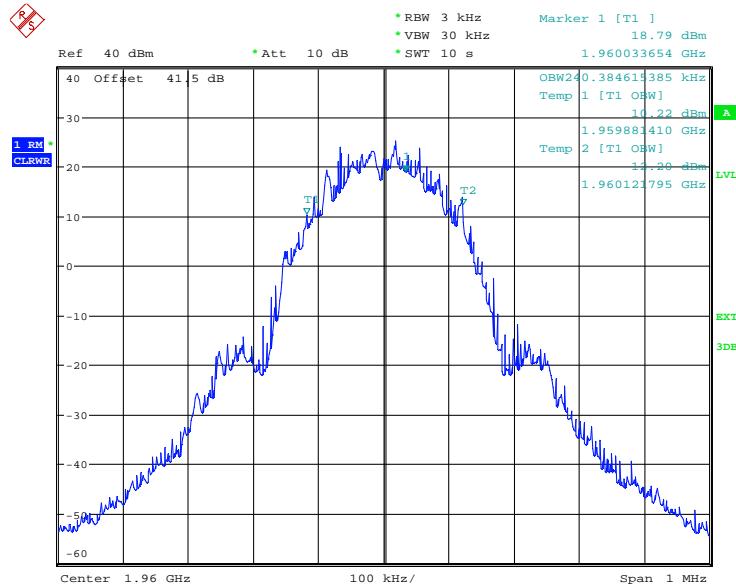


8-PSK

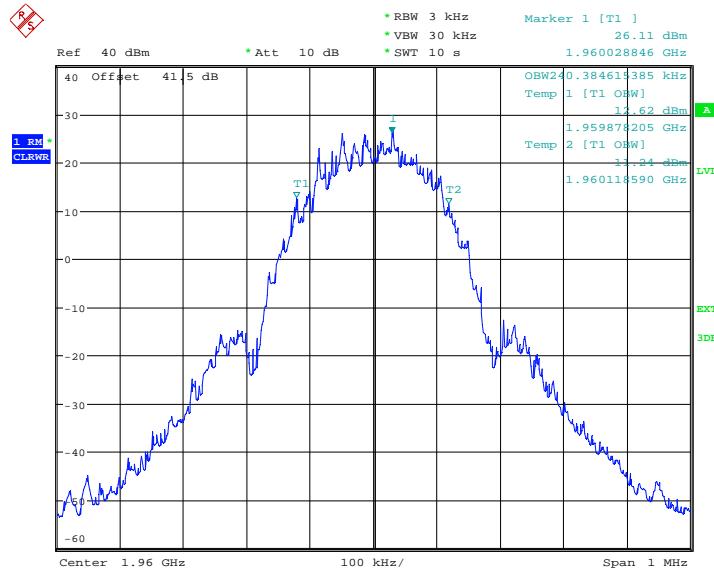
Date: 22.SEP.2011 10:11:30

16QAM

Date: 21.SEP.2011 16:40:41

32QAM

Date: 21.SEP.2011 16:13:33

AQPSK

Date: 21.SEP.2011 15:28:52



2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS ($\pm 1\text{MHz}$)

2.5.1 Specification Reference

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

2.5.2 Equipment Under Test

RRUN19-22 / KRC 161 170/5, S/N: TD3G925968

2.5.3 Date of Test and Modification State

22 September 2011 – Modification State 0

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

In accordance with 24.238(b), at least 1% of the emission bandwidth was used for the resolution bandwidth up to 1 MHz away from the block edge. A resolution bandwidth of 50kHz was used between 1MHz to 5MHz away from the band edge. As the FCC rules specify a RBW of 1MHz for measurements of emissions > 1MHz away from the band edges, the limit was adjusted with -13dB to -26dBm to compensate for the reduced measurement bandwidth. Spectrum analyser detector was set as RMS.

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

The EUT was tested at its maximum power level with all timeslots active.

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

Configuration 1 - Mode 4
 - Mode 5

2.5.6 Environmental Conditions

22 September 2011

Ambient Temperature 25.2°C

Relative Humidity 31.0%



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 ($\pm 1\text{MHz}$)

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

Remark:

The channel adjacent to the lower and higher band-edge cannot be used. The lowest usable channel is 513 (1930.4MHz), the highest usable channel is 809 (1989.6MHz)

Configuration 1 - Mode 4 and 5

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

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.

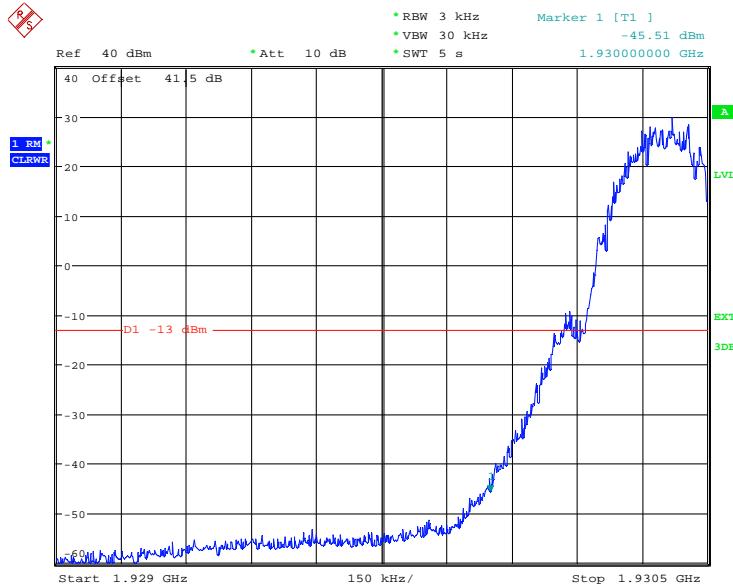
The channels outside of those shown in the table above were not tested at lower power levels to determine a level at which compliance would be achieved. Therefore, to maintain compliance, only the channels shown in the table above shall be used.



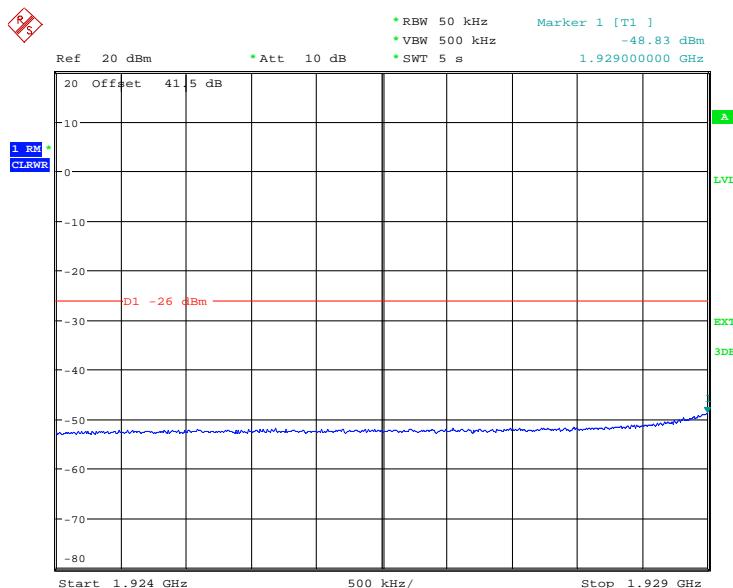
The test results are shown below

Configuration 1 - Mode 4

GMSK



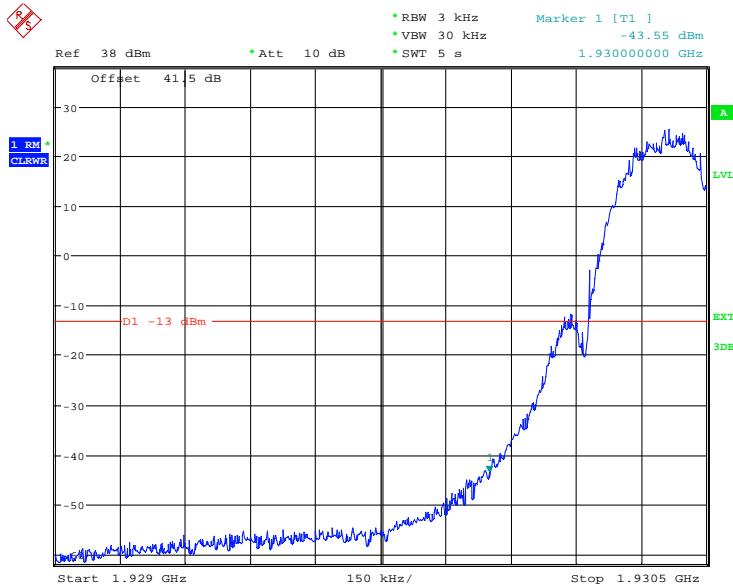
Date: 22.SEP.2011 11:15:45



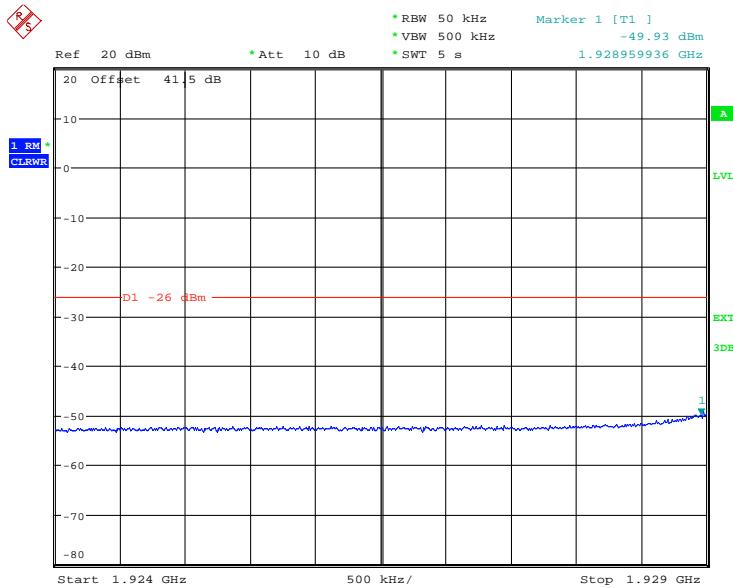
Date: 22.SEP.2011 11:20:03



Product Service

8-PSK

Date: 22.SEP.2011 11:26:13

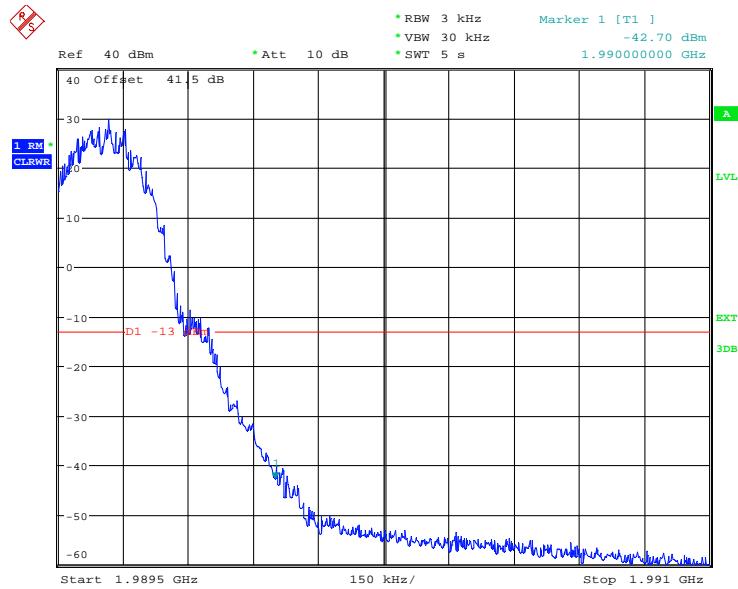


Date: 22.SEP.2011 11:22:34

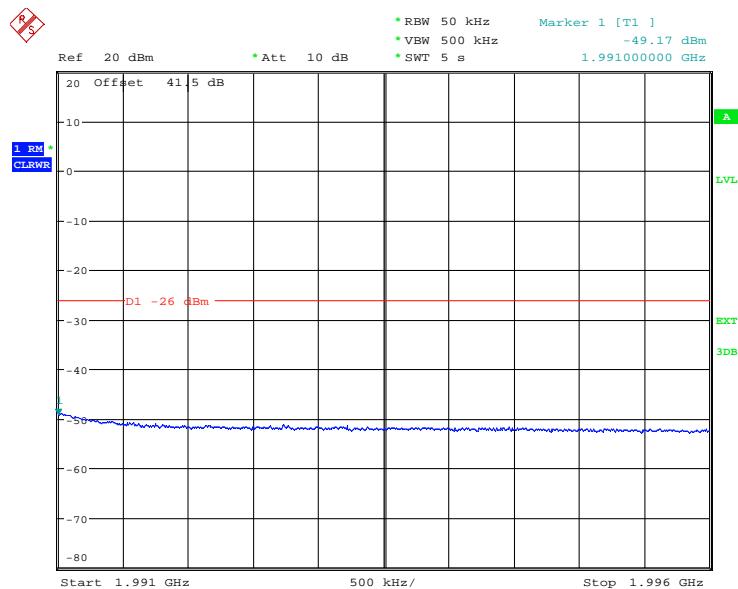


Configuration 1 - Mode 5

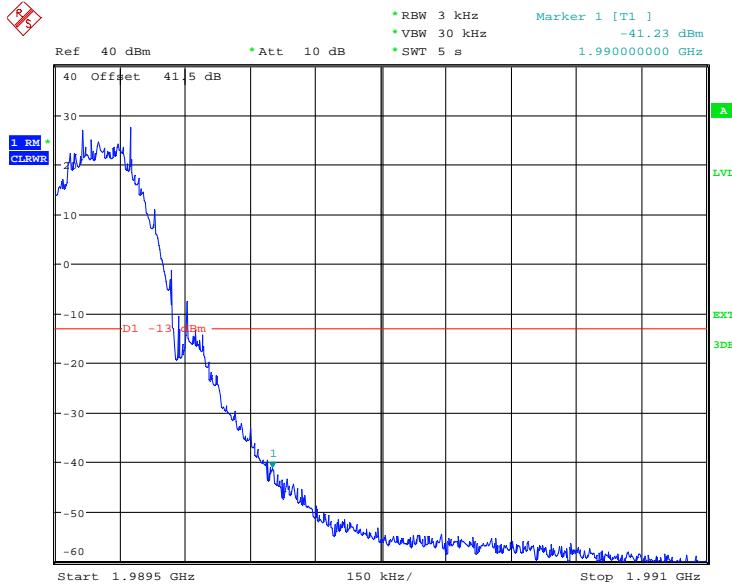
GMSK



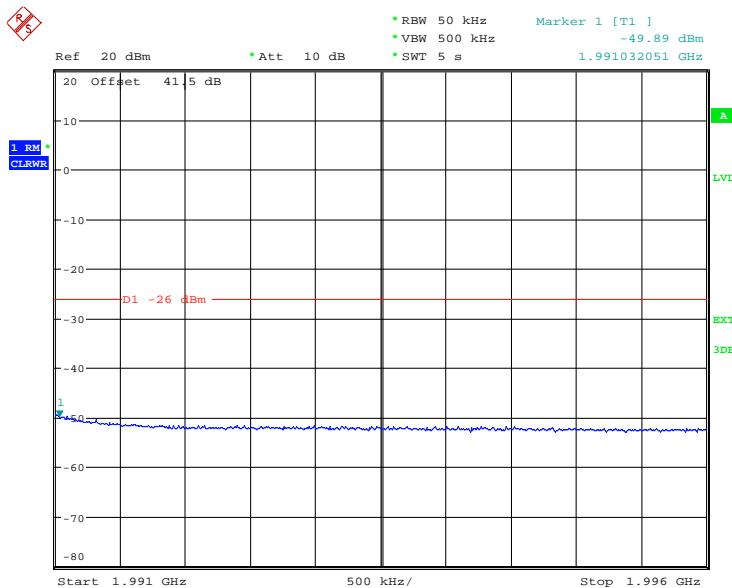
Date: 22.SEP.2011 13:51:31



Date: 22.SEP.2011 14:00:11

8-PSK

Date: 22.SEP.2011 11:43:11



Date: 22.SEP.2011 11:45:11

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

RRUN19-22 / KRC 161 170/5, S/N: TD3G925968

2.6.3 Date of Test and Modification State

19 and 20 October 2011 – Modification State 0

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

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

Emissions identified within the range 30MHz - 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 + 10Log (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:

$$E_{(V/m)} = (30 \times 1.64 \times 5.50)^{0.5} / 3 = 5.483V/m = 134.8dB\mu V/m$$

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

$$43 + 10\log(5.50) = 50.4dB$$

Therefore the limit at 3m measurement distance is:

$$134.8 - 50.4 = 84.4dB\mu V/m$$

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

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

Configuration 1 - Mode 1
- Mode 2
- Mode 3

2.6.6 Environmental Conditions

	19 October 2011	20 October 2011
Ambient Temperature	23.5°C	22.0°C
Relative Humidity	48.0%	46.5%



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

Configuration 1 - Mode 1

8-PSK

No emissions were detected within 20dB of the limit.

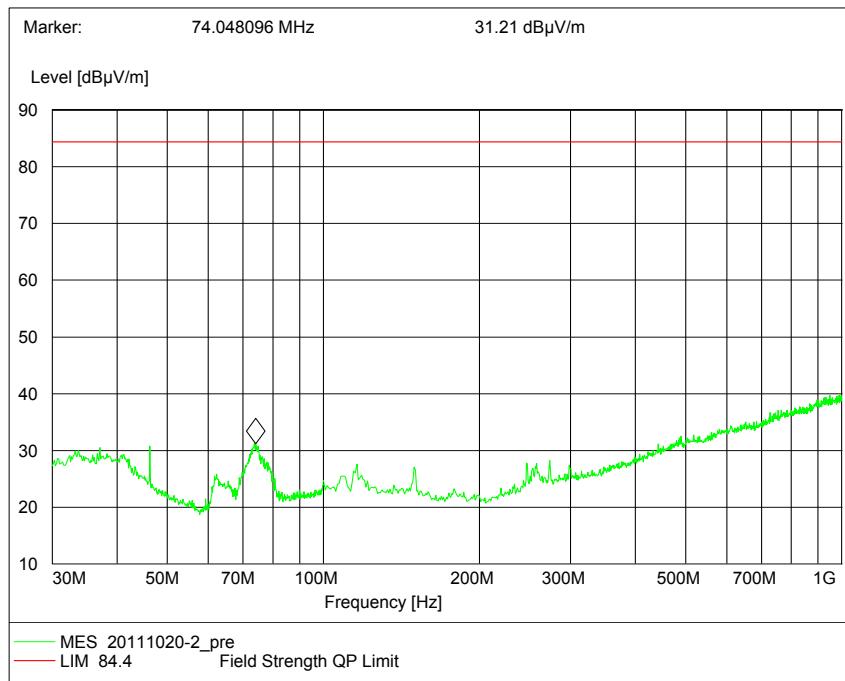
Configuration 1 - Mode 2

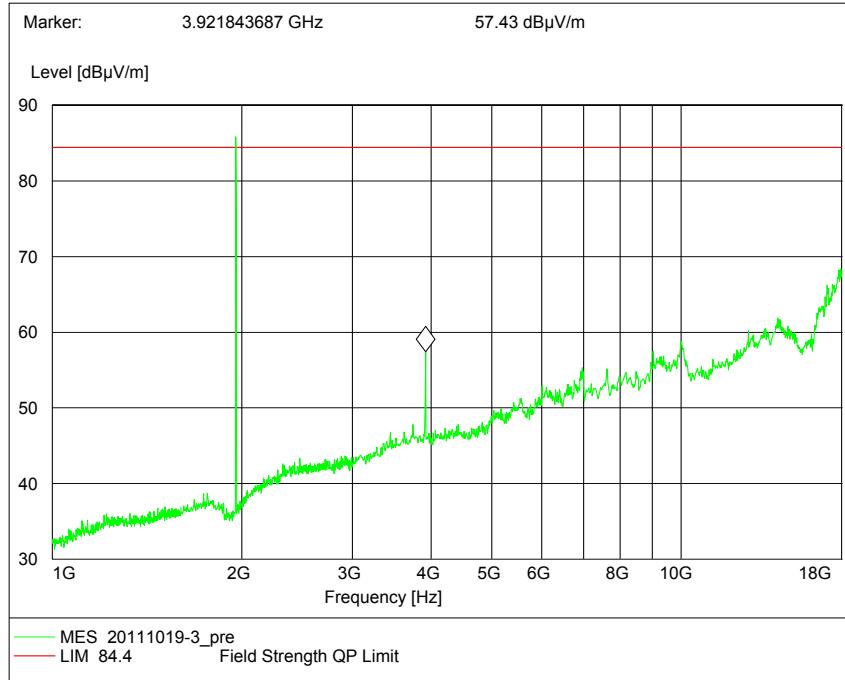
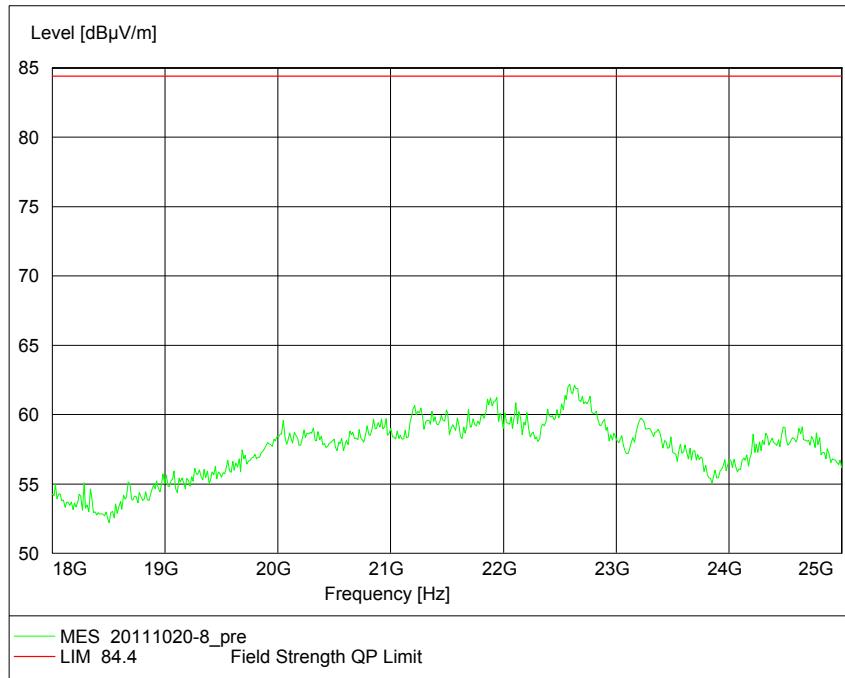
GMSK and 16QAM and 32QAM and AQPSK

No emissions were detected within 20dB of the limit.

8-PSK

30MHz – 1GHz



1GHz – 18GHz18GHz – 25GHz

**Configuration 2 - Mode 3****8-PSK**

No emissions were detected within 20dB of the limit.

Limit	-13dBm / 84.4dB μ V/m
-------	---------------------------

Remarks

The EUT does not exceed -13dBm / 84.4dB μ V/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

RRUN19-22 / KRC 161 170/5, S/N: TD3G925968

2.7.3 Date of Test and Modification State

22 September 2011 – Modification State 0

2.7.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 9kHz to 25GHz. The EUT was set to transmit on maximum power level with all timeslots active. The EUT was tested on Bottom, Middle and Top channels for GMSK and 8-PSK modulations as the representative modes. 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

2.7.6 Environmental Conditions

22 September 2011

Ambient Temperature 25.2°C

Relative Humidity 31.0%



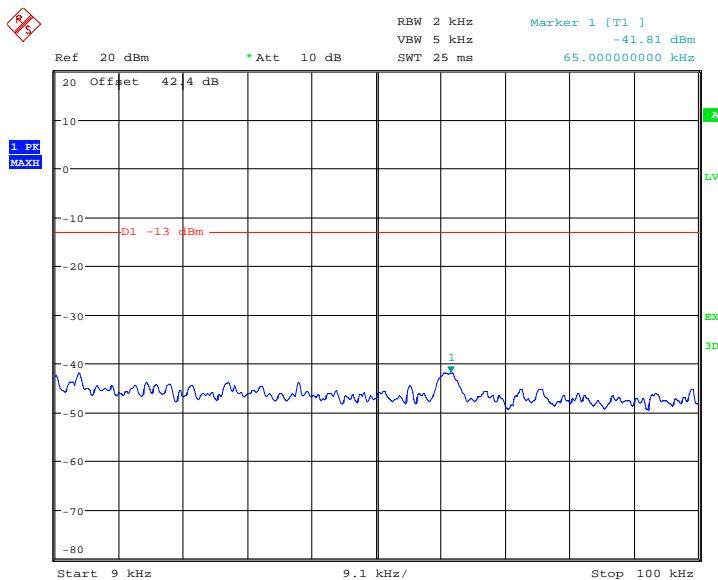
2.7.7 Test Results

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.

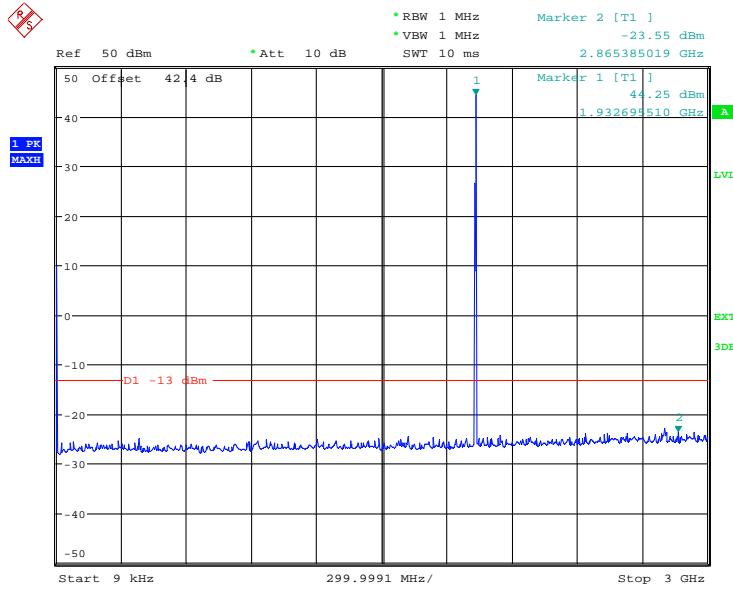
The test results are shown below

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.

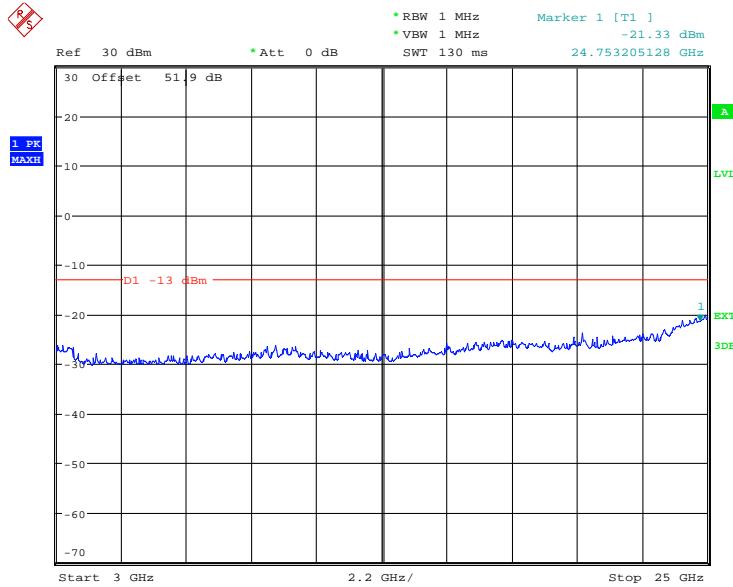


Date: 22.SEP.2011 10:07:10

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

Date: 22.SEP.2011 10:43:02

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

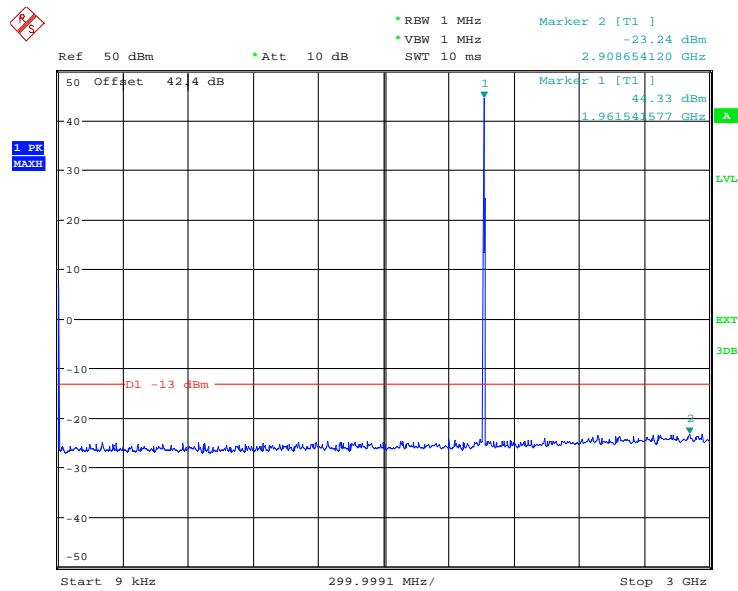
3GHz to 25GHz

Date: 22.SEP.2011 10:49:19



Configuration 1 - Mode 2

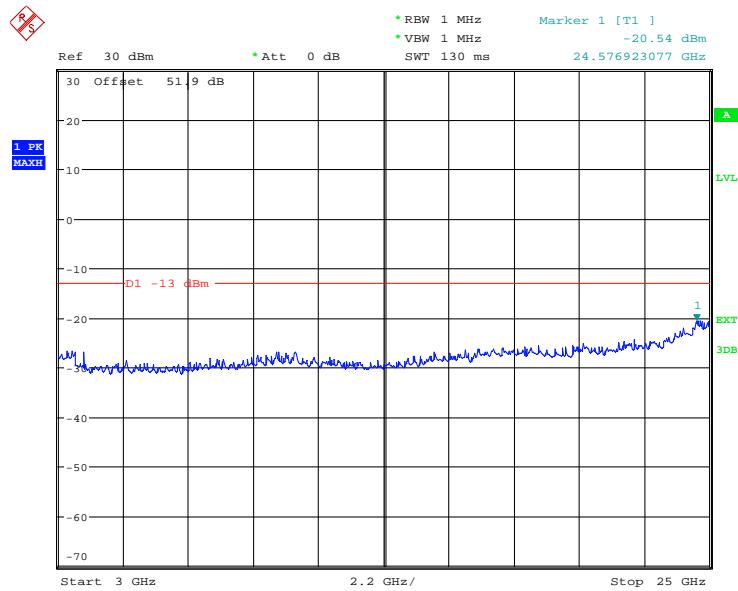
9kHz to 3GHz



Date: 22.SEP.2011 09:59:38

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

3GHz to 25GHz

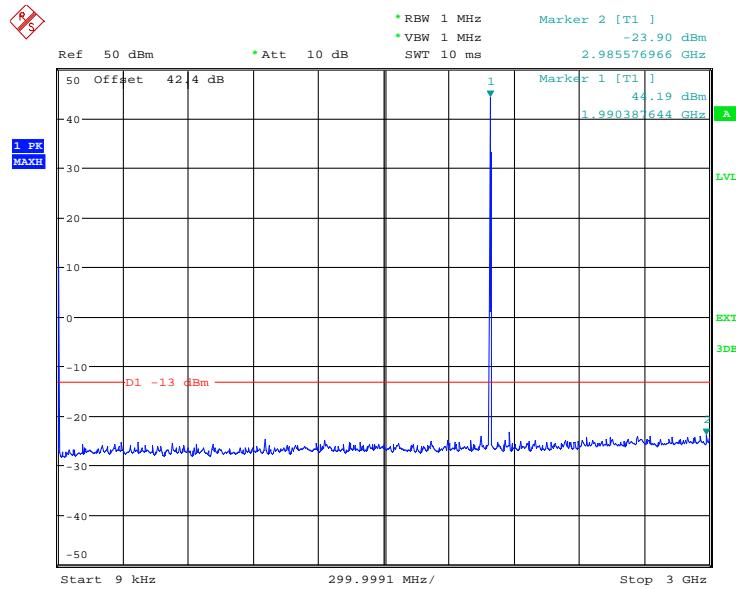


Date: 22.SEP.2011 10:00:54



Configuration 1 - Mode 3

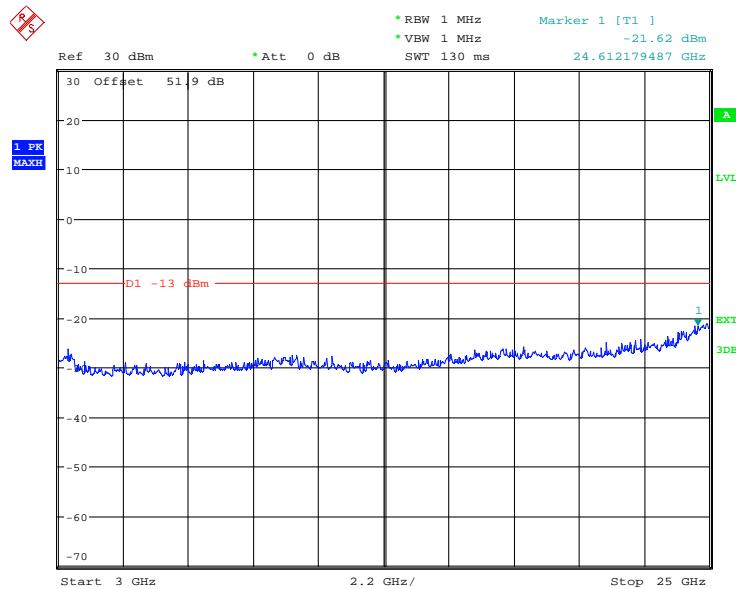
9kHz to 3GHz



Date: 22.SEP.2011 10:33:54

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

3GHz to 25GHz



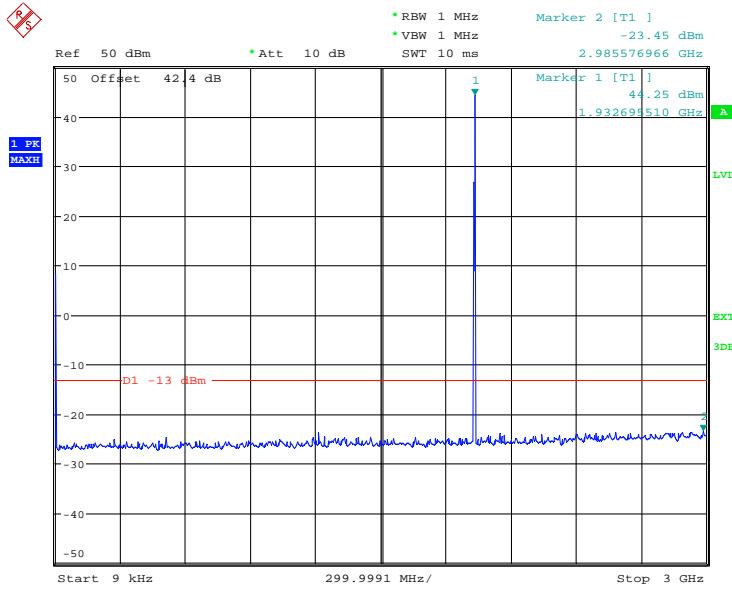
Date: 22.SEP.2011 10:35:12



8-PSK

Configuration 1 - Mode 1

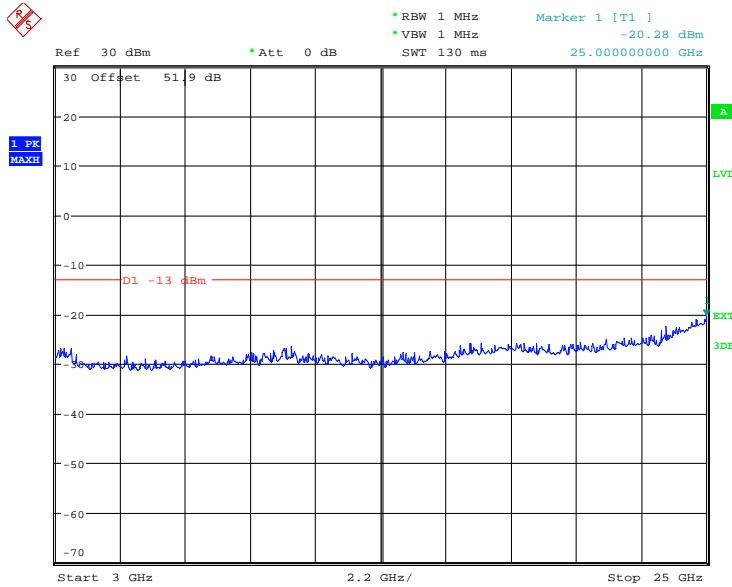
9kHz to 3GHz



Date: 22.SEP.2011 10:24:33

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

3GHz to 25GHz

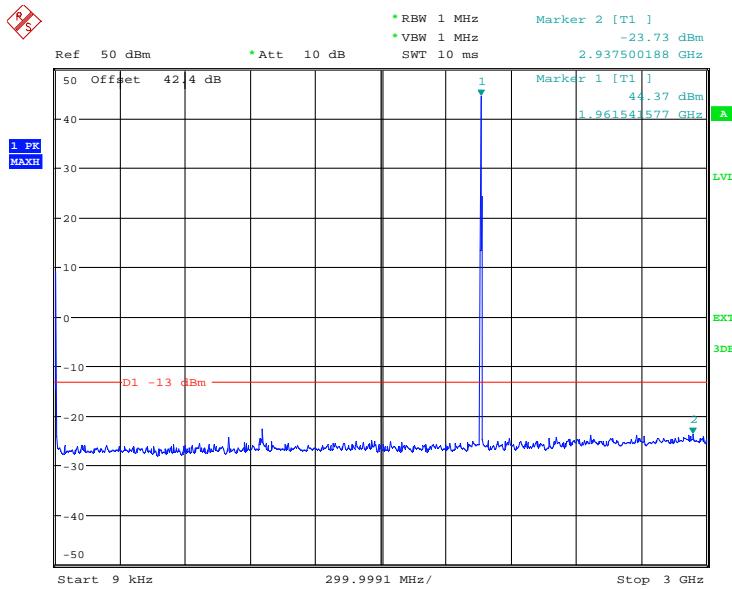


Date: 22.SEP.2011 10:27:03



Configuration 1 - Mode 2

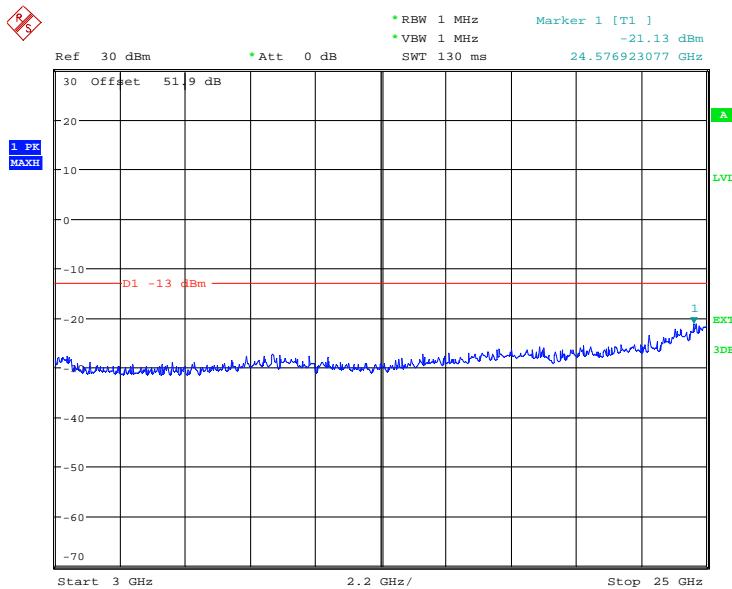
9kHz to 3GHz



Date: 22.SEP.2011 10:06:12

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

3GHz to 25GHz

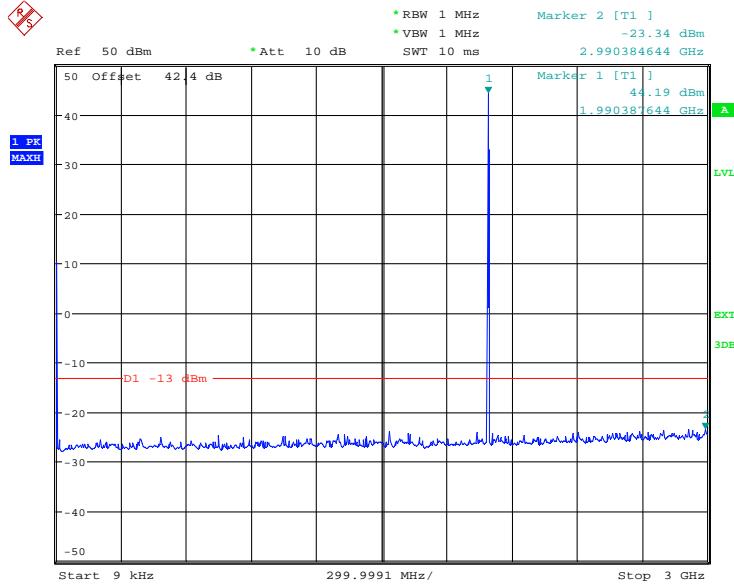


Date: 22.SEP.2011 10:04:53



Configuration 1 - Mode 3

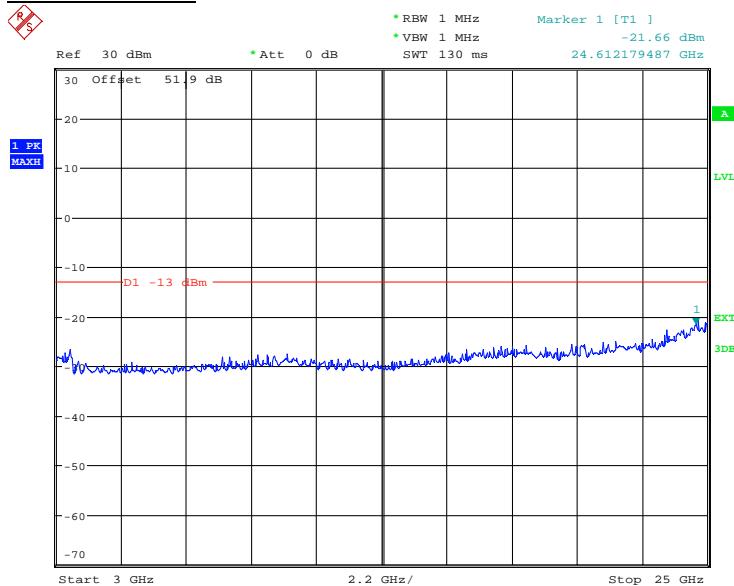
9kHz to 3GHz



Date: 22.SEP.2011 10:31:08

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

3GHz to 25GHz



Date: 22.SEP.2011 10:29:26

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

Remarks

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



2.8 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.8.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
 FCC CFR 47 Part 24, Clause 24.235
 Industry Canada RSS-133, Clause 6.3

2.8.2 Equipment Under Test

RRUN19-22 / KRC 161 170/5, S/N: TD3G925968

2.8.3 Date of Test and Modification State

23 and 24 September 2011 – Modification State 0

2.8.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

The EUT was set to transmit on maximum power level with all timeslots active. A Spectrum Analyser was used to measure the frequency error. The temperature was adjusted between -30°C and +50°C in 10° steps as per 2.1055.

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

Configuration 1 - Mode 2

2.8.6 Environmental Conditions

	23 September 2011	24 September 2011
Ambient Temperature	25.1°C	25.4°C
Relative Humidity	35.8%	35.5%



2.8.7 Test Results

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

The test results are shown below

Power Supply: -48V DC

Configuration 1 - Mode 2

GMSK

Temperature Interval (°C)	Deviation (Hz)
-30	7.51
-20	-15.0
-10	14.85
0	-7.47
+10	7.60
+20	-13.61
+30	-21.03
+40	10.92
+50	-17.18

8-PSK

Temperature Interval (°C)	Deviation (Hz)
-30	8.43
-20	-16.34
-10	10.92
0	-8.55
+10	-6.27
+20	-23.69
+30	-18.55
+40	5.75
+50	-14.99

Limit	±1.0 ppm or ±1.96kHz
-------	----------------------

Remarks

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



2.9 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.9.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 24, Clause 24.235
Industry Canada RSS-133, Clause 6.3

2.9.2 Equipment Under Test

RRUN19-22 / KRC 161 170/5, S/N: TD3G925968

2.9.3 Date of Test and Modification State

24 September 2011 – Modification State 0

2.9.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.9.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

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

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

Configuration 1 - Mode 2

2.9.6 Environmental Conditions

24 September 2011

Ambient Temperature 25.4°C

Relative Humidity 35.5%



2.9.7 Test Results

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

The test results are shown below

Temperature: 20°C

Configuration 1 - Mode 2

GMSK

DC Voltage (V)	Deviation (Hz)
-40.8	-13.55
-48.0	-13.61
-55.2	-10.79

8-PSK

DC Voltage (V)	Deviation (Hz)
-40.8	-16.21
-48.0	-23.69
-55.2	-23.59

Limit	±1.0 ppm or ±1.96kHz
-------	----------------------

Remarks

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



2.10 RECEIVER SPURIOUS EMISSIONS

2.10.1 Specification Reference

Industry Canada RSS-133, Clause 6.6

2.10.2 Equipment Under Test

RRUN19-22 / KRC 161 170/5, S/N: TD3G925968

2.10.3 Date of Test and Modification State

22 September 2011 – Modification State 0

2.10.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.10.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of Industry Canada RSS-133.

In accordance with RSS-Gen Clause 6.2, the receiver spurious emissions from the antenna terminal were measured. Measurements were performed on the receiver 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 a 50 Ohm load.

The resolution was set to 1MHz in the frequency range 9kHz to 13GHz thus meeting the requirements of RSS-Gen Clause 4.10, the spectrum analyser detector was set to peak and trace was kept on Max Hold to give the worst case. The limit line was displayed, showing the -57dBm, 2 nanowatts in band 9kHz to 1GHz and above 1GHz, -53dBm, 5 nanowatts.

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

In addition, measurements were made from 9kHz up to the 5th 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

2.10.6 Environmental Conditions

22 September 2011

Ambient Temperature 25.2°C

Relative Humidity 31.0%



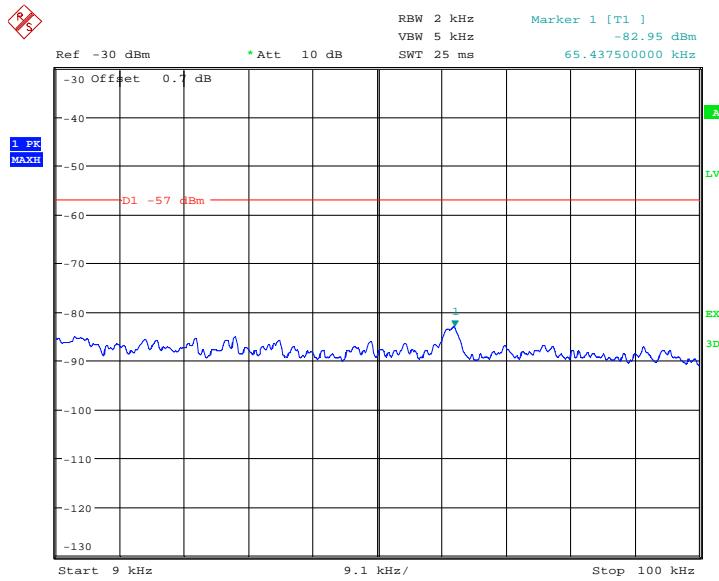
2.10.7 Test Results

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

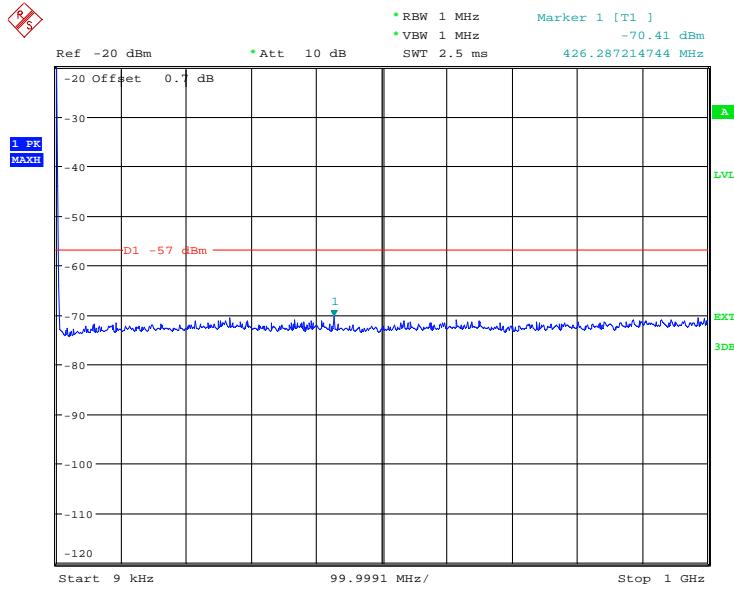
The test results are shown below

Remark:

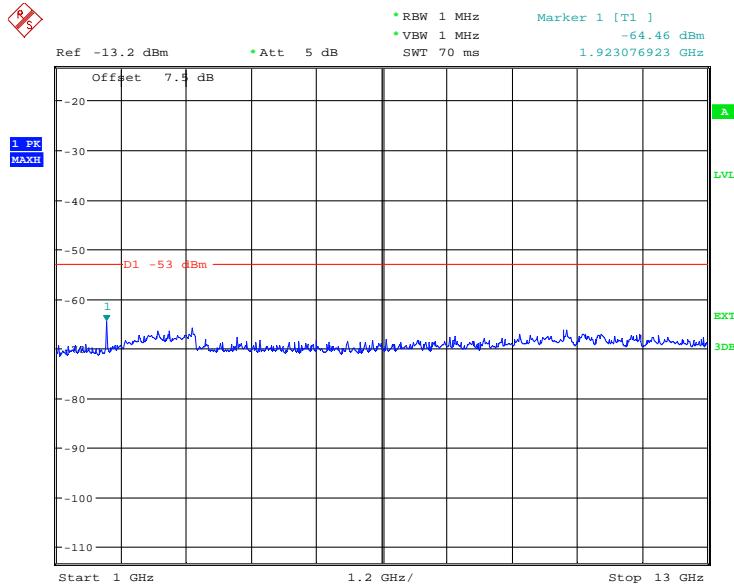
The emissions at 9kHz on the plots was not generated by the test object. A complementary measurement with a smaller Span showed that it was related to the LO feedthrough.



Date: 22.SEP.2011 15:18:32

GMSKConfiguration 1 - Mode 19kHz to 1GHz

Date: 22.SEP.2011 15:04:01

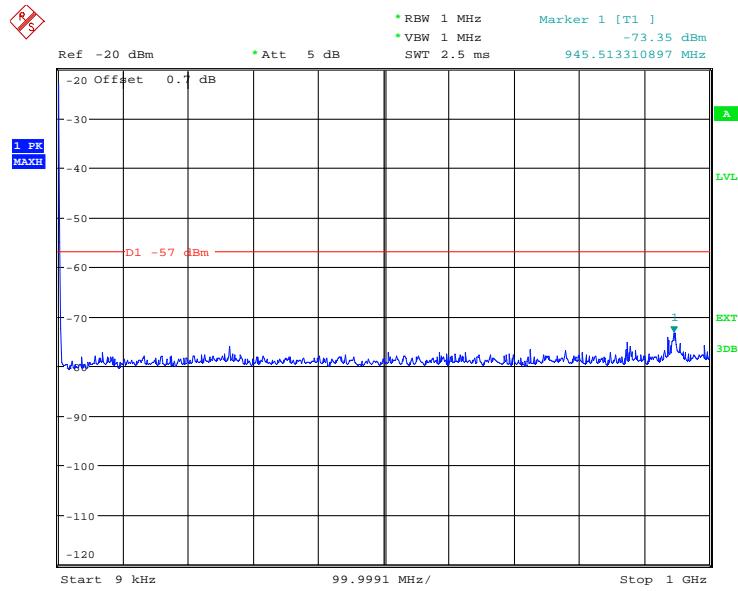
1GHz to 13GHz

Date: 22.SEP.2011 15:06:15



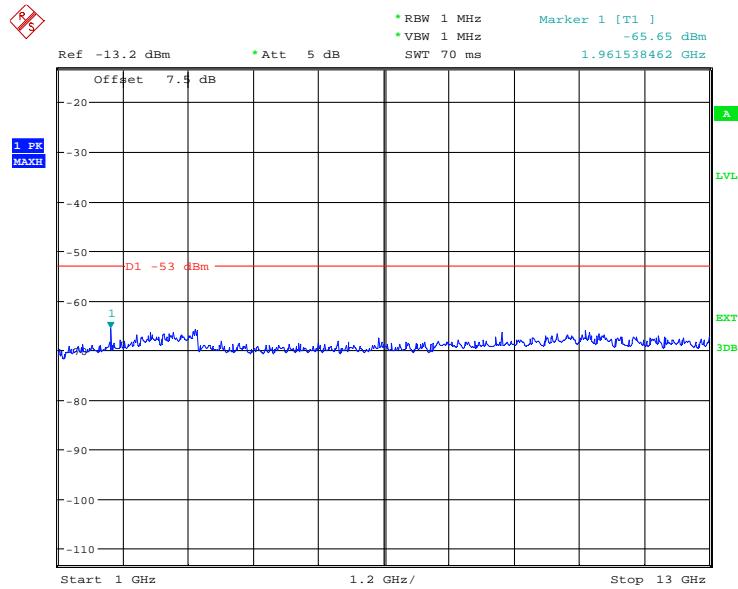
Configuration 1 - Mode 2

9kHz to 1GHz



Date: 22.SEP.2011 15:13:02

1GHz to 13GHz

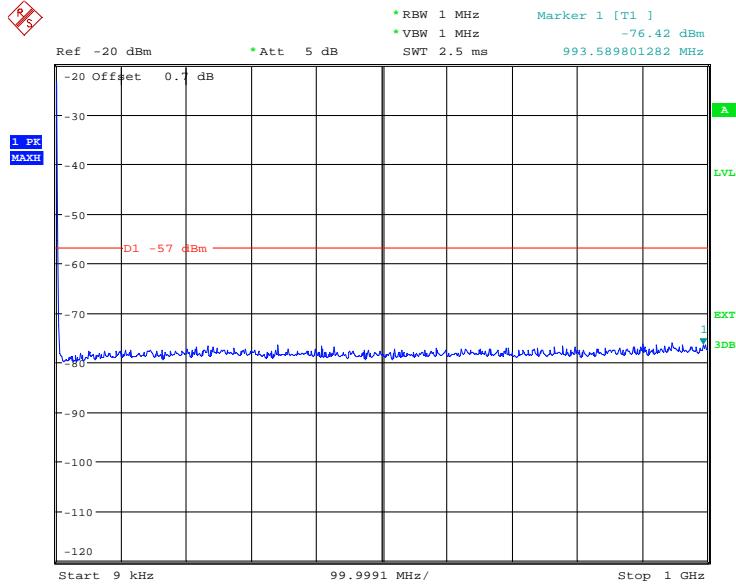


Date: 22.SEP.2011 15:16:27



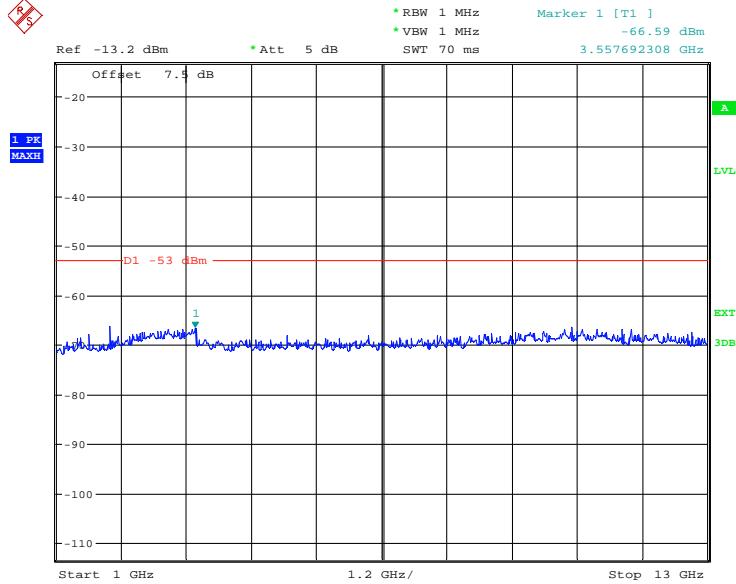
Configuration 1 - Mode 3

9kHz to 1GHz



Date: 22.SEP.2011 15:31:02

1GHz to 13GHz



Date: 22.SEP.2011 15:32:44

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

The EUT does not exceed -57dBm at the frequency range of 9kHz to 1GHz and does not exceed -53dBm at the frequency range of 1GHz to 13GHz.



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
Section 2.1, 2.2, 2.3, 2.4, 2.5, 2.7 and 2.10 – Maximum Conducted Output Power, Peak – Average Ratio, Modulation Characteristics, Occupied Bandwidth, Spurious Emissions at Antenna Terminals ($\pm 1\text{MHz}$), Conducted Spurious Emissions and Receiver Spurious Emissions.					
Spectrum Analyser	Rohde & Schwarz	FSQ26	100253	12	27-Mar-2012
Signal Analyser	Agilent	MXA N9020A	MY50200544	12	27-Mar-2012
Power Meter	Rohde & Schwarz	NRP	102624	12	27-Mar-2012
Thermal Power Sensor	Rohde & Schwarz	NRP-Z21	101644	12	27-Mar-2012
Network Analyzer	Agilent	8720D	US36140166	-	08-Sep-2012
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121603	-	O/P MON
Power Supply	Dahua	DH1716-5D	2008040003	-	O/P MON
Power Supply	Dahua	DH1716A-14	20080401	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	03-Jan-2012
Thermo-hygrometer	AZ Instruments	8705	9151655		24-Aug-2012
Section 2.6 – Radiated Spurious Emissions					
Load	Shanghai Huaxiang	TF100	09121603	-	O/P MON
Load	Shanghai Huaxiang	TF150	06081422	-	O/P MON
EMI Receiver	Rohde & Schwarz	ESI 40	100015	12	19-Aug-2012
Ultra log test antenna	Rohde & Schwarz	HL 562	100167	12	19-Aug-2012
Double-Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2012
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	-	19-Aug-2012
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	N/A
Semi Anechoic Chamber	Frankonia	23.18m×16.88m×9.60m	-	12	19-Aug-2012
Power Supply	Dahua	DH1716-5D	2008040003	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	03-Jan-2012
Thermo-hygrometer	AZ Instruments	8705	9151655	12	24-Aug-2012



Section 2.8 and 2.9 – Frequency Stability Under Temperature and Voltage Variations					
Spectrum Analyser	Rohde & Schwarz	FSQ26	100253	12	27-Mar-2012
40dB Attenuator	Aeroflex / Weinschel	48-40-43-LIM	BR5020	-	O/P MON
Load	Shanghai Huaxiang	TF150-3	090323432	-	O/P MON
Temperature Chamber	ZUNDAR	ZT100U	10080064	12	O/P MON
Power Supply	Dahua	DH1716-5D	2008040003	-	O/P MON
Power Supply	Dahua	DH1716A-14	20080401	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	03-Jan-2012
Thermo-hygrometer	AZ Instruments	8705	9151655	12	24-Aug-2012

N/A – Not Applicable

O/P MON - Output monitored with calibration equipment



3.2 MEASUREMENT UNCERTAINTY

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

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

* In accordance with CISPR 16-4



Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

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

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