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Report On

FCC and Industry Canada Testing of the Ericsson AB RUG 11 B5

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FCC ID: TA8AKRC161194-1 IC ID: 287AB-AG1611941

Document 75909919 Report 01 Issue 2

June 2010



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

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REPORT ON

FCC and Industry Canada Testing of the Ericsson AB RUG 11 B5

Document 75909919 Report 01 Issue 2

June 2010

PREPARED FOR

Ericsson AB Torshamnsgatan 23 S-164 80 Stockholm Sweden

PREPARED BY

N Bennett Senior Administrator

APPROVED BY

M Jenkins Authorised Signatory

DATED

22 June 2010

This report has been re-issued as issue 2 to update Max Output Power and Band Edge and OBW Test Data

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

Test Engineer(s);

X Zhang



C Zhang



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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the Ericsson AB RUG 11 B5



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson AB RUG 11 B5 to the requirements of FCC CFR 47 Part 22 and Industry Canada RSS-132.

Testing was carried out in support of an application for Grant of Equipment Authorisation in the name of Ericsson AB RUG 11 B5.

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 Model	RUG 11 B5
Product Name	KRC 161 194/1
Serial Number(s)	CB4C986602
Software Version	G10A/1_R25E
Hardware Version	R1B
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 22: 2009 Industry Canada RSS-132: 2005
Incoming Release Date	Declaration of Build Status 17 May 2010
Order Number Date	PTP 19 May 2010
Start of Test	17 May 2010
Finish of Test	19 June 2010
Name of Engineer(s)	X Zhang C Zhang
Related Document(s)	ANSI C63.4: 2009 FCC CFR 47 Part 2: 2009 FCC CFR 47 Part 15: 2009 Industry Canada RSS-GEN Issue 2: 2007



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.

Configura	ition 1 – UC (Hyb	rid Uncombined): C	utput 1 without internal combiner				
Section	Spe	c Clause	Test Description	Mode	Mod State	Result	Comments
Cotion	FCC Part 22	RSS-132		mode		rtooun	
				869.2 MHz		N/A	
				881.6 MHz		N/A	
				893.8 MHz		N/A	
	22.913(a)	4.4	Effective Radiated Power	869.4 MHz		N/A	No integral antenna.
				893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz	0	Pass	
				881.6 MHz	0	Pass	
	2.1046,			893.8 MHz	0	Pass	
2.1	22.913 (a)	4.4	Maximum Peak Output Power - Conducted	869.4 MHz		N/A	
	22.913 (a)			893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz	0	Pass	
				881.6 MHz		N/A	
				893.8 MHz	0	Pass	
2.2	2.1047 (d)	4.2	Modulation Characteristics	869.4 MHz		N/A	Technical description provided
				893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz	0	Pass	
				881.6 MHz	0	Pass	
	2.1049,	RSS-Gen		893.8 MHz	0	Pass	
2.3	2.1049, 22.917(b)	4.6.1	Occupied Bandwidth	869.4 MHz		N/A	
	22.317(0)	7.0.1		893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	



Configura	ation 1 – UC (Hyb	rid Uncombined):	Output 1 without internal combiner				
Section	Spe	c Clause	Test Description	Mode	Mod State	Result	Comments
Cotion	FCC Part 22	RSS-132		Mode	mod olate	rteourt	Commente
				869.2 MHz		N/A	
				881.6 MHz		N/A	The channel adjacent to the lower
	2.1051,		Spurious Emissions at Antenna Terminals	893.8 MHz		N/A	and higher band-edge cannot be
2.4	2.1051, 22.917(b)	4.5	(±1MHz)	869.4 MHz	0	Pass	used. The lowest usable channel is
	22.917(D)			893.6 MHz	0	Pass	129 (869.4MHz), the highest usable
				869.2 MHz+ 881.6 MHz		N/A	channel is 250 (893.6 MHz)
				881.6 MHz+ 893.8 MHz		N/A	1
				869.2 MHz	0	Pass	
				881.6 MHz	0	Pass	7
	0.4050			893.8 MHz	0	Pass	7
2.5	2.1053, 22.917(a)	4.5	Radiated Spurious Emissions	869.4 MHz		N/A	1
	22.917(d)			893.6 MHz		N/A	1
				869.2 MHz+ 881.6 MHz		N/A	1
				881.6 MHz+ 893.8 MHz		N/A	1
				869.2 MHz	0	Pass	
				881.6 MHz	0	Pass	7
	0.4054			893.8 MHz	0	Pass	7
2.6	2.1051, 22.917(a)	4.5	Conducted Spurious Emissions	869.4 MHz		N/A	1
	22.917(d)			893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	1
				881.6 MHz+ 893.8 MHz		N/A	1
				869.2 MHz		N/A	
				881.6 MHz	0	Pass	7
	0.4055			893.8 MHz		N/A	1
2.7	2.1055,	4.3	Frequency Stability Under Temperature	869.4 MHz		N/A	1
	22.355		Variations	893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	1
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz		N/A	
				881.6 MHz	0	Pass	1
	0.4055			893.8 MHz		N/A	1
2.8	2.1055,	4.3	Frequency Stability Under Voltage Variations	869.4 MHz		N/A	1
	22.355			893.6 MHz		N/A	1
				869.2 MHz+ 881.6 MHz		N/A	1
				881.6 MHz+ 893.8 MHz		N/A	1

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Castian	Spec Clause				Mod State	Desult	O
Section	FCC Part 22	RSS-132	Test Description	Mode	woo State	Result	Comments
				869.2 MHz		N/A	
			881.6 MHz		N/A	7	
				893.8 MHz		N/A	-
	22.913(a)	4.4	Effective Radiated Power	869.4 MHz		N/A	No integral antenna.
	. ,			893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	7
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz	0	Pass	
				881.6 MHz	0	Pass	7
	0.4040			893.8 MHz	0	Pass	
2.1	2.1046, 22.913 (a)	4.4	Maximum Peak Output Power - Conducted	869.4 MHz		N/A	
	22.913 (a)			893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz		N/A	
				881.6 MHz		N/A	
				893.8 MHz		N/A	
2.2	2.1047 (d)	4.2	Modulation Characteristics	869.4 MHz		N/A	Technical description provided
				893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz		N/A	
				881.6 MHz		N/A	
	2.1049,	RSS-Gen		893.8 MHz		N/A	
2.3	22.917(b)	4.6.1	Occupied Bandwidth	869.4 MHz		N/A	
	22.017(0)	4.0.1		893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	



-	,	c Clause	nt Combining): Output 1 with internal combiner plus				
tion	FCC Part 22	RSS-132	— Test Description	Mode	Mod State	Result	Comments
	10010122	100-132		869.2 MHz		N/A	
				881.6 MHz		N/A	The channel adjacent to the lawer
				893.8 MHz		N/A	The channel adjacent to the lower and higher band-edge cannot be
	2.1051,	4.5	Spurious Emissions at Antenna Terminals	869.4 MHz	0	Pass	used. The lowest usable channel is
	22.917(b)	4.5	(±1MHz)	893.6 MHz	0	Pass	129 (869.4MHz), the highest usable
				869.2 MHz+ 881.6 MHz	0	N/A	channel is 250 (893.6 MHz)
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz	0	Pass	
				881.6 MHz	0	Pass	-
				893.8 MHz	0	Pass	-
	2.1053,	4.5	Radiated Spurious Emissions	869.4 MHz	0	N/A	
	22.917(a)	4.5	Radiated Spundus Emissions	893.6 MHz		N/A	-
				869.2 MHz+ 881.6 MHz		N/A N/A	-
				881.6 MHz+ 893.8 MHz	+	N/A	-
				869.2 MHz	0	Pass	
				881.6 MHz	0	Pass	-1
				893.8 MHz	0	Pass	-
	2.1051,	4.5	Conducted Spurious Emissions	869.4 MHz	U	N/A	-
	22.917(a)	4.0	Conducted Spunous Emissions	893.6 MHz		N/A	-
				869.2 MHz+ 881.6 MHz	-	N/A	-
				881.6 MHz+ 893.8 MHz		N/A N/A	-
				869.2 MHz		N/A	
							-
				881.6 MHz 893.8 MHz		N/A N/A	-
	2.1055,	4.0	Frequency Stability Under Temperature			N/A N/A	_
	22.355	4.3	Variations	869.4 MHz 893.6 MHz			-
						N/A N/A	-
				869.2 MHz+ 881.6 MHz		N/A N/A	-
				881.6 MHz+ 893.8 MHz			
				869.2 MHz		N/A N/A	-
				881.6 MHz			-
	2.1055,	10	Francisco (Otability Index) (alterna) (aristica	893.8 MHz		N/A	-
.8 22.355	4.3	Frequency Stability Under Voltage Variations	869.4 MHz		N/A	-	
				893.6 MHz		N/A	-
				869.2 MHz+ 881.6 MHz		N/A	-
				881.6 MHz+ 893.8 MHz		N/A N/A	

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Configura	Configuration 3 – HC (Hybrid Combined): Output 1 with internal combiner						
Oration	Spec Clause				Mada Mad Otata		O
Section	FCC Part 22	RSS-132	 Test Description 	Mode	Mod State	Result	Comments
	Ì			869.2 MHz		N/A	
				881.6 MHz		N/A	1
				893.8 MHz		N/A	
	22.913(a)	4.4	Effective Radiated Power	869.4 MHz		N/A	No integral antenna.
				893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	1
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz	0	Pass	
				881.6 MHz	0	Pass	
	2.1046,			893.8 MHz	0	Pass	
2.1	2.1046, 22.913 (a)	4.4	Maximum Peak Output Power - Conducted	869.4 MHz		N/A	
	22.913 (d)			893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz		N/A	
				881.6 MHz		N/A	
				893.8 MHz		N/A	
2.2	2.1047 (d)	4.2	Modulation Characteristics	869.4 MHz		N/A	Technical description provided
				893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz		N/A	
				881.6 MHz		N/A	
	2.1049,	RSS-Gen		893.8 MHz		N/A	
2.3	2.1049, 22.917(b)	4.6.1	Occupied Bandwidth	869.4 MHz		N/A	
	22.317(0)	4.0.1		893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	



o "	Spe	c Clause	Test Description				Comments
Section	FCC Part 22	RSS-132		Mode	Mod State	Result	
				869.2 MHz		N/A	
				881.6 MHz		N/A	The channel adjacent to the lower
	0.4054			893.8 MHz		N/A	and higher band-edge cannot be
2.4	2.1051, 22.917(b)	4.5	Spurious Emissions at Antenna Terminals	869.4 MHz	0	Pass	used. The lowest usable channel is
	22.917(D)		(±1MHz)	893.6 MHz	0	Pass	129 (869.4MHz), the highest usabl
				869.2 MHz+ 881.6 MHz		N/A	channel is 250 (893.6 MHz)
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz		N/A	
				881.6 MHz		N/A	
	0.4050			893.8 MHz		N/A	
2.5	2.1053,	4.5	Radiated Spurious Emissions	869.4 MHz		N/A	
	22.917(a)			893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz	0	Pass	
				881.6 MHz+ 893.8 MHz	0	Pass	
				869.2 MHz		N/A	
				881.6 MHz		N/A	
	a			893.8 MHz		N/A	
2.6	2.1051,	145		869.4 MHz		N/A	
	22.917(a)			893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz	0	Pass	
				881.6 MHz+ 893.8 MHz	0	Pass	
				869.2 MHz		N/A	
				881.6 MHz		N/A	
				893.8 MHz		N/A	-
2.7	2.1055,	4.3	Frequency Stability Under Temperature	869.4 MHz		N/A	
	22.355	-	Variations	893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	
				869.2 MHz		N/A	
				881.6 MHz		N/A	
				893.8 MHz		N/A	
2.8	2.1055,	4.3	Frequency Stability Under Voltage Variations	869.4 MHz		N/A	
	22.355			893.6 MHz		N/A	
				869.2 MHz+ 881.6 MHz		N/A	
				881.6 MHz+ 893.8 MHz		N/A	-

N/A – Not Applicable

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1.3 DECLARATION OF BUILD STATUS

MAIN EUT					
MANUFACTURING DESCRIPTION	Radio Unit				
MANUFACTURER	Ericsson AB				
PART NUMBER	KRC 161 194/1				
SERIAL NUMBER	CB4C986602				
HARDWARE VERSION	R1B				
SOFTWARE VERSION	G10A/1_R25E				
TRANSMITTER OPERATING RANGE	869.4MHz - 893.6MHz				
INTERMEDIATE FREQUENCIES					
ITU DESIGNATION OF EMISSION	250KGXW 250KG7W				
HIGHEST INTERNALLY GENERATED FREQUENCY	894MHz				
OUTPUT POWER (RMS) (W or dBm)	GMSK: UC: 46.0dBm HC: 42.5dBm TCC: 48.5dBm 8PSK: UC: 42.7dBm HC: 39.2dBm TCC: 45.2dBm				
OUTPUT POWER TOLERANCE	± 2dB				
FCC ID	TA8AKRC161194-1				
IC ID	287AB-AG1611941				
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is a Radio Unit of GSM Base Stations				

Signature

28 May 2010

Date D of B S Serial No

28 May 2010 o 75909919/01

No responsibility will be accepted by TÜV 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) was an Ericsson AB RUG 11 B5 working in the public mobile service 800MHz band which provides communication connections to GSM850 network. The RUG 11 B5 operates from a -48V volt supply.

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



Equipment Under Test



1.4.2 Test Configuration

Configuration 1 – UC (Hybrid Uncombined): Output 1 without internal combiner

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

Configuration 2 – TCC (Transmitter Coherent Combining): Output 1 with internal combiner plus TCC

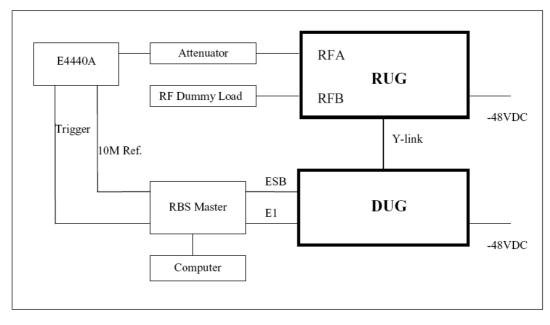
The EUT was configured in accordance with FCC CFR 47 Part 22 and Industry Canada RSS-132.

Configuration 3 – HC (Hybrid combined): Output 1 with internal combiner

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

The RUG 11 B5 supports both GMSK and 8PSK modulation at 850MHz, the unit includes a maximum of two TRX's. Testing was performed on one TRX RF output connector. The complete testing was performed with both modulation schemes at maximum RF power unless otherwise stated. The EUT was powered by a -48V DC Power supply.



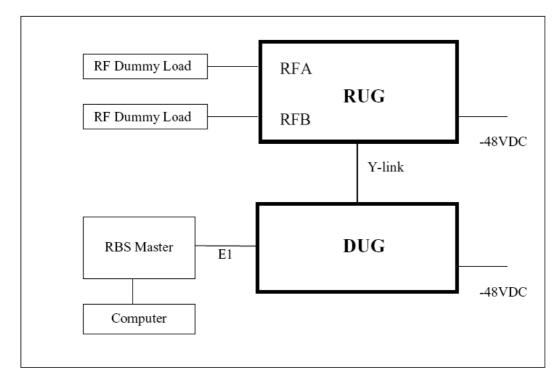


Test Setup, Conducted Measurement:

Test Object	Model Type	Version	Serial Number
RUG 11 B5	KRC 161 194/1	R1B	CB4C986602

Auxiliary Equipment	Model Type	Version	Serial Number
Computer	HP NC6400		
DUG 10 01	KDU 137 597/1	R1G	CB4C823749
RBS Master 2	LPY 107 1007/1	R1D/B	05W42
Spectrum Analyzer	E4440		MY46186610





Test Setup, Radiated Measurement:

Test Object	Model Type	Version	Serial Number
RUG 11 B5	KRC 161 194/1	R1B	CB4C986602

Auxiliary Equipment	Model Type	Version	Serial Number
Computer	HP NC6400		
DUG 10 01	KDU 137 597/1	R1G	CB4C823749
RBS Master 2	LPY 107 1007/1	R1D/B	05W42



1.4.3 Modes of Operation

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

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

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

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

Mode 4 - ARFCN 129: 869.4 MHz

Mode 5 - ARFCN 250: 893.6 MHz

Mode 6 - ARFCN 128 + 190: 869.2 MHz + 881.6 MHz (Bottom Channel + Middle Channel)

Mode 7 - ARFCN 190 + 251: 881.6 MHz + 893.8 MHz (Middle Channel + Top Channel)

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 a chamber as appropriate.

The EUT was powered from a -48 V 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.



SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the Ericsson AB RUG 11 B5



2.1 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.1.1 Specification Reference

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

2.1.2 Equipment Under Test

RUG 11 B5, S/N: CB4C986602

2.1.3 Date of Test and Modification State

17 May and 17 June 2010 – 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 22 and Industry Canada RSS-132.

Using a spectrum analyzer/power metre and attenuator(s), the output power of the EUT was measured at the antenna terminals. The EUT supports GMSK and 8PSK modulation schemes. The carrier power was measured with both modulations and all of the timeslots working.

The spectrum analyzer RBW and VBW were set to 1MHz and the path loss measured and entered as a reference level offset.

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

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

2.1.6 Environmental Conditions

	17 May 2010	17 June 2010
Ambient Temperature	25.3°C	27.4°C
Relative Humidity	37.7%	39.8%



2.1.7 Test Results

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

The test results are shown below

<u>GMSK</u>

Configuration 1 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	869.2	40.9	46.32 / 46.00	42.85 / 39.81
Middle	881.6	40.9	46.51 / 46.13	44.77 / 41.02
Тор	893.8	40.9	46.52 / 46.08	44.87 / 40.55

Configuration 2 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	869.2	40.9	49.15 / 48.63	82.22 / 72.95
Middle	881.6	40.9	49.21 / 48.70	83.37 / 74.13
Тор	893.8	40.9	49.21 / 48.72	83.37 / 74.47

Configuration 3 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	869.2	40.9	43.22 / 42.75	20.99 / 18.84
Middle	881.6	40.9	42.92 / 42.85	19.59 / 19.28
Тор	893.8	40.9	43.00 / 42.87	19.95 / 19.36



<u>8PSK</u>

Configuration 1 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	869.2	40.9	46.31 / 42.60	42.76 / 18.20
Middle	881.6	40.9	46.43 / 42.70	43.95 / 18.62
Тор	893.8	40.9	46.52 / 42.60	44.87 / 18.20

Configuration 2 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	869.2	40.9	49.09 / 45.41	81.09 / 34.75
Middle	881.6	40.9	49.10 / 45.53	81.28 / 35.73
Тор	893.8	40.9	49.11 / 45.42	81.47 / 34.83

Configuration 3 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	869.2	40.9	43.18 / 39.43	20.80 / 8.77
Middle	881.6	40.9	42.85 / 39.51	19.28 / 8.93
Тор	893.8	40.9	42.98 / 39.50	19.86 / 8.91

Limit	≤500W or <+57dBm
-------	------------------

Remarks

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



2.2 MODULATION CHARACTERISTICS

2.2.1 Specification Reference

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

2.2.2 Date of Test and Modification State

18 May 2010 – Modification State 0

2.2.3 Test Equipment Used

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

2.2.4 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.

Configuration 1 - Mode 1 - Mode 3

2.2.5 Modulation Description

The modulation scheme used in GSM is called Gaussian Minimum Shift Keying (GMSK). GMSK facilitates the use of narrow bandwidth and allows for both coherent and non coherent detection capabilities. It is a scheme in which the transitions from One to Zero or Zero to One do not occur quickly, but over a period of time. If pulses are transmitted quickly harmonics are transmitted. The power spectrum for a square wave is rich in harmonics, and the power within the side lobes is wasted, and can be a cause of potential interference.

A method to reduce the harmonics is to round off the edges of the pulses thus lowering the spectral components of the signal. In GSM this is done by using a Gaussian pre-filter which typically has a bandwidth of 81.25kHz. The output from the Gaussian filter then phase modulates the carrier. As there are no dramatic phase transitions of the carrier this gives a constant envelope and low spectral component output from the transmitter.

The spectral efficiency is calculated by

bit rate / Channel bandwidth = 270.83333 kbit/s / 200 kHz = 1.354 bit/s/Hz.

The bandwidth product BT = Bandwidth x bit duration = 81.25 kHz x 3.6923 micros = 0.3

GMSK and 8PSK overview.

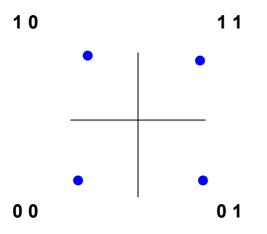
The modulation schemes used for the EUT are GMSK and 8PSK. The 8PSK modulation scheme is EDGE (Enhanced Date Rates for GSM Evolution).

A brief overview of how GMSK and 8PSK works is shown below.



GMSK (Gaussian Minimum Shift Keying)

The fundamental principal behind GMSK is Phase shift keying. This splits a data stream into a series of 2digit phase shifts, using the following phase shifts to represent data pairs.



Therefore for the BIT sequence 0 0 1 1 1 0 0 1 The corresponding phase shift will be used

BIT SEQUENCE	00	11	10	01
PHASE	225°	45°	135°	315°

This is called QPSK (Quadratic Phase Shift Keying)

<u>However</u>

There is a problem with QPSK: transition from e.g. 00 to 11 gives phase shift of 180° (π radians). This has the effect of inverting the carrier waveform and this can lead to detection errors at the receiver.

Solution: restrict phase changes to ± 90°

1. Split bit stream into 2 streams e.g.

	0	0	1	1	0 1		1 0	
I Stream	0		1		0		1	
Q stream		0		1		1		0

2. Modulate each stream with PSK (1 = 90° or $\pi/2$, 0 = -90° or - $\pi/2$ phase shift)

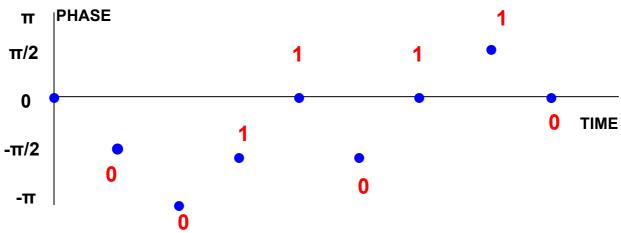
I Stream	0		1		0		1	
	-π/2		-π/2		-π/2		π/2	
Q stream		0		1		1		0
		-π/2		π/2		π/2		-π/2



3. Combine (add) the two PSK signals:

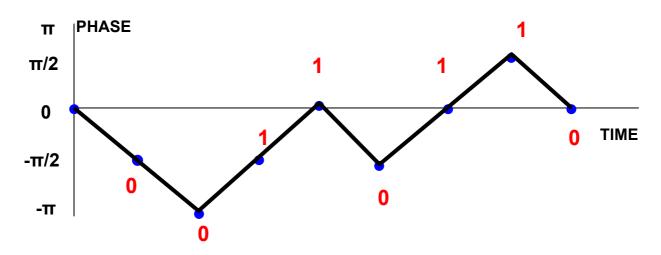
Combined Phase	-π/2	-π	-π/2	0	-π/2	0	π/2	0

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



It would be preferable to have "gradual" changes in place between each pair of bits (Continuous-phase modulation). Replacing each "rectangular" shaped pulse (for 1 or 0) with a sinusoidal pulse can do this:

Result: Minimum Shift Keying (MSK):





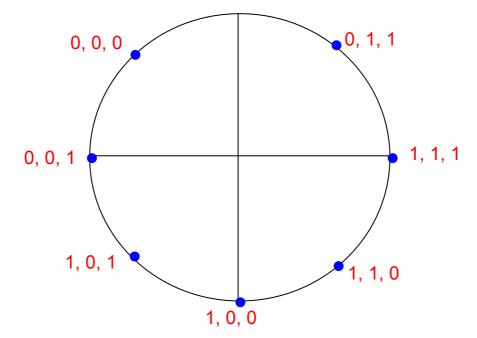
Gaussian Minimum Shift Keying

MSK has high sidebands relative to the main lobes in the frequency domain - this can lead to interference with adjacent signals.

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

8-PSK (8-Phase Shift Keying)

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





2.3 OCCUPIED BANDWIDTH

2.3.1 Specification Reference

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

2.3.2 Equipment Under Test

RUG 11 B5, S/N: CB4C986602

2.3.3 Date of Test and Modification State

18 May and 19 June 2010 – Modification State 0

2.3.4 Test Equipment Used

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

2.3.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-GEN.

The EUT was transmitting at maximum power, modulated with all timeslots active. Using a resolution bandwidth of 10 kHz and a video bandwidth of 100 kHz. The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission. The –26dBc points were also established and the emission bandwidth determined.

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

Configuration 1 - Mode 1 - Mode 2 - Mode 3

2.3.6 Environmental Conditions

	18 May 2010	19 June 2010
Ambient Temperature	25.8°C	26.7°C
Relative Humidity	37.6%	38.2%



2.3.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 22 and Industry Canada RSS-132 for Occupied Bandwidth.

The test results are shown below

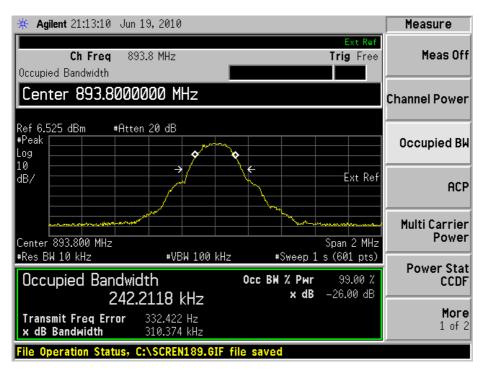
<u>GMSK</u>

ዡ Agilent 21:12:17 Jun 19, 2010	Measure
Ch Freq 869.2 MHz Trig Free Occupied Bandwidth Image: Character Structure Image: Character Structu	Meas Off
Center 869.2000000 MHz	Channel Power
Ref 6.525 dBm *Atten 20 dB *Peak Log 10	Occupied BW
dB/	ACP
Center 869.200 MHz Span 2 MHz	Multi Carrier Power
*Res BW 10 kHz *VBW 100 kHz *Sweep 1 s (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % 243.5105 kHz × dB -26.00 dB	Power Stat CCDF
Transmit Freq Error 932.965 Hz × dB Bandwidth 311.050 kHz	More 1 of 2
File Operation Status, C:\SCREN188.GIF file saved	



🔆 Agilent 21:14:17 Jun 19, 2010	Measure
Ext Ref Ch Freq 881.6 MHz Trig Free Occupied Bandwidth	Meas Off
Center 881.6000000 MHz	Channel Power
Ref 6.525 dBm #Atten 20 dB #Peak Log 10	Occupied BW
dB/ Ext Ref	ACP
Center 881.600 MHz Span 2 MHz #Res BW 10 kHz #VBW 100 kHz #Sweep 1 s (601 pts)	
Оссиріеd Bandwidth Осс ВМ % Рыг 99.00 % 240.0169 kHz × dB -26.00 dB	Power Stat CCDF
Transmit Freq Error 335.700 Hz x dB Bandwidth 315.757 kHz File Operation Status, C:\SCREN190.6IF file saved	More 1 of 2

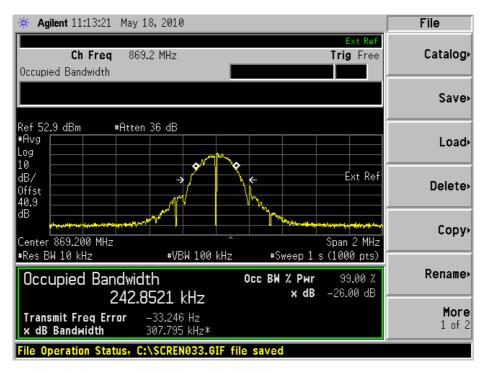
Configuration 1 - Mode 3

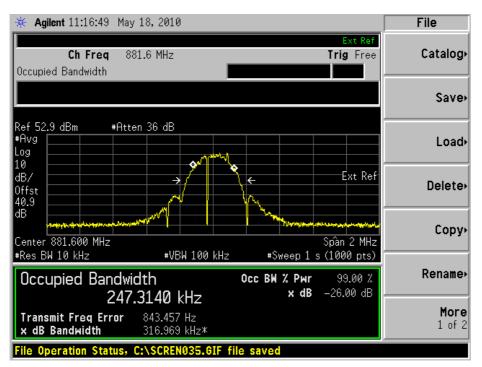




<u>8PSK</u>

Configuration 1 - Mode 1







🔆 Agilent 11:17:37 May 18, 2010	Freq/Channel
Ch Freq 893.8 MHz Trig Free Occupied Bandwidth Image: Character Street	Center Freq 893.800000 MHz
Center 893.8000000 MHz	Start Freq 892.800000 MHz
Ref 52.9 dBm #Atten 36 dB #Avg Log 10	Stop Freq 894.800000 MHz
dB/ Offst 40.9 → CExt Ref	CF Step 200.000000 kHz <u>Auto</u> Man
dB	FreqOffset 0.00000000 Hz
*Res BW 10 kHz *VBW 100 kHz *Sweep 1 s (1000 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % 236.1510 kHz × dB -26.00 dB	Signal Track On <u>Off</u>
Transmit Freq Error -2.299 kHz x dB Bandwidth 297.859 kHz* File Operation Status, C:\SCREN036.GIF file saved	



2.4 SPURIOUS EMISSIONS AT TERMINALS (±1MHz)

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test

RUG 11 B5, S/N: CB4C986602

2.4.3 Date of Test and Modification State

18 May and 18 June 2010 – 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-132.

In accordance with 22.917(b), at least 1% of the 26dB bandwith was used for the resolution and video bandwidths up to 1 MHz away from the block edge. At greater than 1MHz the resolution and video bandwidths were increased to 1 MHz. The spectrum analyser detector was set as RMS.

The reference power and path losses of all channels used for testing in each frequency block were measured. It was found that there was <0.5dB variation in all channels, thus the worst case reference level offset was used throughout. Having entered the reference level offset, the limit line was displayed, showing the -13dBm.

The EUT was tested at it's 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	
Configuration	2 - Mode 4	
	- Mode 5	
Configuration	3 - Mode 4	
	- Mode 5	

2.4.6 Environmental Conditions

	18 May 2010	18 June 2010
Ambient Temperature	25.8°C	27.6°C
Relative Humidity	37.6%	39.9%



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-132 for Spurious Emissions Antenna Terminals (±1MHz)

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

Remark:

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

Channel (MHz)	Edge Test with GMSK modulation Channel No./Frequencies	Edge Test with 8PSK modulation Channel No./Frequencies
Bottom 869.4	Channel: 129 Frequency: 869MHz P0 Power level	Channel: 129 Frequency : 869MHz P0 Power level
Тор 893.6	Channel: 250 Frequency : 894MHz P0 Power level	Channel : 250 Frequency: 894MHz P0 Power level

Configuration 1 - Mode 4 & 5

Configuration 2 - Mode 4 & 5

Channel (MHz)	Edge Test with GMSK modulation Channel No./Frequencies	Edge Test with 8PSK modulation Channel No./Frequencies
Bottom 869.4	Channel: 129 Frequency: 869MHz P0 Power level	Channel: 129 Frequency : 869MHz P0 Power level
Тор 893.6	Channel: 250 Frequency : 894MHz P0 Power level	Channel : 250 Frequency: 894MHz P0 Power level

Configuration 3 - Mode 4 & 5

Channel (MHz)	Edge Test with GMSK modulation Channel No./Frequencies	Edge Test with 8PSK modulation Channel No./Frequencies
Bottom 869.4	Channel: 129 Frequency: 869MHz P0 Power level	Channel: 129 Frequency : 869MHz P0 Power level
Тор 893.6	Channel: 250 Frequency : 894MHz P0 Power level	Channel : 250 Frequency: 894MHz P0 Power level

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.

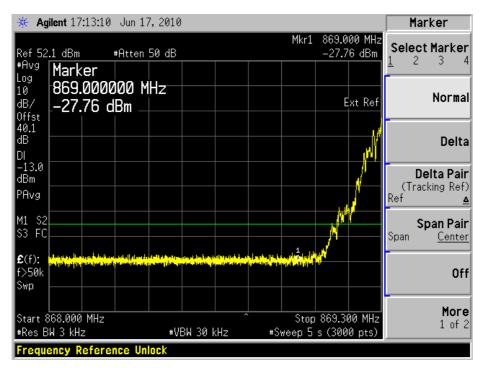
The channels outside of those shown in the table above were not tested at lower power levels to determine a level at which compliance would be achieved. Therefore, to maintain compliance, only the channels shown in the table above shall be used.



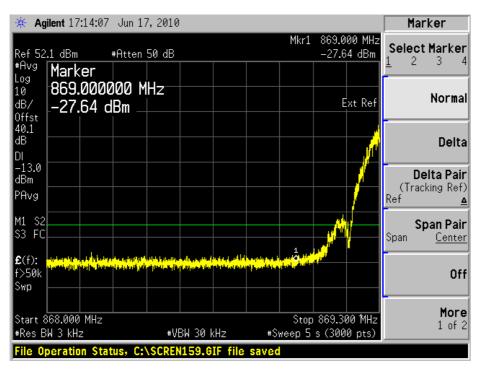
The test results are shown below

Configuration 1 - Mode 4

GMSK - Edge Measurement with EUT Transmitting on P0 Power Level



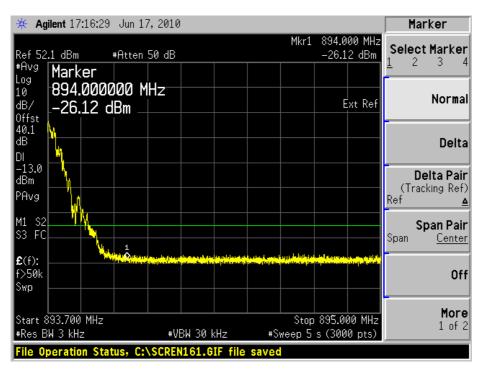
8PSK - Edge Measurement with EUT Transmitting on P0 Power Level



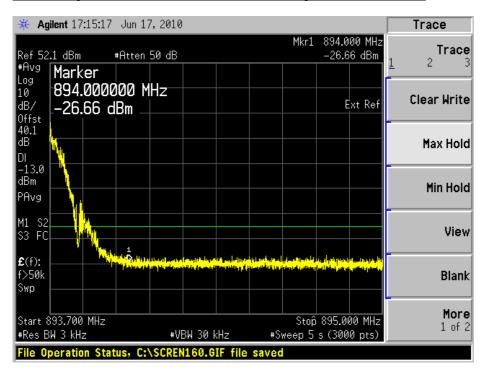


Configuration 1 - Mode 5

GMSK - Edge Measurement with EUT Transmitting on P0 Power Level



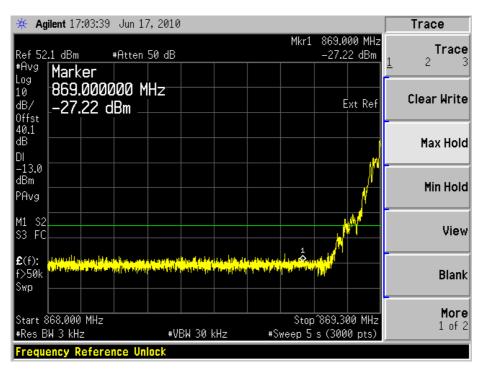
8PSK - Edge Measurement with EUT Transmitting on P0 Power Level



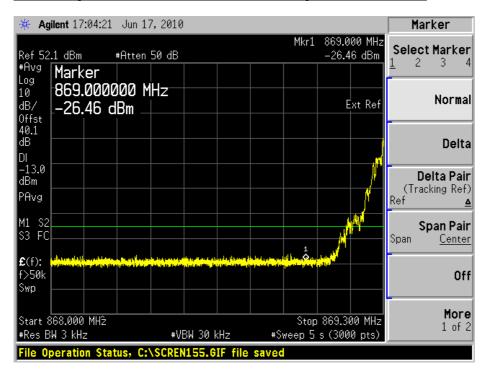


Configuration 2 - Mode 4

GMSK - Edge Measurement with EUT Transmitting on P0 Power Level

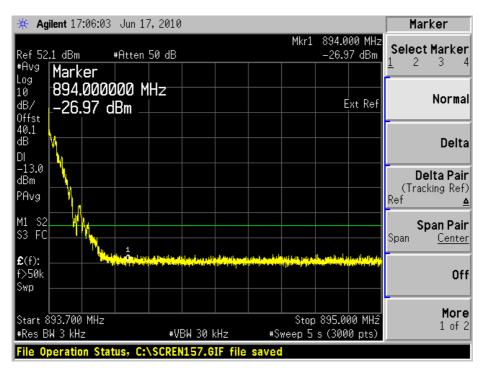


8PSK - Edge Measurement with EUT Transmitting on P0 Power Level

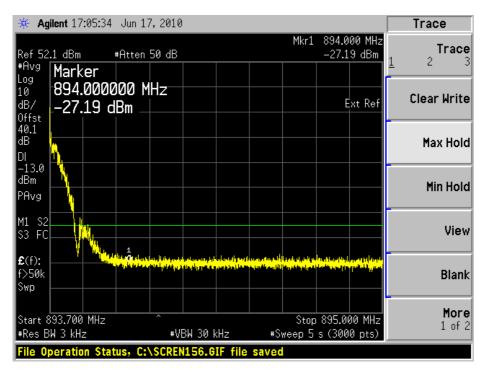




GMSK - Edge Measurement with EUT Transmitting on P0 Power Level

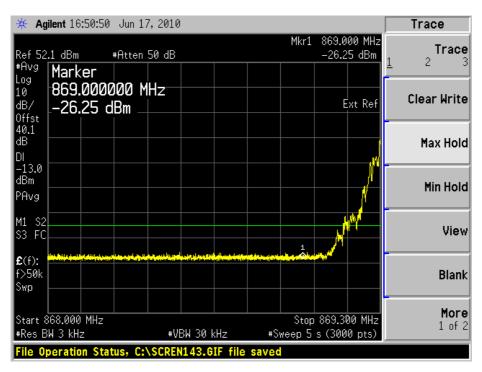


8PSK - Edge Measurement with EUT Transmitting on P0 Power Level

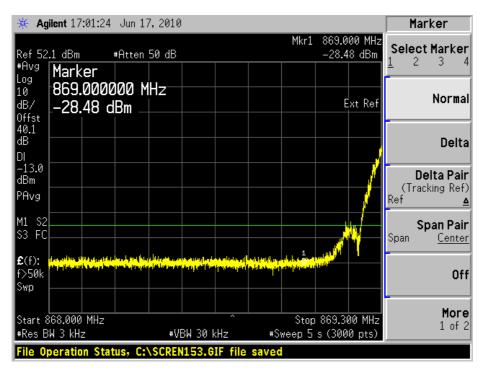




GMSK - Edge Measurement with EUT Transmitting on P0 Power Level

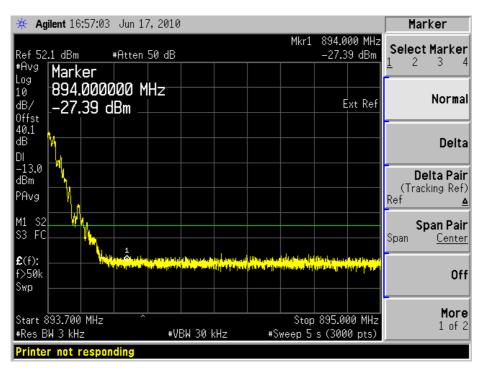


8PSK - Edge Measurement with EUT Transmitting on P0 Power Level

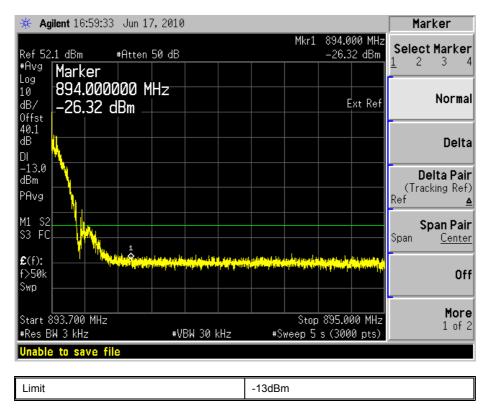




GMSK - Edge Measurement with EUT Transmitting on P0 Power Level



8PSK - Edge Measurement with EUT Transmitting on P0 Power Level





2.5 RADIATED SPURIOUS EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 2: 2009, Clause 2.1053 FCC CFR 47 Part 22, 22.917(a) Industry Canada RSS-132, Clause 4.5

2.5.2 Equipment Under Test

RUG 11 B5, S/N: CB4C986602

2.5.3 Date of Test and Modification State

21 May 2010 – 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.

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 – 1GHz were then formally measured using a Peak detector. Emissions identified within the range 1GHz – 10GHz were then formally measured using Peak and Average Detectors, as appropriate.

In the frequency Range 30MHz - 1GHz, the measurement was performed with a resolution bandwidth of 100kHz, in the frequency Range 1GHz - 10GHz, the measurement was performed with a resolution of 1MHz.

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

The limits was displayed, showing the -13dBm

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 Configuration 2 - Mode 1 - Mode 2 - Mode 2 - Mode 3 Configuration 3 - Mode 6 - Mode 7



2.5.6 Environmental Conditions

	21 May 2010
Ambient Temperature	23.4°C
Relative Humidity	36.7%

2.5.7 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

<u>GMSK</u>

Configuration 1 - Mode 1

No emissions were detected within 35dB of the limit.

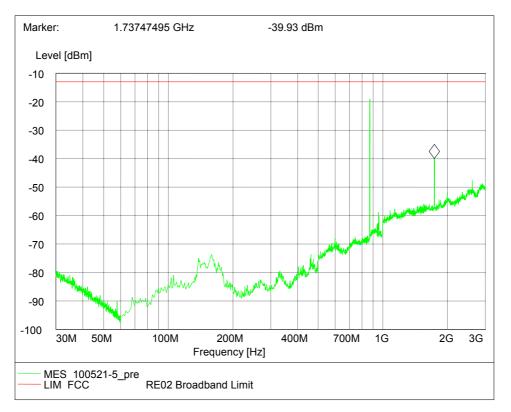
Configuration 1 - Mode 2

No emissions were detected within 35dB of the limit.

Configuration 1 - Mode 3



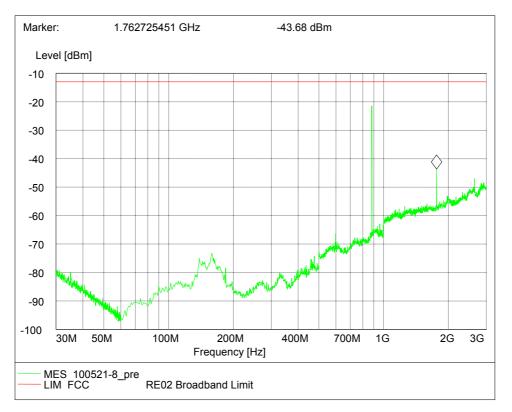
<u>30MHz – 3GHz:</u>



<u> 3GHz – 10GHz:</u>



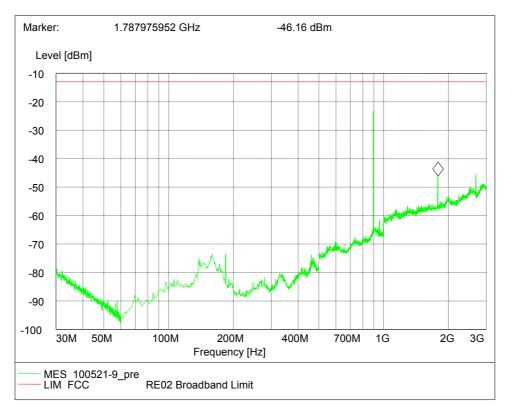
<u>30MHz – 3GHz:</u>



<u> 3GHz – 10GHz:</u>



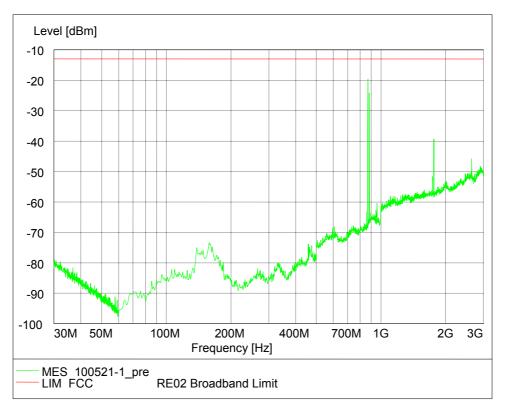
<u>30MHz – 3GHz:</u>



<u> 3GHz – 10GHz:</u>



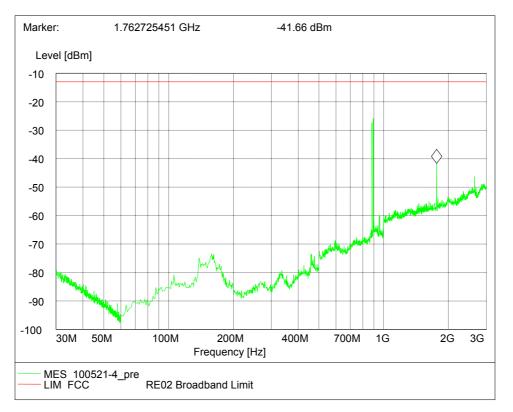
<u>30MHz – 3GHz:</u>



<u> 3GHz – 10GHz:</u>



<u>30MHz – 3GHz:</u>



<u> 3GHz – 10GHz:</u>



<u>8PSK</u>

Configuration 1 - Mode 1

No emissions were detected within 35dB of the limit.

Configuration 1 - Mode 2

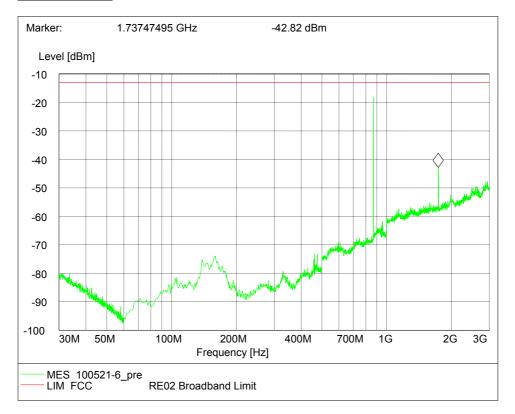
No emissions were detected within 35dB of the limit.

Configuration 1 - Mode 3

No emissions were detected within 35dB of the limit.

Configuration 2 - Mode 1

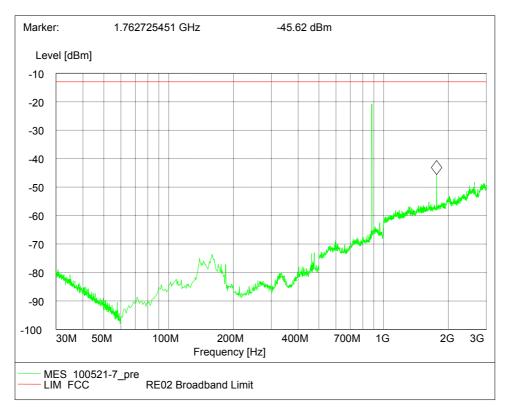
<u> 30MHz – 3GHz:</u>



<u> 3GHz – 10GHz:</u>



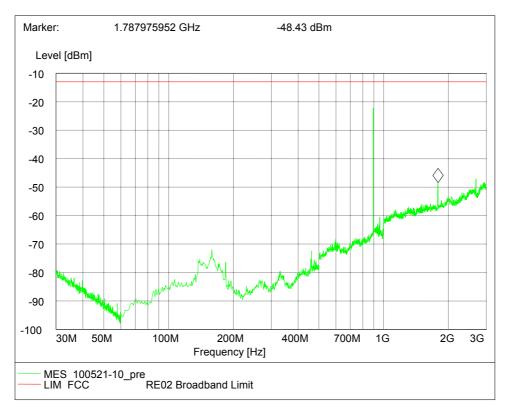
<u>30MHz – 3GHz:</u>



<u> 3GHz – 10GHz:</u>



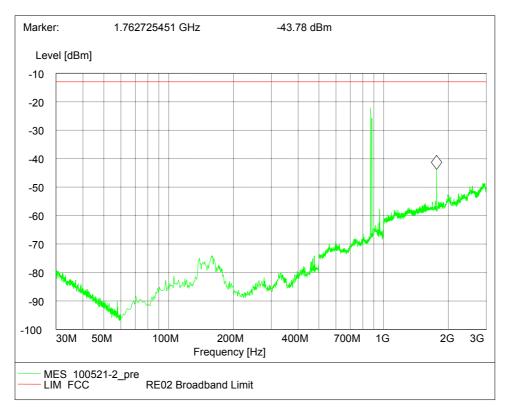
<u>30MHz – 3GHz:</u>



<u> 3GHz – 10GHz:</u>



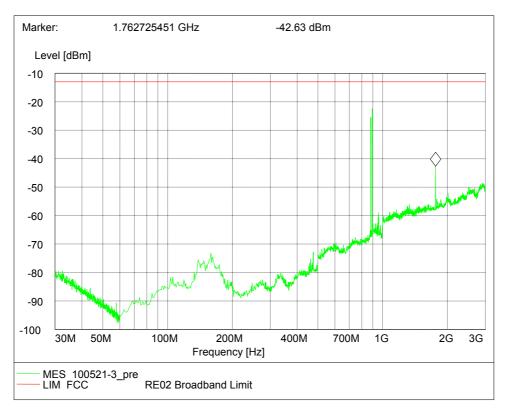
<u>30MHz – 3GHz:</u>



<u> 3GHz – 10GHz:</u>



<u>30MHz – 3GHz:</u>



<u> 3GHz – 10GHz:</u>

No emissions were detected within 35dB of the limit.

Limit -13dBm

Remarks

The EUT does not exceed -13dBm at the measured frequencies.



2.6 CONDUCTED SPURIOUS EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 2: 2009, Clause 2.1051 FCC CFR 47 Part 22, 22.917(a) Industry Canada RSS-132, Clause 4.5

2.6.2 Equipment Under Test

RUG 11 B5, S/N: CB4C986602

2.6.3 Date of Test and Modification State

18 and 19 and 20 May 2010 – 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.

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of a filter and attenuators and the frequency spectrum investigated from 9kHz to 9GHz. The EUT was set to transmit on maximum power. The EUT was tested on Bottom, Middle and Top channels for both modulation types. The resolution was set to 100kHz for 9kHz to 1GHz and 1MHz for 1GHz to 9GHz thus meeting the requirements of Part 22.917(b). The spectrum analyser detector was set to Max Hold.

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

In addition, measurements were made up to the 10th harmonic of the fundamental.

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

Configuration	
	- Mode 2
	- Mode 3
Configuration	2 - Mode 1
	- Mode 2
	- Mode 3
Configuration	3 - Mode 6
-	- Mode 7



2.6.6 Environmental Conditions

	18 May 2010	19 May 2010	20 May 2010
Ambient Temperature	25.8°C	25.0°C	25.2°C
Relative Humidity	37.6%	37.1%	37.9%

2.6.7 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 Radiated Spurious Emissions.

The test results are shown below

Remark:

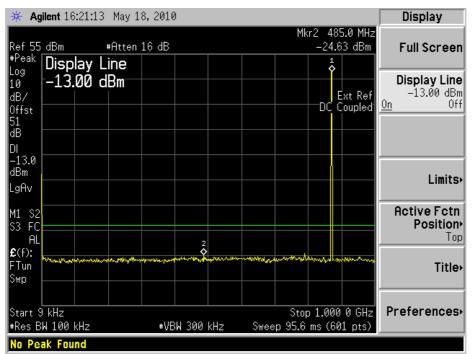
The emissions at 9kHz on the plots was not generated by the test object. A complementary measruement with a smaller RBW showed that it was related to the LO feedthrough.



<u>GMSK</u>

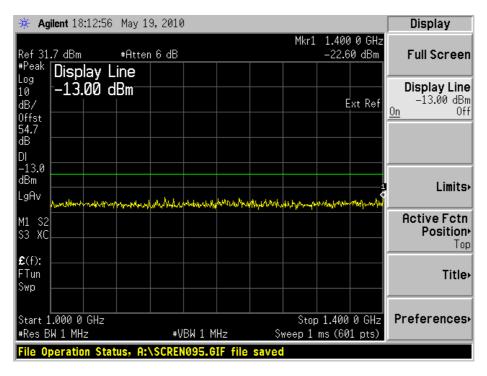
Configuration 1 - Mode 1

9kHz to 1GHz



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

1GHz to 1.4GHz



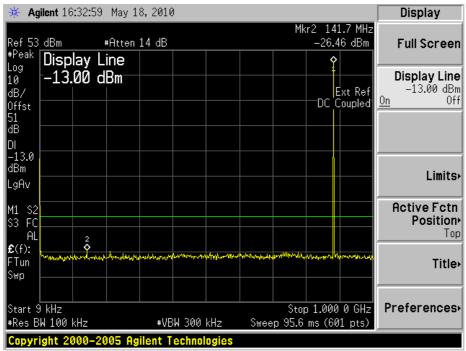


1.4GHz to 9GHz

🔆 Agilent 18:06:28 May 19, 2010	Display
Mkr1 7.366 GHz Ref 30.7 dBm #Atten 6 dB — 17.85 dBm	Full Screen
*Peak Display Line 10 -13.00 dBm	Display Line
dB/ Ext Ref	-13.00 dBm <u>On</u> Off
54.7 dB DI	
-13.0 dBm LgAv underson of the way to a show the stand of	Limits⊦
M1 S2 S3 XC	Active Fctn Position• Top
£ (f): FTun Swp	Title⊦
Start 1.400 GHz Stop 9.000 GHz #Res BW 1 MHz #VBW 1 MHz Sweep 12.68 ms (601 pts)	Preferences.
File Operation Status, A:\SCREN088.GIF file saved	

Configuration 1 - Mode 2

9kHz to 1GHz



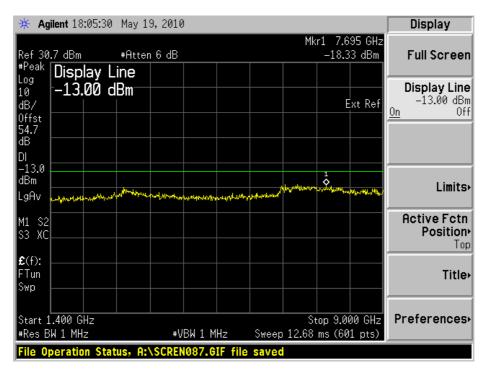
Note: The emission beyond the limit is the operating frequency.



1GHz to 1.4GHz

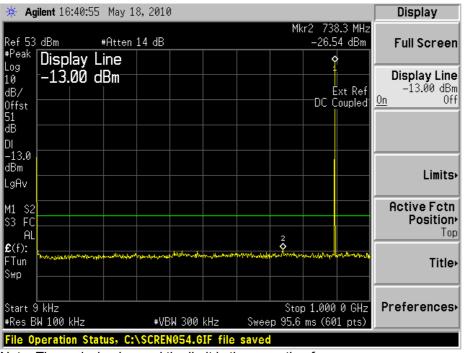
🔆 Agilent 18:13:39 May 1	9,2010				Display
Ref 31.7 dBm #Atten	n 6 dB		Mkr1	1.062 0 GHz -22.63 dBm	Full Screen
^{*Peak} Display Line ^{Log} -13.00 dBm					Display Line -13.00 dBm
dB/ Offst 54.7				Ext Ref	On Off
dB DI -13.0					
dBm1 LgAv	noralin provide	but any and the second second	han an a	ntweethout the	Limits
M1 S2 S3 XC					Active Fctn Position Top
£(f): FTun Swp					Title⊦
Start 1.000 0 GHz #Res BW 1 MHz	#VBW 1 M	IHz		1.400 0 GHz ms (601 pts)	Preferences.
File Operation Status, A:	SCREN096.G	IF file say			

1.4GHz to 9GHz



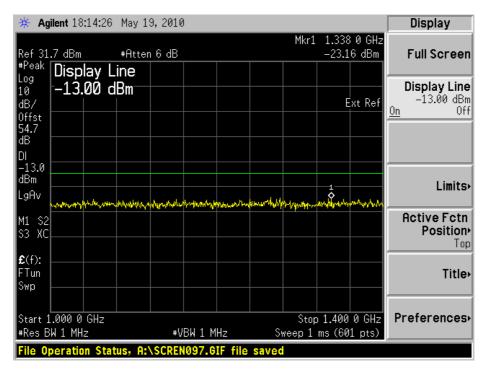


9kHz to 1GHz



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

1GHz to 1.4GHz



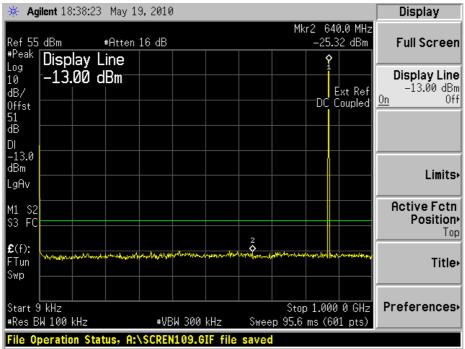


1.4GHz to 9GHz

🔆 Agilent 18:04:26 May 19, 2010	Display
Mkr1 8.468 GHz Ref 30.7 dBm #Atten 6 dB — 18.95 dBm	Full Screen
*Peak Display Line 10 -13.00 dBm	Display Line
dB/ Ext Ref	-13.00 dBm <u>On</u> Off
54.7 dB	
DI -13.0 dBm	
dBm LgAv www.tem.exercelet.co. ⁶⁴ ther.ellemeters.co.co.elemeters.	Limits⊦
M1 \$2 \$3 XC	Active Fctn Position∙
£(f):	Тор
FTun Swp	Title⊦
Start 1.400 GHz Stop 9.000 GHz	Preferences.
<pre>#Res BW 1 MHz #VBW 1 MHz Sweep 12.68 ms (601 pts) File Operation Status, A:\SCREN086.GIF file saved</pre>	

Configuration 2 - Mode 1

9kHz to 1GHz



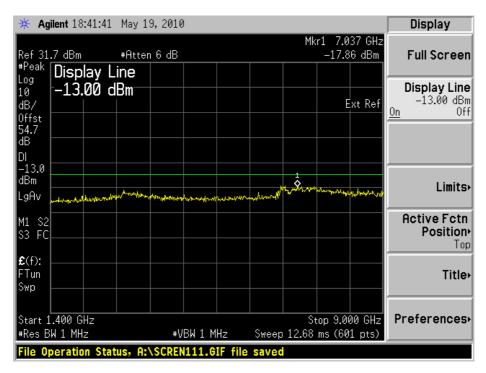
Note: The emission beyond the limit is the operating frequency.



1GHz to 1.4GHz

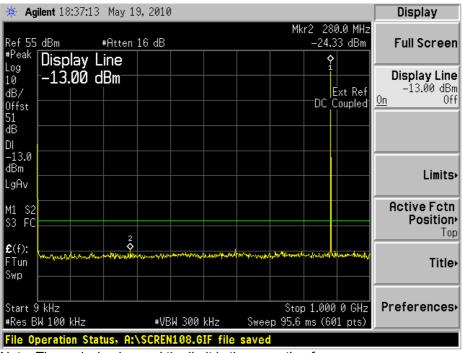
🔆 Agilent 18:26:20 May 19,	, 2010		Display
Ref 30.7 dBm #Atten	6 dB	Mkr1 1.224 -21.34	
*Peak Log 10 -13.00 dBm dB/ Offst 54.7 dB		Ex	t Ref
U –13.0 dBm LgAv "ликолина–Ипалицананана	un the state of th	han and a star and a star and a star a st	Limits
M1 S2 S3 FC			Active Fctn Position Top
£(f): FTun Swp			Title
Start 1.000 0 GHz #Res BW 1 MHz	VBW 1 MHz	Stop 1.400 0 Sweep 1 ms (601	
Frequency Reference Unio	ick		

1.4GHz to 9GHz



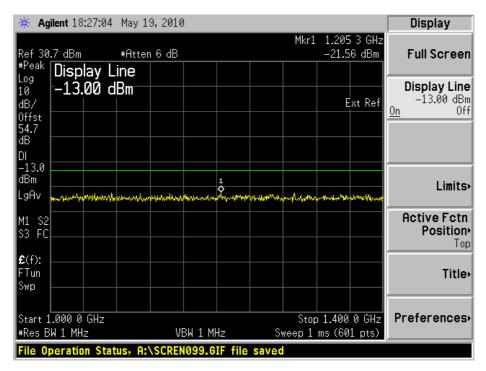


9kHz to 1GHz



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

1GHz to 1.4GHz



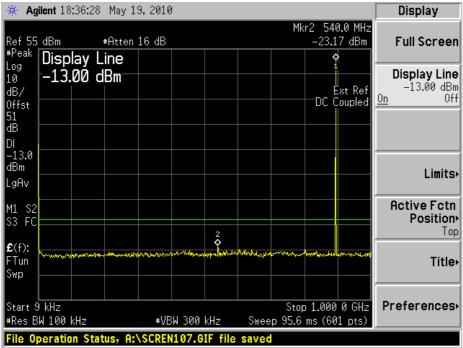


1.4GHz to 9GHz

🔆 Agilent 18:42:27 May 19, 2010		Auto Couple
Ref 31.7 dBm #Atten 6 dB #Peak Diaplay Lina	Mkr1 7.404 GHz -16.81 dBm	Auto All
^{#Peak} Log 10 -13.00 dBm dB/ Offst	Ext Ref	FFT & Sweep Auto: Best∙ Dynamic Range
54.7 dB DI -13.0		PhNoise Opt Fast Tune∙ <u>Auto</u> Man
dBm LgAv		Detector Peak∙ Auto <u>Man</u>
M1 S2 S3 FC		Avg/VBWType Log-Pwr (Video)∙ <u>Auto</u> Man
£(f): FTun Swp		ADC Dither Off∙ <u>Auto</u> Man
Start 1.400 GHz #Res BW 1 MHz #VBW 1 M	Stop 9.000 GHz 1Hz Sweep 12.68 ms (601 pts)	ADC Ranging Autorange∙ (Best S/N)
File Operation Status, A:\SCREN112.6	IF file saved	

Configuration 2 - Mode 3

9kHz to 1GHz



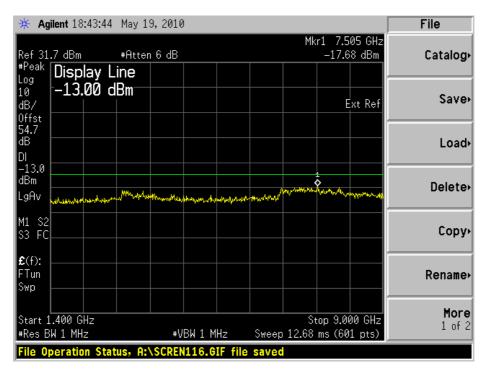
Note: The emission beyond the limit is the operating frequency.



1GHz to 1.4GHz

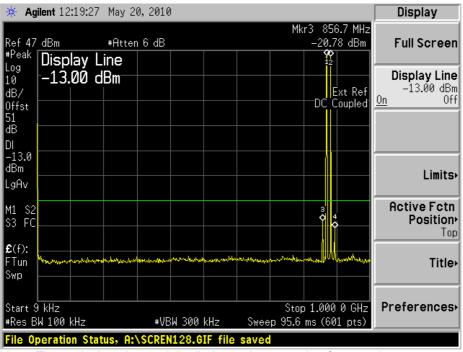
🔆 Agilent 18:27:38 May	19,2010	l						Display
Ref 30.7 dBm #Att	en 6 dB				Mkr1		2 7 GHz 2 dBm	Full Screen
*Peak Log 10 -13.00 dBm dB/ Offst 54.7						E	xt Ref	Display Line -13.00 dBm <u>On</u> Off
dB DI -13.0								
dBm LgAv _{Na} hannandanananananananananananananananana	1 homen	whenwerthe	hhubu	whether	walatura yan	Altom	Northern	Limits≻
M1 S2 S3 FC								Active Fctn Position Top
€(f): FTun Swp								Title∙
Start 1.000 0 GHz #Res BW 1 MHz	VI	3W 1 M		S	Stop weep 1		0 GHz 1 pts)	Preferences.
File Operation Status, A	:\SCREM	100.G	IF file	savec				

1.4GHz to 9GHz



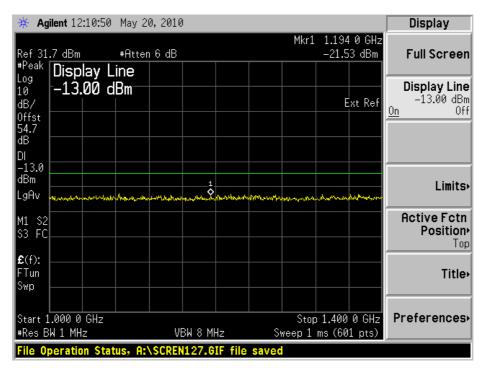


9kHz to 1GHz



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

1GHz to 1.4GHz





1.4GHz to 9GHz

🔆 Agilent 11:57:10	May 20, 2010	File
Ref 31.7 dBm #Peak Log	Mkr1 7.062 GHz #Atten 6 dB -17.34 dBm	Catalog•
10 dB/ Offst	Ext Ref	Save
54.7 dB DI		Load
-13.0 dBm LgAv www.www.	a manun mar and a far and a star and a	Delete
M1 S2 S3 FC		Сорун
€(f): FTun Swp		Rename
Start 1.400 GHz #Res BW 1 MHz	Stop 9.000 GHz #VBW 1 MHz Sweep 12.68 ms (601 pts)	More 1 of 2
Frequency Referen	nce Unlock	

Configuration 3 - Mode 7

9kHz to 1GHz

🔆 Agilent 12:26:17 May 20, 2010	Display
Mkr3 870.0 MHz Ref 47 dBm #Atten 6 dB — 21.19 dBm #Dack —	Full Screen
51	Display Line -13.00 dBm <u>On</u> Off
dB Dl -13.0 dBm LgAv	Limits
M1 S2 S3 FC €(f):	Active Fctn Position Top
FTun Nuusuna malaana ka	Title
Start 9 kHz Stop 1.000 0 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 95.6 ms (601 pts) File Operation Status, A:\SCREN131.GIF file saved	Preferences

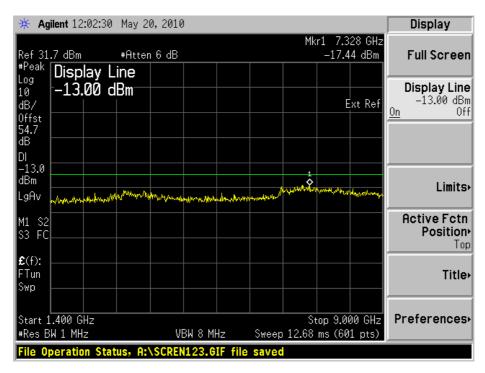
Note: The emissions beyond the limit are the operating frequencies.



1GHz to 1.4GHz

🔆 Agilent 12:07:04 May	20,2010	I						Display
Ref 31.7 dBm #Att	en 6 dB				Mkr1		7 GHz 8 dBm	Full Screen
*Peak Display Line Log 10 -13.00 dBm dB/ Offst						E	xt Ref	Display Line -13.00 dBm <u>On</u> Off
54.7 dB DI -13.0								
dBm LgAv	protestation	anton marters	yaan waa googo yo googo ha ahaa ahaa ahaa ahaa ahaa ahaa	1 ********	-	ada da ana tana tana tana tana tana tana	-homethons	Limits≀
M1 S2 S3 FC								Active Fctn Position⊷ Top
€(f): FTun Swp								Title∙
Start 1.000 0 GHz #Res BW 1 MHz	V	3W 8 MI	Hz	S	Stop Weep 1		0 GHz 1 pts)	Preferences.
File Operation Status, A	:\SCREM	124.6	IF file	save	d			

1.4GHz to 9GHz

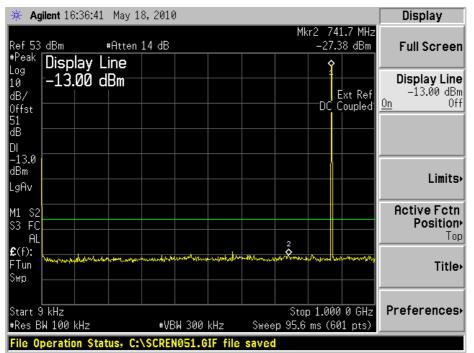




<u>8PSK</u>

Configuration 1 - Mode 1

9kHz to 1GHz



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

1GHz to 1.4GHz

🔆 Agilent 18:12:16 May 1	9,2010		Display
Ref 31.7 dBm #Atter	n 6 dB	Mkr1 1.381 3 GHz -22.84 dBm	Full Screen
*Peak Display Line Log 10 -13.00 dBm dB/		Ext Ref	Display Line -13.00 dBm On Off
Offst 54.7 dB DI			<u>0n</u> 0ff
-13.0 dBm		Maranathingunalulumasat at Matalian sadawa	Limits
M1 S2 S3 XC		an Andrew Michael Land Constitution	Active Fctn Position Top
£(f): FTun Swp			Title⊦
Start 1.000 0 GHz #Res BW 1 MHz	#VBW 1 MHz	Stop 1.400 0 GHz Sweep 1 ms (601 pts)	Preferences.
File Operation Status, A:	SCREN094.GIF file	saved	

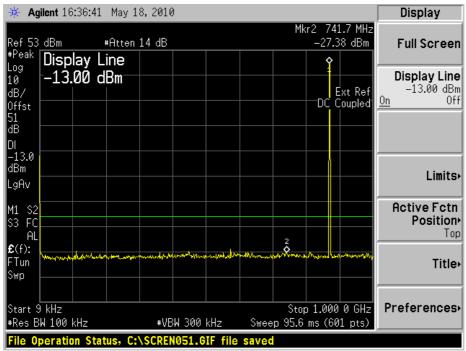


1.4GHz to 9GHz

🔆 Agilent 18:07:21 May 19, 2010	Display
Mkr1 7.366 GHz Ref 30.7 dBm #Atten 6 dB —19.25 dBm	Full Screen
*Peak Display Line	Display Line
dB/ Ext Ref	-13.00 dBm <u>On</u> Off
54.7 dB DI	
-13.0 dBm	Limits
LSAV monorphy and the second and the	
M1 S2 S3 XC	Active Fctn Position Top
£(f):	
FTun Swp	Title∙
Start 1.400 GHz Stop 9.000 GHz	Preferences.
#Res BW 1 MHz #VBW 1 MHz Sweep 12.68 ms (601 pts)	
File Operation Status, A:\SCREN089.GIF file saved	

Configuration 1 - Mode 2

9kHz to 1GHz



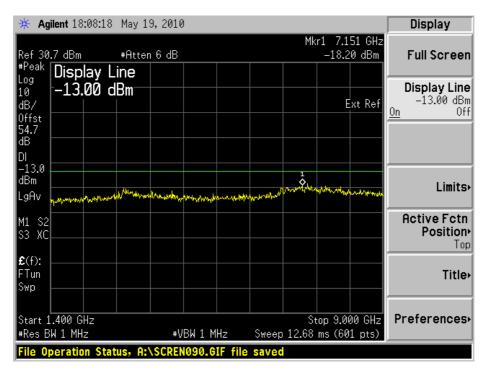
Note: The emission beyond the limit is the operating frequency.



1GHz to 1.4GHz

🔆 Agilent 18:11:38 May 1	9,2010				Display
Ref 31.7 dBm #Atter	ı6 dB		Mkr1	1.052 0 GHz -21.83 dBm	Full Screen
*Peak Log 10 - 13.00 dBm dB/				Ext Ref	Display Line -13.00 dBm
0ffst 54.7 dB					On Off
DI -13.0 dBm 1					Limits•
LgAv	and the second	wallowanth	un har hat have a fer	www.waterholden.ml	
M1 S2 S3 XC					Active Fctn Position• Top
£ (f): FTun Swp					Title⊦
Start 1.000 0 GHz #Res BW 1 MHz	#VBW 1 M) 1.400 0 GHz ms (601 pts)	Preferences.
File Operation Status, A:\SCREN093.GIF file saved					

1.4GHz to 9GHz



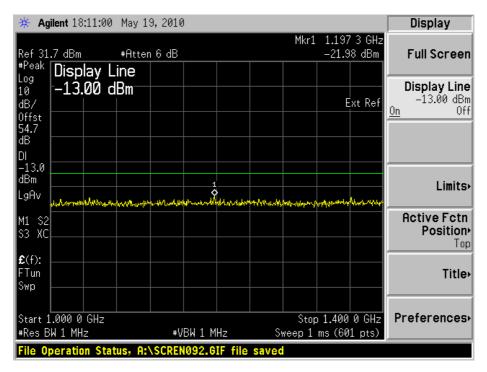


9kHz to 1GHz

🔆 Agilent 16:39:12 May 18, 2010	Display			
Mkr2 251.7 MHz Ref 53 dBm #Atten 14 dB	Full Screen			
^{*Peak} Display Line ∲ 10 −13.00 dBm	Display Line			
dB/ Éxt Ref Offst DC Coupled	-13.00 dBm <u>On</u> Off			
51 dB				
DI -13.0 dBm				
LgAv	Limits⊦			
M1 S2	Active Fctn Position•			
AL £ (f):	Top			
FTun Swp	Title⊦			
Start 9 kHz Stop 1.000 0 GHz	Preferences.			
<pre>#Res BW 100 kHz #VBW 300 kHz Sweep 95.6 ms (601 pts) File Operation Status, C:\SCREN053.6IF file saved</pre>				
The operation status, c. (scheross of the saved				

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

1GHz to 1.4GHz



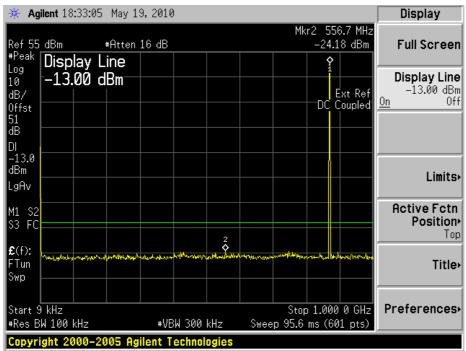


1.4GHz to 9GHz

🔆 Agilent 18:09:10 May 19, 2010	Display
Mkr1 7.695 GHz Ref 30.7 dBm #Atten 6 dB — 18.43 dBm	Full Screen
*Peak Display Line	Display Line
dB/ Ext Ref	-13.00 dBm <u>On</u> Off
54.7 dB	
DI	
dBm LgAv manipuptinghandradan manipupting and a start a	Limits⊦
M1 S2 S3 XC	Active Fctn Position•
£(f):	Тор
FTun Swp	Title∙
Start 1.400 GHz Stop 9.000 GHz	Preferences.
#Res BW 1 MHz #VBW 1 MHz Sweep 12.68 ms (601 pts)	
File Operation Status, A:\SCREN091.GIF file saved	

Configuration 2 - Mode 1

9kHz to 1GHz



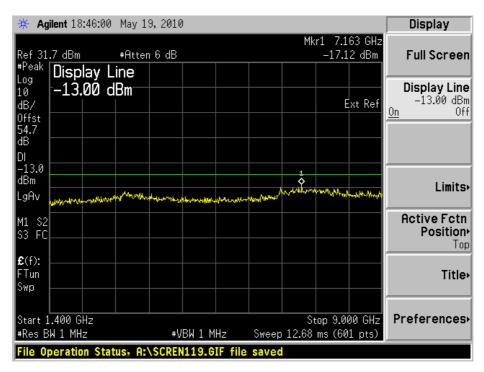
Note: The emission beyond the limit is the operating frequency.



1GHz to 1.4GHz

🔆 Agilent 18:29:23 May	19,2010	I						Display
Ref 30.7 dBm #At	ten 6 dB				Mkr1		3 GHz 1 dBm	Full Screen
*Peak Log 10 -13.00 dBm dB/ Offst 54.7						E	xt Ref	Display Line -13.00 dBm <u>On</u> Off
dB DI								
-13.0 dBm LgAv	www.which.org	homen	Mapricantal	ne t	and the state of the	ggannya ^g gan	posetuneur	Limits
M1 S2 S3 FC								Active Fctn Position Top
£ (f): FTun Swp								Title⊦
Start 1.000 0 GHz #Res BW 1 MHz	VE	3W 8 MH	lz	SI	Stop weep 1		0 GHz 1 pts)	Preferences.
File Operation Status,	A:\SCREN	103.6	lF file	saved				

1.4GHz to 9GHz



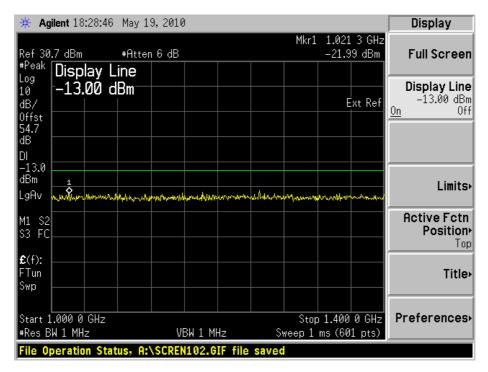


9kHz to 1GHz

★ Agilent 18:34:27 May 19, 2010	Display
Mkr2 955.0 MHz Ref 55 dBm #Atten 16 dB — 24.39 dBm	Full Screen
*Peak Log 10 Display Line ↑ 10 -13.00 dBm Ext Ref dB/ 0ffst DC Coupled	Display Line -13.00 dBm <u>On</u> Off
51 dB DI -13.0	
dBm LgAv	Limits
M1 \$2 \$3 FC	Active Fctn Position Top
£(f): FTun Swp	Title•
Start 9 kHz Stop 1.000 0 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 95.6 ms (601 pts)	Preferences.
No Peak Found	

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

1GHz to 1.4GHz



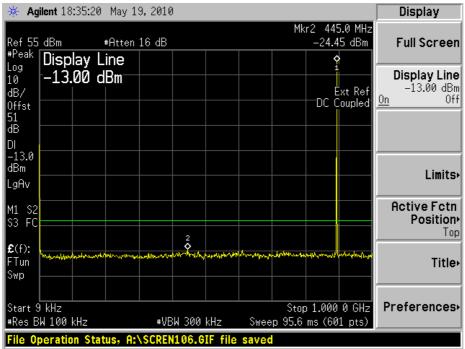


1.4GHz to 9GHz

🔆 Agilent 18:45:06 May 19, 2010	Display
Mkr1 7.138 GHz Ref 31.7 dBm #Atten 6 dB —18.18 dBm	Full Screen
^{*Peak} Display Line 10 -13.00 dBm	Display Line
dB/ Ext Ref	-13.00 dBm <u>On</u> Off
54.7 dB DI	
	Limits
LgAv when he was a second and a	Active Fctn
\$3 FC	Position Top
£(f):	Title⊦
Swp	Ductourness
Start 1.400 GHz Stop 9.000 GHz #Res BW 1 MHz #VBW 1 MHz Sweep 12.68 ms (601 pts)	Preferences.
File Operation Status, A:\SCREN118.GIF file saved	

Configuration 2 - Mode 3

9kHz to 1GHz



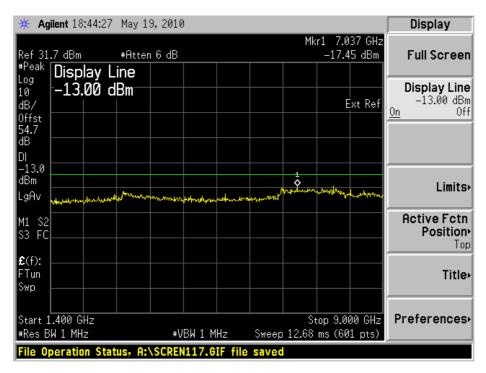
Note: The emission beyond the limit is the operating frequency.



1GHz to 1.4GHz

🗰 Agilent 18:28:07 May 19, 2010	Display
Mkr1 1.182 0 GHz Ref 30.7 dBm #Atten 6 dB -21.82 dBm	Full Screen
*Peak Log 10 Display Line 10 -13.00 dBm dB/ 0ffst Ext Ref	Display Line -13.00 dBm <u>On</u> Off
54.7 dB DI -13.0	
dBm LgAv phawnanahaappelannaarpointhetimaalajaacharmaadopathiminaachimathimina	Limits≻
M1 S2 S3 FC	Active Fctn Position• Top
£(f):	Title⊦
Start 1.000 0 GHz Stop 1.400 0 GHz #Res BW 1 MHz Sweep 1 ms (601 pts)	Preferences.
File Operation Status, A:\SCREN101.GIF file saved	

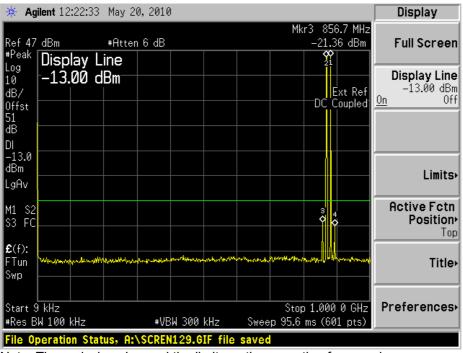
1.4GHz to 9GHz





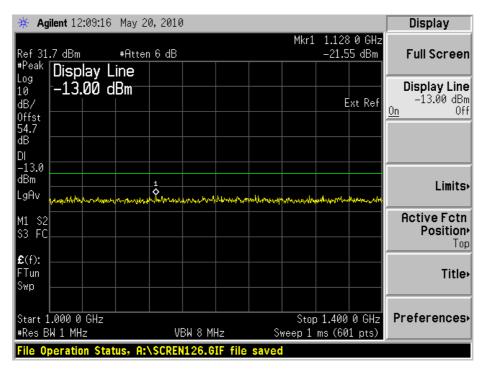
Configuration 3 - Mode 6

9kHz to 1GHz



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

1GHz to 1.4GHz





1.4GHz to 9GHz

ዡ Agilent 12:00:35 May 20, 2010	Display
Mkr1 7.277 GHz Ref 31.7 dBm #Atten 6 dB — 16.21 dBm	Full Screen
*Peak Display Line 10 -13.00 dBm	Display Line
dB/ Ext Ref 0ffst	-13.00 dBm <u>On</u> Off
54.7 dB	
DI -13.0 1	
dBm LgAv mannengerth resource and have more and man der and have a second of the sec	Limits
M1 S2 S3 FC	Active Fctn Position•
£(f):	Тор
FTun Swp	Title∙
Start 1.400 GHz Stop 9.000 GHz	Preferences.
#Res BW 1 MHz VBW 8 MHz Sweep 12.68 ms (601 pts)	
File Operation Status, A:\SCREN121.GIF file saved	

Configuration 3 - Mode 7

9kHz to 1GHz

🔆 Agilent 12:24:58 May 20), 2010		Display
Ref 47 dBm #Atten #Peak Display Line	6 dB	Mkr3 870.0 MHz -21.91 dBm	Full Screen
Log 10 -13.00 dBm dB/ 0ffst 51		Ext Ref	Display Line -13.00 dBm <u>On</u> Off
dB DI dBm LgAv			Limits
M1 S2 S3 FC		 ⊗ 4 ↓	Active Fctn Position Top
£(f): FTun Swp		nonderson and the second second	Title⊦
Start 9 kHz #Res BW 100 kHz	#VBW 300 kHz	Stop 1.000 0 GHz Sweep 95.6 ms (601 pts)	Preferences.
File Operation Status, A:\	SCREN130.GIF file	saved	

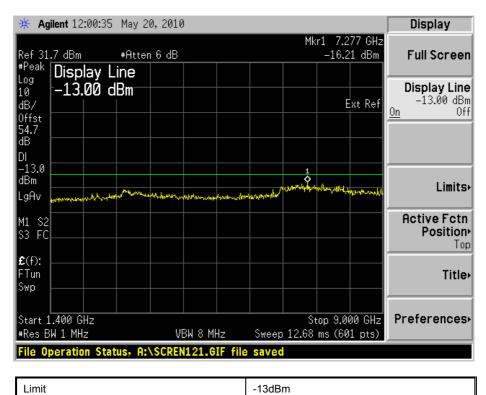
Note: The emissions beyond the limit are the operating frequencies.



1GHz to 1.4GHz

🔆 Agilent 12:08:12 May 20, 2010	Display		
Mkr1 1.2 Ref 31.7 dBm #Atten 6 dB -21	37 3 GHz .62 dBm Full Screen		
*Peak Display Line	Ext Ref On Off		
dB DI			
-13.0 dBm LgAv	Limits≻		
M1 \$2 \$3 FC	Active Fctn Position Top		
£(f): FTun Swp	Title⊦		
Start 1.000 0 GHz Stop 1.40 #Res BW 1 MHz VBW 8 MHz Sweep 1 ms (6			
File Operation Status, A:\SCREN125.GIF file saved	File Operation Status, A:\SCREN125.GIF file saved		

1.4GHz to 9GHz





2.7 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.7.1 Specification Reference

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

2.7.2 Equipment Under Test

RUG 11 B5, S/N: CB4C986602

2.7.3 Date of Test and Modification State

19 May 2010 – 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.

The EUT was set to transmit on maximum power with all timeslots active. A Spectrum Analyser was used to measure the frequency error. The average result was taken over 200 bursts. The temperature was adjusted between -30° C and $+50^{\circ}$ 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

2.7.6 Environmental Conditions

	19 May 2010
Ambient Temperature	25.0°C
Relative Humidity	37.1%



2.7.7 Test Results

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

The test results are shown below

Power Supply: -48V DC

<u>GMSK</u>

Configuration 1 - Mode 2

Temperature Interval (°C)	Deviation (Hz)
-30	9.05
-20	8.58
-10	-6.08
0	-9.35
+10	-10.11
+20	5.21
+30	7.32
+40	5.89
+50	-5.47

<u>8PSK</u>

Configuration 1 - Mode 2

Temperature Interval (°C)	Deviation (Hz)
-30	9.30
-20	10.43
-10	-7.37
0	-10.72
+10	-10.39
+20	7.54
+30	7.28
+40	-5.95
+50	6.41

Limit ±1.5 ppm or ±1.322 kHz

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.



2.8 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.8.1 Specification Reference

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

2.8.2 Equipment Under Test

RUG 11 B5, S/N: CB4C986602

2.8.3 Date of Test and Modification State

19 May 2010 - Modification State 0

2.8.4 Test Equipment Used

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

2.8.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and Part 22 and Industry Canada RSS-132.

The EUT was set to transmit on maximum power on timeslot 3. A Spectrum Analyser was used to measure the frequency error. The average result was taken over 200 bursts. 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

2.8.6 Environmental Conditions

19 May 2010

Ambient Temperature	25.0°C
Relative Humidity	37.1%



2.8.7 Test Results

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

The test results are shown below

Temperature: 20°C

<u>GMSK</u>

Configuration 1 - Mode 2

DC Voltage (V)	Deviation (Hz)
-40.0	7.20
-48.0	5.21
-57.6	6.53

<u>8PSK</u>

Configuration 1 - Mode 2

Deviation (Hz)
6.84
7.54
7.68

Limit	±1.5 ppm or ±1.322 kHz

Remarks

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



SECTION 3

TEST EQUIPMENT USED



3.1 **TEST EQUIPMENT USED**

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

Instrument	Manufacturer	Туре No.	Serial No.	Calibration Due		
Section 2.1, 2.2, 2.3, 2.4 2.5, 2.7 and 2.8 – Maximum Conducted Output Power, Modulation Characteristics, Occupied Bandwidth, Spurious Emissions at Antenna Terminals (±1MHz), Conducted Spurious Emissions and Receiver Spurious Emissions.						
Spectrum Analyser	Agilent	E4440A	MY46186610	2010/07/19		
Power Metre	Rohde & Schwarz	NRP	101202	2011/04/27		
AVG Power Sensor	Rohde & Schwarz	NRP-Z21	100868	2011/01/26		
Network Analyzer	Agilent	8720D	US38431317	2010/10/26		
40dB Attenuator	SHX	DTS100	04051204	O/P MON		
10dB Attenuator	SHX	DTS150	05112234	O/P MON		
High Pass Filter	K&L	5PH1-1400 / U12750	7	O/P MON		
Power Supply	Dahua	DH1716-5D	4001375	O/P MON		
Power Supply	Dahua	SM70-45D		O/P MON		
Digital Multi-meter	FLUKE	179	91820401	2011/01/03		
Thermo-hygrometer	AZ Instruments	8705	9151655	2010/12/16		
Section 2.6 – Radiated Spurious	Emissions					
Power Supply	Dahua	DH1716-5D	4001375	O/P MON		
EMI Receiver	Rohde & Schwarz	ESI 40	100015	2010/08/19		
Ultra log test antenna	Rohde & Schwarz	HL562	100167	2010/08/19		
Double-Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF 906	100029	2010/08/19		
Antenna master	Frankonia	MA 260	-	2010/08/19		
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	TU		
Anechoic Chamber	Frankonia	9.08m×5.255m×e.525m	-	2010/08/19		
Digital Multimeter	FLUKE	179	91820401	2010/12/02		
Thermo-hygrometer	AZ Instruments	8705	9151655	2010/12/07		
Section 2.9 and 2.10 – Frequence	y Stability Under Tem	perature and Voltage Varia	ations			
Spectrum Analyser	Agilent	E4440A	MY46186610	2010/07/19		
Network Analyzer	Agilent	8720D	US38431317	2010/10/26		
40dB Attenuator	SHX	DTS100	04051204	O/P MON		
Temperature Chamber	Zungdar	ZTH100U	10080065	O/P MON		
Power Supply	Dahua	DH1716-5D	4001375	O/P MON		
Power Supply	Dahua	SM70-45D		O/P MON		
Digital Multimeter	FLUKE	179	91820401	2010/12/02		
Thermo-hygrometer	AZ Instruments	8705	9151655	2010/12/07		

O/P MON Output monitored with calibration equipment ΤU

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



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).

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