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Report On

FCC and Industry Canada Testing of the
Ericsson AB RUG 11 B2

COMMERCIAL-IN-CONFIDENCE

FCC ID: TA8AKRC161198-1
IC ID: 287AB-AG1611981

Document 75910227 Report 01 Issue 1 July 2010

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

REPORT ON FCC and Industry Canada Testing of the Ericsson AB RUG 11 B2

Document 75910227 Report 01 Issue1

July 2010

PREPARED FOR

Ericsson AB
Torshamnsgatan 23
S-164 80
Stockholm
Sweden

PREPARED BY

N Bennett
Senior Administrator

APPROVED BY

M J Hardy
Authorised Signatory

DATED 6 July 2010

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

Test Engineer(s);

Q LI C Zhang

UKAS TESTING 0141

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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Ericsson AB RUG 11 B2

Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson AB RUG 11 B2 to the requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133.

Testing was carried out in support of an application for Grant of Equipment Authorisation in the name of Ericsson AB RUG 11 B2.

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 B2
Product Name	KRC 161 198/1
Serial Number(s)	CB4D438043
Software Version	G10A/1_R25E
Hardware Version	R1A
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 24: 2009 Industry Canada RSS-133: 2009
Incoming Release Date	Declaration of Build Status 21 June 2010
Order Number Date	PTP 18 June 2010
Start of Test	21 June 2010
Finish of Test	6 July 2010
Name of Engineer(s)	Q LI C Zhang
Related Document(s)	FCC CFR 47 Part 2: 2009 FCC CFR 47 Part 15: 2009 Industry Canada RSS-GEN Issue 2: 2007

Product Service

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 – UC (Hybrid Uncombined): Output 1 without internal combiner							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 24	RSS-133					
	24.232(a)	6.4	Effective Isotropically Radiated Power	1930.2 MHz		N/A	No integral antenna.
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.1	2.1046, 24.232 (a)	6.4	Maximum Peak Output Power - Conducted	1930.2 MHz	0	Pass	
				1960 MHz	0	Pass	
				1989.8 MHz	0	Pass	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.2	24.232(d)	6.4	Peak-Average Ratio	1930.2 MHz		N/A	
				1960 MHz	0	Pass	
				1989.8 MHz		N/A	
				1930.4 MHz			
				1989.6 MHz			
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
2.3	2.1047 (d)	6.2	Modulation Characteristics	1930.2 MHz		N/A	Technical description provided
				1960 MHz	0	Pass	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	

Product Service

Configuration 1 – UC (Hybrid Uncombined): Output 1 without internal combiner							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 24	RSS-133					
2.4	2.1049, 24.238(b)	RSS-Gen 4.6.1	Occupied Bandwidth	1930.2 MHz	0	Pass	
				1960 MHz	0	Pass	
				1989.8 MHz	0	Pass	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.5	2.1051, 24.238(b)	6.5	Spurious Emissions at Antenna Terminals (±1MHz)	1930.2 MHz		N/A	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 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz	0	Pass	
				1989.6 MHz	0	Pass	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.6	2.1053, 24.238(a)	6.5	Radiated Spurious Emissions	1930.2 MHz	0	Pass	
				1960 MHz	0	Pass	
				1989.8 MHz	0	Pass	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.7	2.1051, 24.238(a)	6.5	Conducted Spurious Emissions	1930.2 MHz	0	Pass	
				1960 MHz	0	Pass	
				1989.8 MHz	0	Pass	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	

Product Service

Configuration 1 – UC (Hybrid Uncombined): Output 1 without internal combiner							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 24	RSS-133					
2.8	--	6.6	Receiver Spurious Emissions	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.9	2.1055, 24.235	6.3	Frequency Stability Under Temperature Variations	1930.2 MHz		N/A	
				1960 MHz	0	Pass	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.10	2.1055, 24.235	6.3	Frequency Stability Under Voltage Variations	1930.2 MHz		N/A	
				1960 MHz	0	Pass	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	

Product Service

Configuration 2 – TCC (Transmitter Coherent Combining): Output 1 with internal combiner plus TCC							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 24	RSS-133					
	24.232(a)	6.4	Effective Isotropically Radiated Power	1930.2 MHz		N/A	No integral antenna.
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.1	2.1046, 24.232 (a)	6.4	Maximum Peak Output Power - Conducted	1930.2 MHz	0	Pass	
				1960 MHz	0	Pass	
				1989.8 MHz	0	Pass	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.2	24.232(d)	6.4	Peak-Average Ratio	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.3	2.1047 (d)	6.2	Modulation Characteristics	1930.2 MHz		N/A	Technical description provided
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	

Product Service

Configuration 2 – TCC (Transmitter Coherent Combining): Output 1 with internal combiner plus TCC							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 24	RSS-133					
2.4	2.1049, 24.238(b)	RSS-Gen 4.6.1	Occupied Bandwidth	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.5	2.1051, 24.238(b)	6.5	Spurious Emissions at Antenna Terminals (±1MHz)	1930.2 MHz		N/A	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 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz	0	Pass	
				1989.6 MHz	0	Pass	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.6	2.1053, 24.238(a)	6.5	Radiated Spurious Emissions	1930.2 MHz	0	Pass	
				1960 MHz	0	Pass	
				1989.8 MHz	0	Pass	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.7	2.1051, 24.238(a)	6.5	Conducted Spurious Emissions	1930.2 MHz	0	Pass	
				1960 MHz	0	Pass	
				1989.8 MHz	0	Pass	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	

Product Service

Configuration 2 – TCC (Transmitter Coherent Combining): Output 1 with internal combiner plus TCC							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 24	RSS-133					
2.8	--	6.6	Receiver Spurious Emissions	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.9	2.1055, 24.235	6.3	Frequency Stability Under Temperature Variations	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.10	2.1055, 24.235	6.3	Frequency Stability Under Voltage Variations	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	

Product Service

Configuration 3 – HC (Hybrid combined): Output 1 with internal combiner							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 24	RSS-133					
	24.232(a)	6.4	Effective Isotropically Radiated Power	1930.2 MHz		N/A	No integral antenna.
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.1	2.1046, 24.232 (a)	6.4	Maximum Peak Output Power - Conducted	1930.2 MHz	0	Pass	
				1960 MHz	0	Pass	
				1989.8 MHz	0	Pass	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.2	24.232(d)	6.4	Peak-Average Ratio	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.3	2.1047 (d)	6.2	Modulation Characteristics	1930.2 MHz		N/A	Technical description provided
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	

Product Service

Configuration 3 – HC (Hybrid combined): Output 1 with internal combiner							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 24	RSS-133					
2.4	2.1049, 24.238(b)	RSS-Gen 4.6.1	Occupied Bandwidth	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.5	2.1051, 24.238(b)	6.5	Spurious Emissions at Antenna Terminals (±1MHz)	1930.2 MHz		N/A	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 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz	0	Pass	
				1989.6 MHz	0	Pass	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.6	2.1053, 24.238(a)	6.5	Radiated Spurious Emissions	1930.2 MHz	0	Pass	
				1960 MHz	0	Pass	
				1989.8 MHz	0	Pass	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.7	2.1051, 24.238(a)	6.5	Conducted Spurious Emissions	1930.2 MHz	0	Pass	
				1960 MHz	0	Pass	
				1989.8 MHz	0	Pass	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	

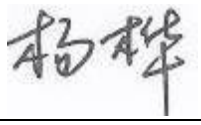
Product Service

Configuration 3 – HC (Hybrid combined): Output 1 with internal combiner							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 24	RSS-133					
2.8	--	6.6	Receiver Spurious Emissions	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz	0	Pass	
2.9	2.1055, 24.235	6.3	Frequency Stability Under Temperature Variations	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	
2.10	2.1055, 24.235	6.3	Frequency Stability Under Voltage Variations	1930.2 MHz		N/A	
				1960 MHz		N/A	
				1989.8 MHz		N/A	
				1930.4 MHz		N/A	
				1989.6 MHz		N/A	
				1930.2 MHz+ 1960 MHz		N/A	
				1960 MHz+ 1989.8 MHz		N/A	
				1960 MHz+ 1880 MHz		N/A	

Product Service

1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Unit
MANUFACTURER	Ericsson AB
PART NUMBER	KRC 161 198/1
SERIAL NUMBER	CB4D438043
HARDWARE VERSION	R1A
SOFTWARE VERSION	G10A/1_R25E
TRANSMITTER OPERATING RANGE	1930.4MHz - 1989.6MHz
INTERMEDIATE FREQUENCIES	--
ITU DESIGNATION OF EMISSION	250KGXW 250KG7W
HIGHEST INTERNALLY GENERATED FREQUENCY	1990MHz
OUTPUT POWER (RMS) (W or dBm)	GMSK: UC: 45.5dBm HC: 42dBm TCC: 48dBm 8PSK: UC: 42.2dBm HC: 38.7dBm TCC: 44.7dBm
OUTPUT POWER TOLERANCE	± 2dB
FCC ID	TA8AKRC161198-1
IC ID	287AB-AG1611981
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is a Radio Unit of GSM Base Stations

Signature 

Date 21 June 2010

D of B S Serial No 75910227/01

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

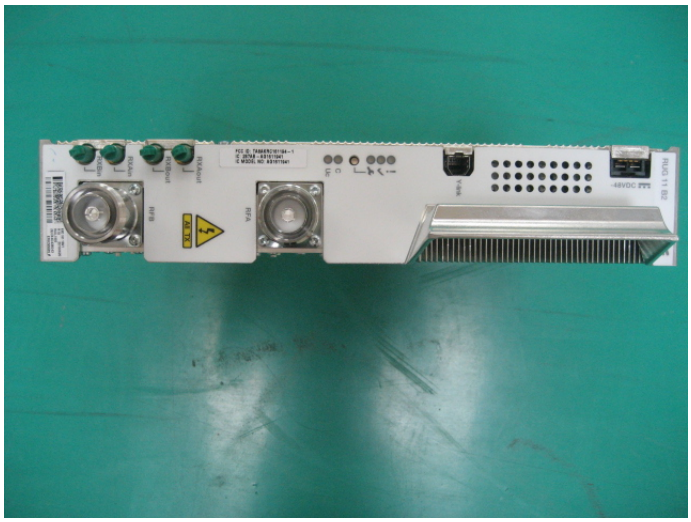
Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was an Ericsson AB RUG 11 B2 working in the public mobile service 1900MHz band which provides communication connections to GSM1900 network. The RUG 11 B2 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

Product Service

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 24 and Industry Canada RSS-133.

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

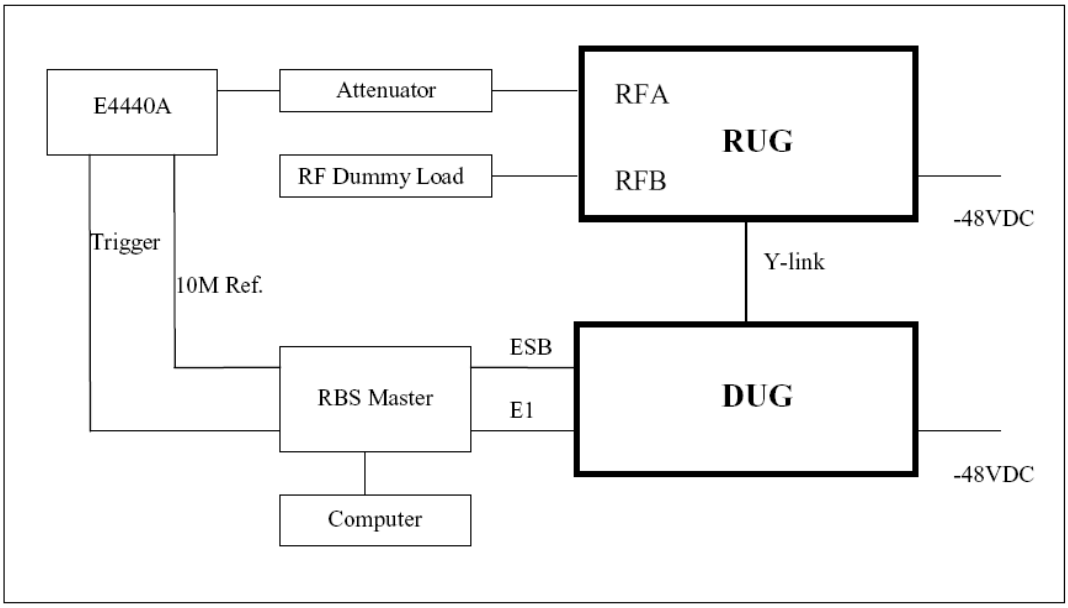
The EUT was configured in accordance with FCC CFR 47 Part 24 and Industry Canada RSS-133.

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

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

The RUG 11 B2 supports both GMSK and 8PSK modulation at 1900MHz, 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.

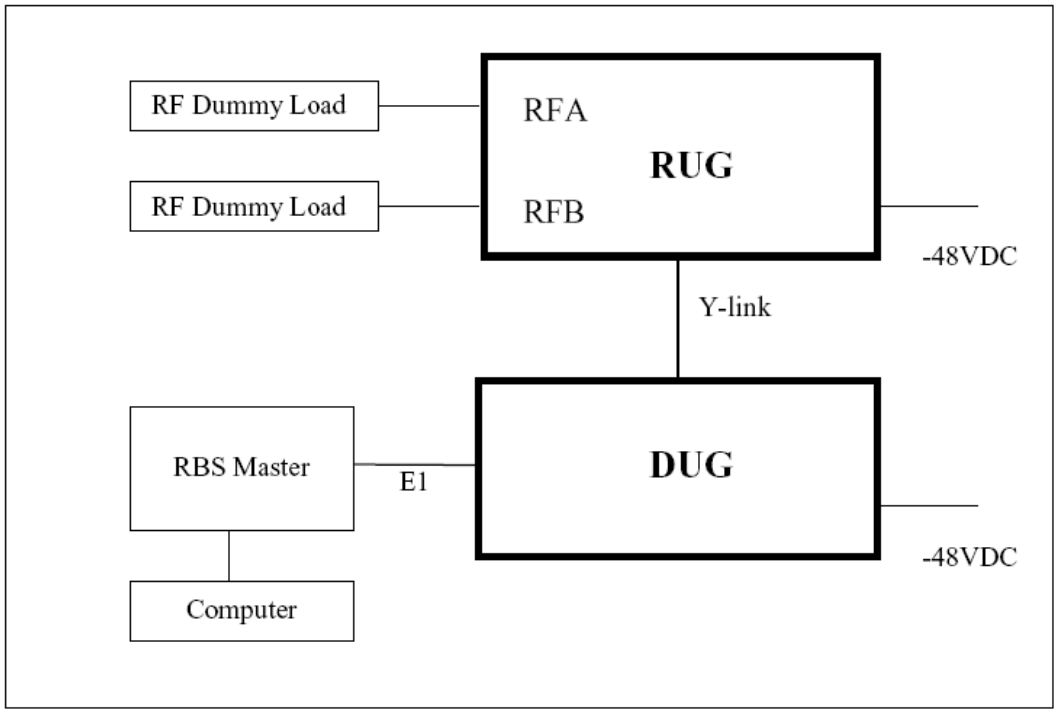
Test Setup, Conducted Measurement:



Test Object	Model Type	Version	Serial Number
RUG 11 B2	KRC 161 198/1	R1A	CB4D438043

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 B2	KRC 161 198/1	R1A	CB4D438043

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

Product Service

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 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

Mode 6 - ARFCN 512 + 661: 1930.2MHz + 1960 MHz (Bottom Channel + Middle Channel)

Mode 7 - ARFCN 661 + 810: 1960 MHz + 1989.8 MHz (Middle Channel + Top Channel)

Mode 8 - ARFCN 661 + 661: 1960 MHz + 1880 MHz (TX Middle Channel + RX Middle Channel)

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

Product Service

1.5 TEST CONDITIONS

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

Product Service

SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
Ericsson AB
RUG 11 B2

Product Service

2.1 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.1.1 Specification Reference

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

2.1.2 Equipment Under Test

RUG 11 B2, S/N: CB4D438043

2.1.3 Date of Test and Modification State

21 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 24 and Industry Canada RSS-133.

Using a spectrum analyzer/power meter 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 with all timeslots active.

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 3

Configuration 3 - Mode 1
- Mode 2
- Mode 3

2.1.6 Environmental Conditions

	21 June 2010
Ambient Temperature	27.4°C
Relative Humidity	39.8%

Product Service

2.1.7 Test Results

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

The test results are shown below

GMSK

Configuration 1 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	1930.2	50.4	46.39/ 45.6	43.55 / 36.31
Middle	1960	50.4	46.49 / 45.7	44.56 / 37.15
Top	1989.8	50.4	46.63 / 45.8	46,02 / 38.02

Configuration 2 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	1930.2	50.4	48.97 / 48.2	78.89 / 66.07
Middle	1960	50.4	49.06 / 48.3	80.54 / 67.61
Top	1989.8	50.4	49.13 / 48.1	81.85 / 64.57

Configuration 3 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	1930.2	50.4	43.07 / 42.4	20.28 / 17.38
Middle	1960	50.4	43.19 / 42.3	20.84 / 16.98
Top	1989.8	50.4	43.37 / 42.3	21.73 / 16.98

8PSK

Configuration 1 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	1930.2	40.9	46.37 / 42.6	43.35 / 18.20
Middle	1960	40.9	46.49 / 42.6	44.57 / 18.20
Top	1989.8	40.9	46.58 / 42.5	45.50 / 17.78

Configuration 2 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	1930.2	40.9	48.94 / 44.9	78.34 / 30.90
Middle	1960	40.9	49.04 / 45.0	80.17 / 31.62
Top	1989.8	40.9	49.05 / 44.9	80.35 / 30.90

Configuration 3 - Mode 1, 2 and 3

Channel	Frequency (MHz)	Path Loss (dB)	Result (dBm) Peak / RMS	Result (W) Peak / RMS
Bottom	1930.2	40.9	43.07 / 38.8	20.28 / 7.59
Middle	1960	40.9	43.16 / 38.8	20.70 / 7.59
Top	1989.8	40.9	43.33 / 38.7	21.53 / 7.41

Limit	≤100W or <+50dBm

Remarks

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

Product Service

2.2 PEAK – AVERAGE RATIO

2.2.1 Specification Reference

FCC CFR 47 Part 24: 2007, Clause 24.232(d)
Industry Canada RSS-133, Clause 6.4

2.2.2 Equipment Under Test

RUG 11 B2, S/N: CB4D438043

2.2.3 Date of Test and Modification State

25 June 2010 – 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 measurment is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determined the largest deviation between the average and the peak power of the EUT in given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percentage of time the signal spends at or above the level defines the probability for that particular power level.

The spectrum analyzer measurment bandwidth was set to 5MHz 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 2

2.2.6 Environmental Conditions

	25 June 2010
Ambient Temperature	25.5°C
Relative Humidity	37.8%

Product Service

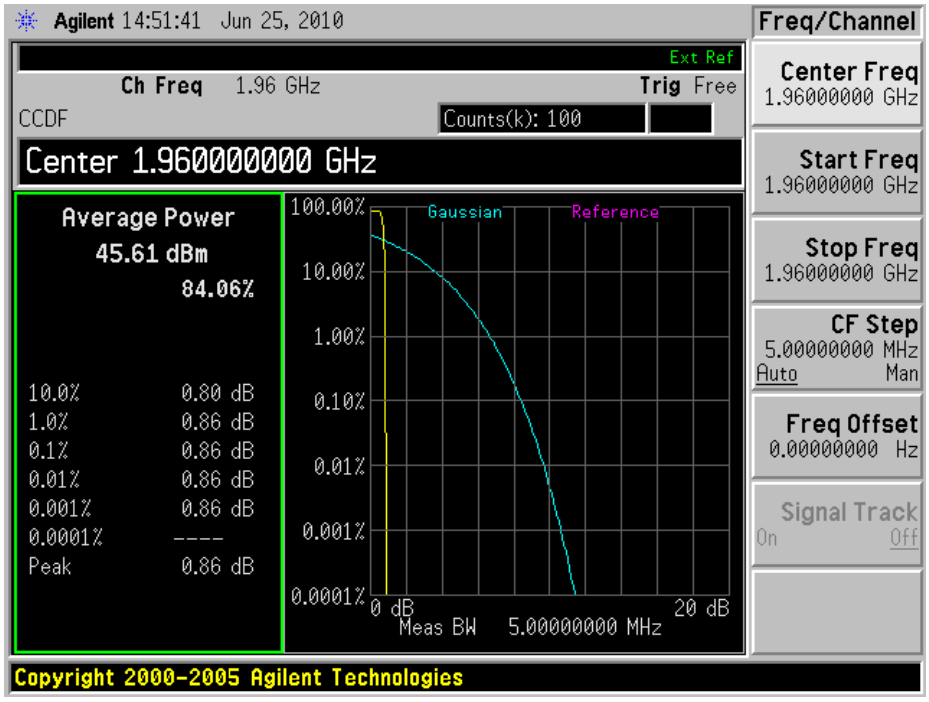
2.2.7 Test Results

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

The test results are shown below.

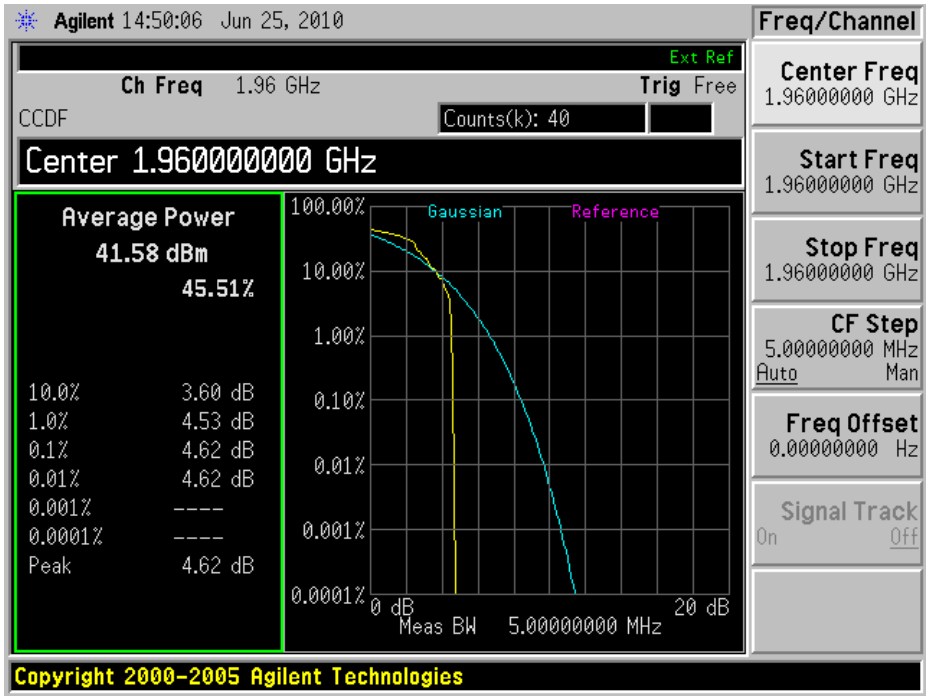
Configuration 1- Mode 2

GMSK – Transmitting under maximum Power



Product Service

8PSK – Transmitting under maximum Power



Limit	13dB

Remarks

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

Product Service

2.3 MODULATION CHARACTERISTICS

2.3.1 Specification Reference

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

2.3.2 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

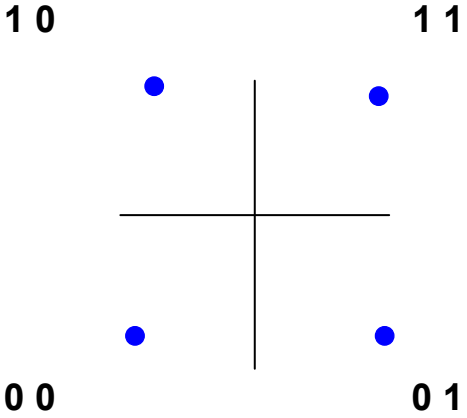
GMSK and 8PSK overview.

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 2-digit phase shifts, using the following phase shifts to represent data pairs.



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

BIT SEQUENCE	0 0	1 1	1 0	01
PHASE	225º	45º	135º	315º

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 π/2, 0 = -90° or - π/2 phase shift)

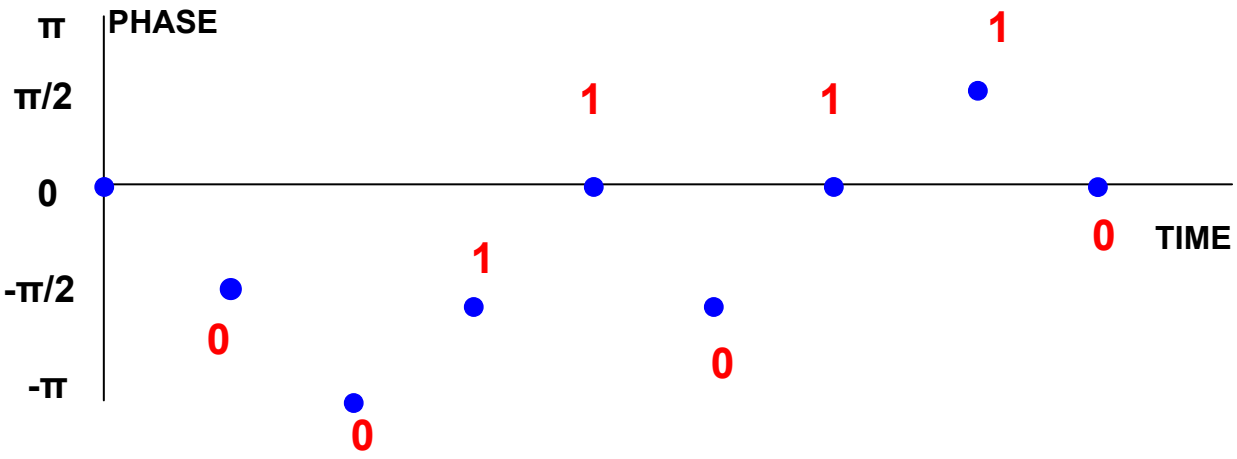
I Stream	0		1		0		1	
	-π/2		-π/2		-π/2		π/2	
Q stream		0		1		1		0
		-π/2		π/2		π/2		-π/2

Product Service

3. Combine (add) the two PSK signals:

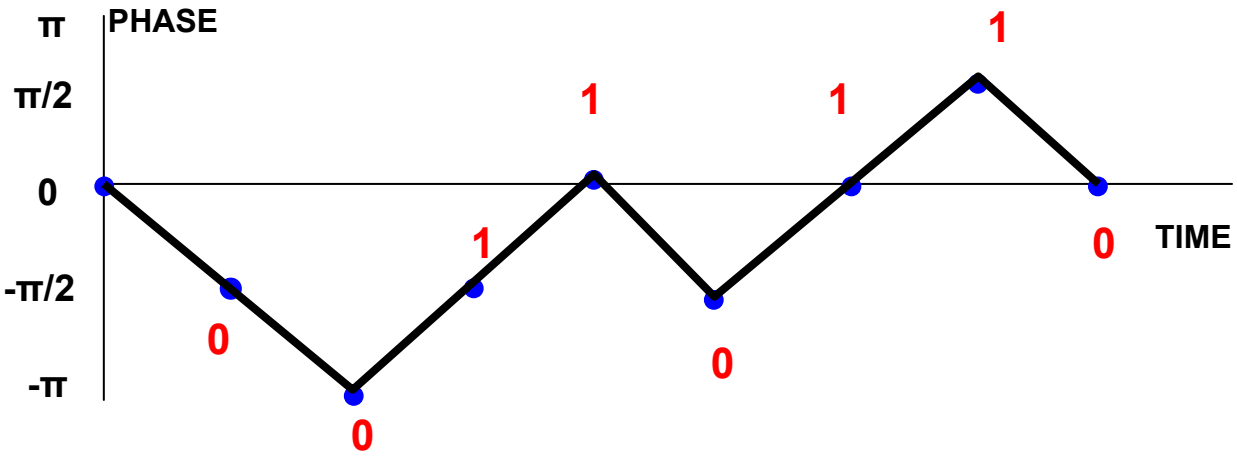
Combined Phase	-π/2	-π	-π/2	0	-π/2	0	π/2	0

Result: offset - QPSK, phase change is restricted to ± π/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):



Product Service

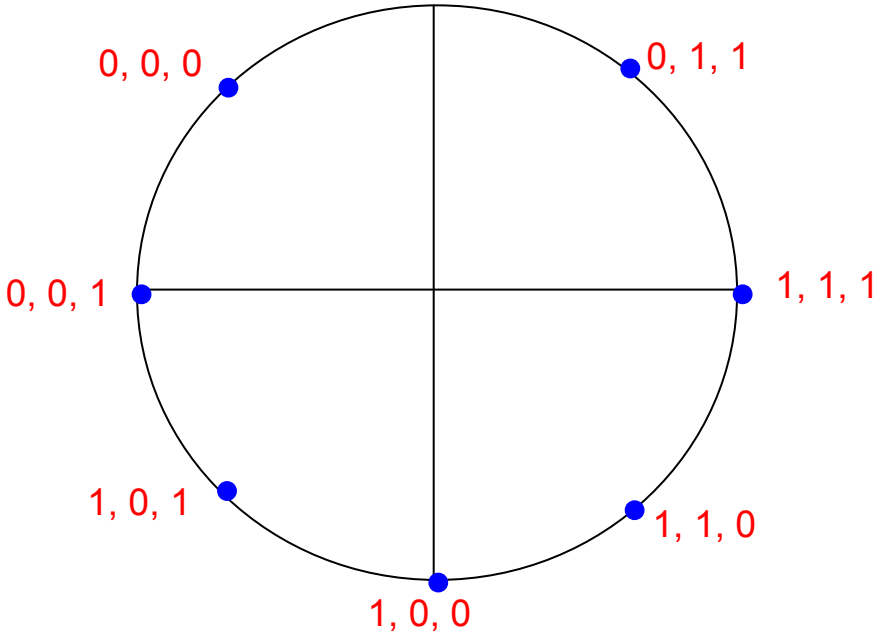
Gaussian Minimum Shift Keying

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

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

8-PSK (8-Phase Shift Keying)

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



Product Service

2.4 OCCUPIED BANDWIDTH

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test

RUG 11 B2, S/N: CB4D438043

2.4.3 Date of Test and Modification State

25 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 24 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

2.4.6 Environmental Conditions

	25 June 2010
Ambient Temperature	25.5°C
Relative Humidity	37.8%

Product Service

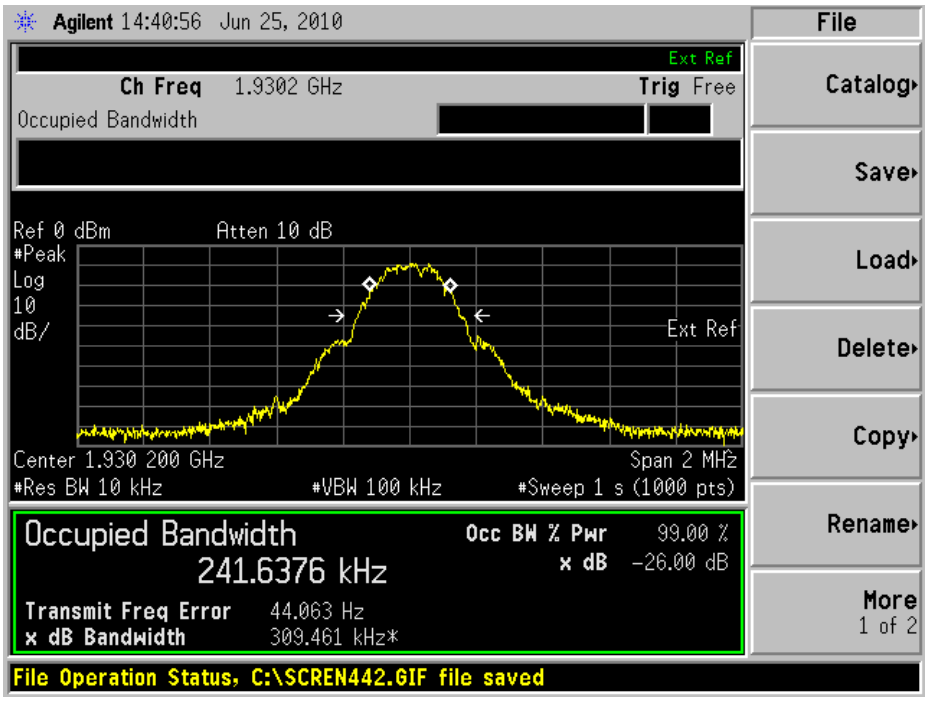
2.4.7 Test Results

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

The test results are shown below

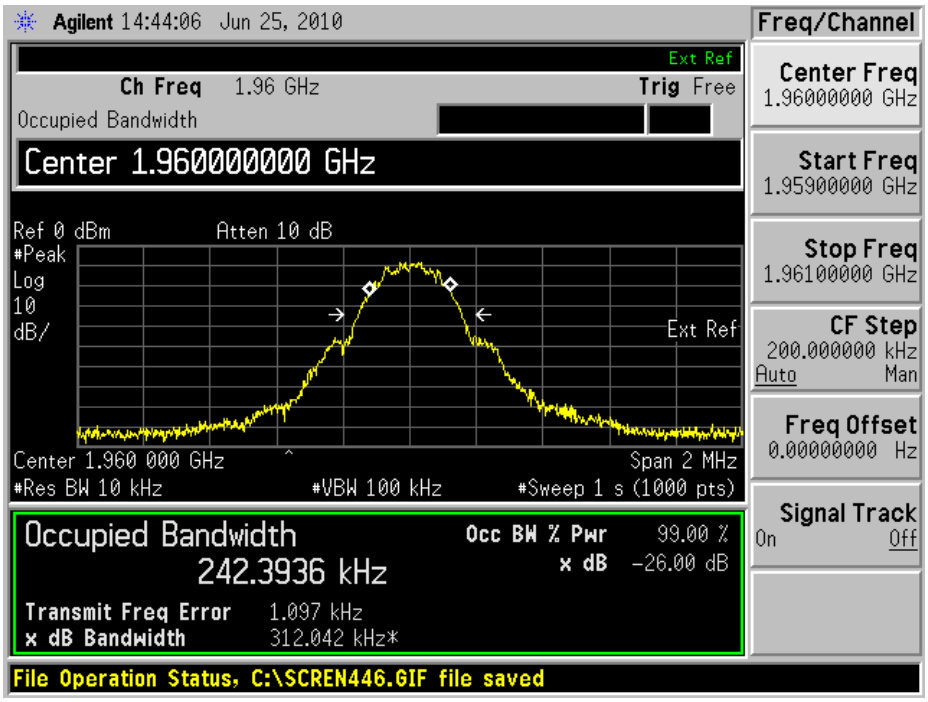
GMSK

Configuration 1 - Mode 1

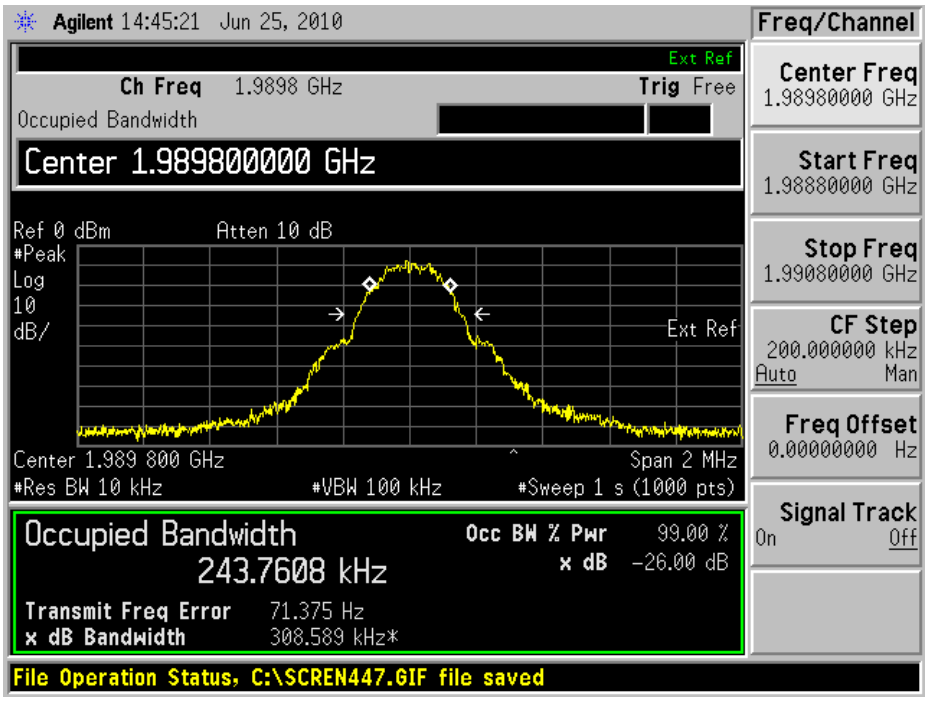


Product Service

Configuration 1 - Mode 2



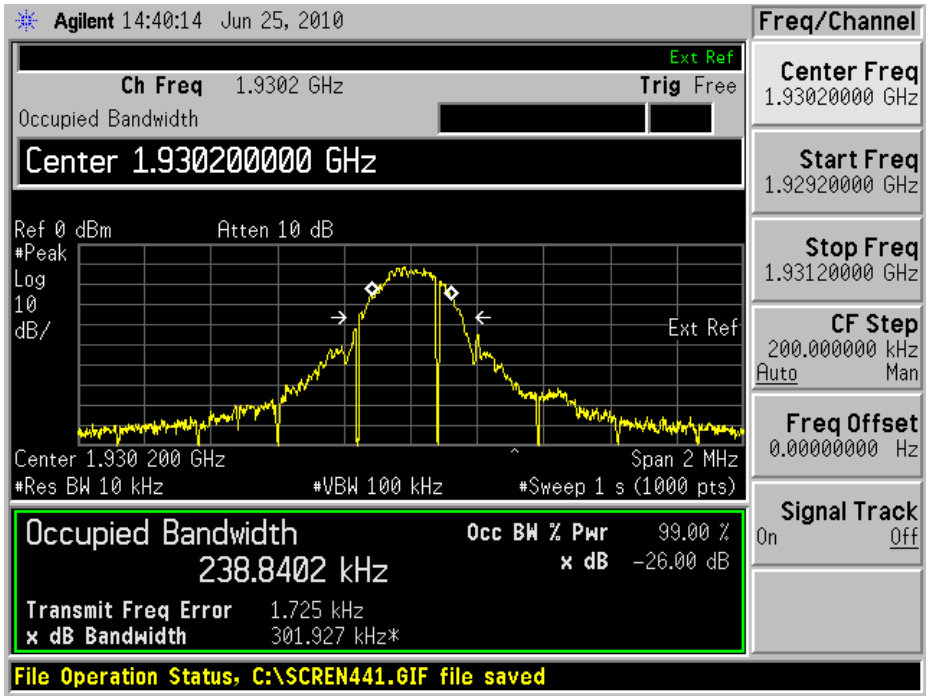
Configuration 1 - Mode 3



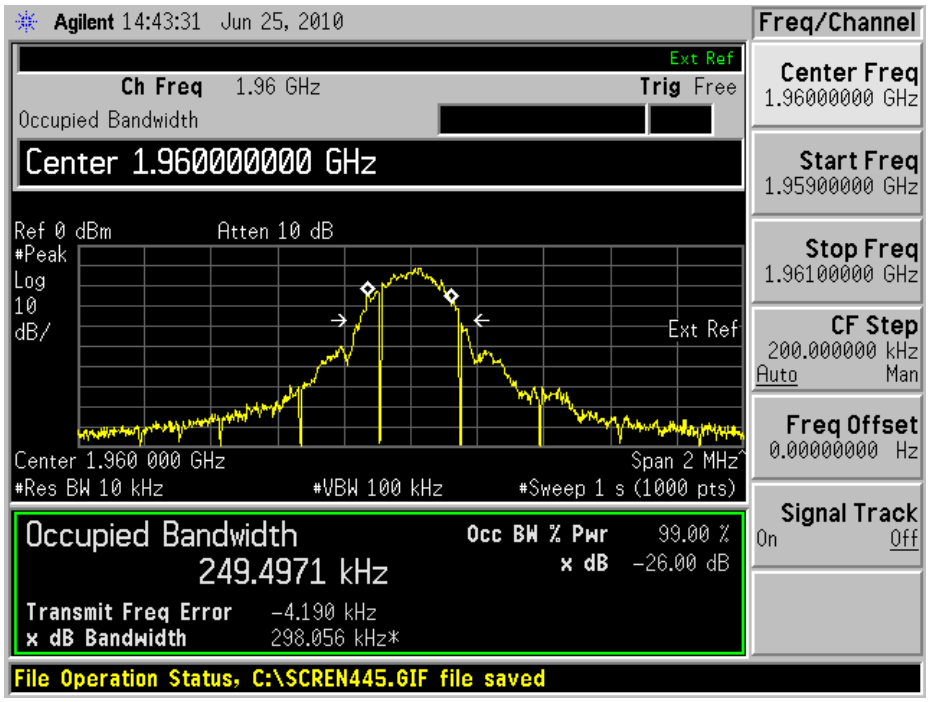
Product Service

8PSK

Configuration 1 - Mode 1

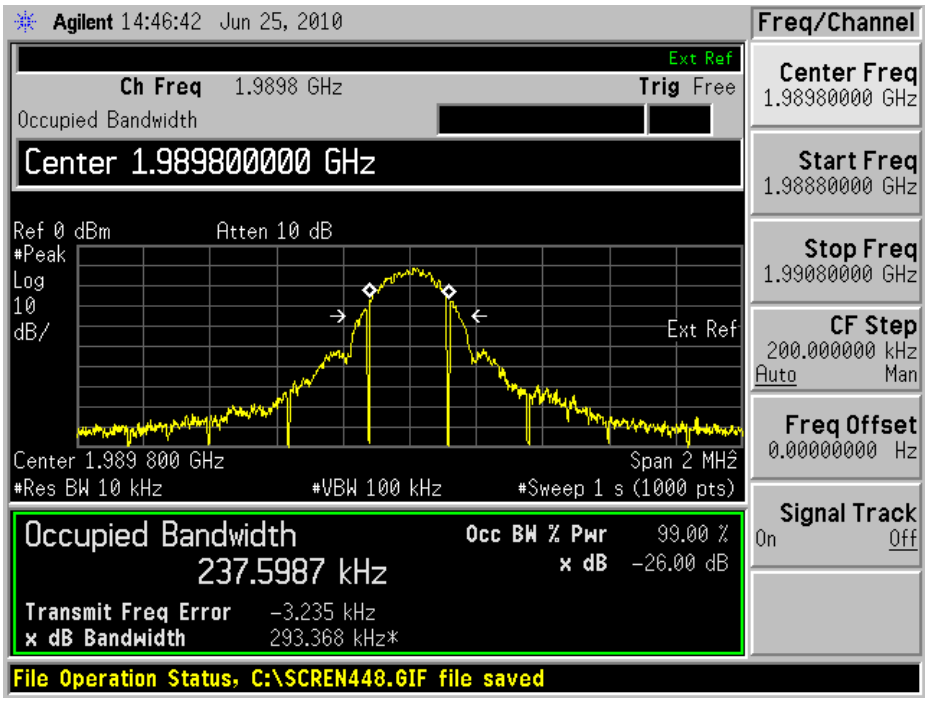


Configuration 1 - Mode 2



Product Service

Configuration 1 - Mode 3



2.5 SPURIOUS EMISSIONS AT TERMINALS (±1MHz)

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

RUG 11 B2, S/N: CB4D438043

2.5.3 Date of Test and Modification State

1 July 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 24 and Industry Canada RSS-133.

In accordance with 24.238(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 Peak.

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

2.5.6 Environmental Conditions

	1 July 2010
Ambient Temperature	24.4°C
Relative Humidity	36.8%

Product Service

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 (±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 513 (1930.4MHz), the highest usable channel is 809 (1989.6 MHz)

Configuration 1 - Mode 4 & 5

Channel (MHz)	Edge Test with GMSK modulation Channel No./Frequencies	Edge Test with 8PSK modulation Channel No./Frequencies
Bottom 1930.4	Channel: 513 Frequency: 1930.4MHz P0 Power level	Channel: 513 Frequency: 1930.4MHz P0 Power level
Top 1989.6	Channel: 809 Frequency : 1989.6MHz P0 Power level	Channel: 809 Frequency : 1989.6MHz P0 Power level

Configuration 2 - Mode 4 & 5

Channel (MHz)	Edge Test with GMSK modulation Channel No./Frequencies	Edge Test with 8PSK modulation Channel No./Frequencies
Bottom 1930.4	Channel: 513 Frequency: 1930.4MHz P0 Power level	Channel: 513 Frequency: 1930.4MHz P0 Power level
Top 1989.6	Channel: 809 Frequency : 1989.6MHz P0 Power level	Channel: 809 Frequency : 1989.6MHz 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 1930.4	Channel: 513 Frequency: 1930.4MHz P0 Power level	Channel: 513 Frequency: 1930.4MHz P0 Power level
Top 1989.6	Channel: 809 Frequency : 1989.6MHz P0 Power level	Channel: 809 Frequency : 1989.6MHz 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.

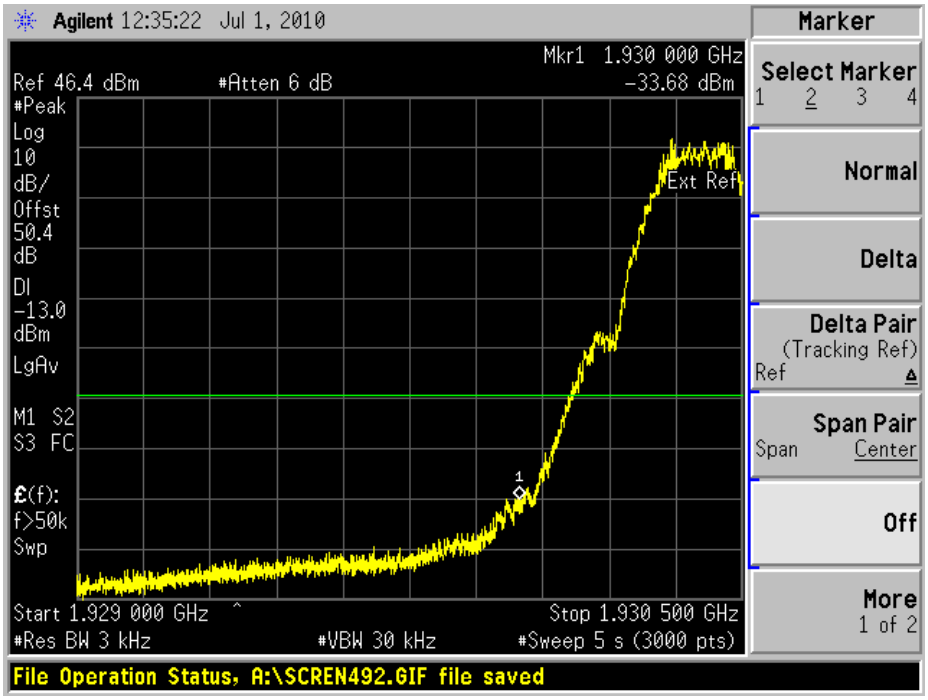
The channels outside of those shown in the table above were not tested at lower power levels to determine a level at which compliance would be achieved. Therefore, to maintain compliance, only the channels shown in the table above shall be used.

Product Service

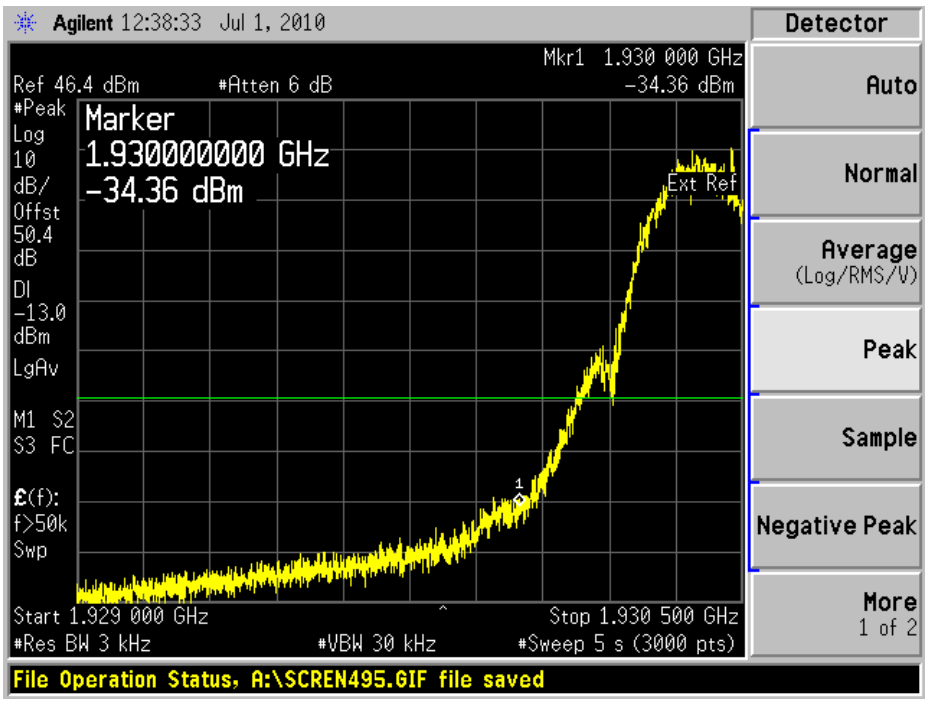
The test results are shown below

Configuration 1 - Mode 4

GMSK - Edge Measurement with EUT Transmitting on P0 Power Level



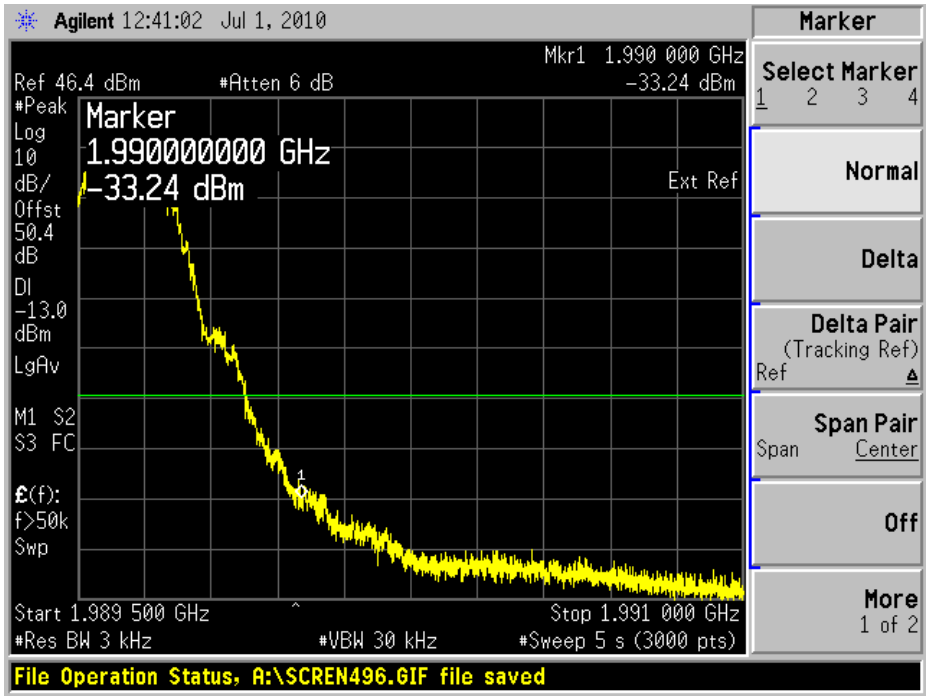
8PSK - Edge Measurement with EUT Transmitting on P0 Power Level



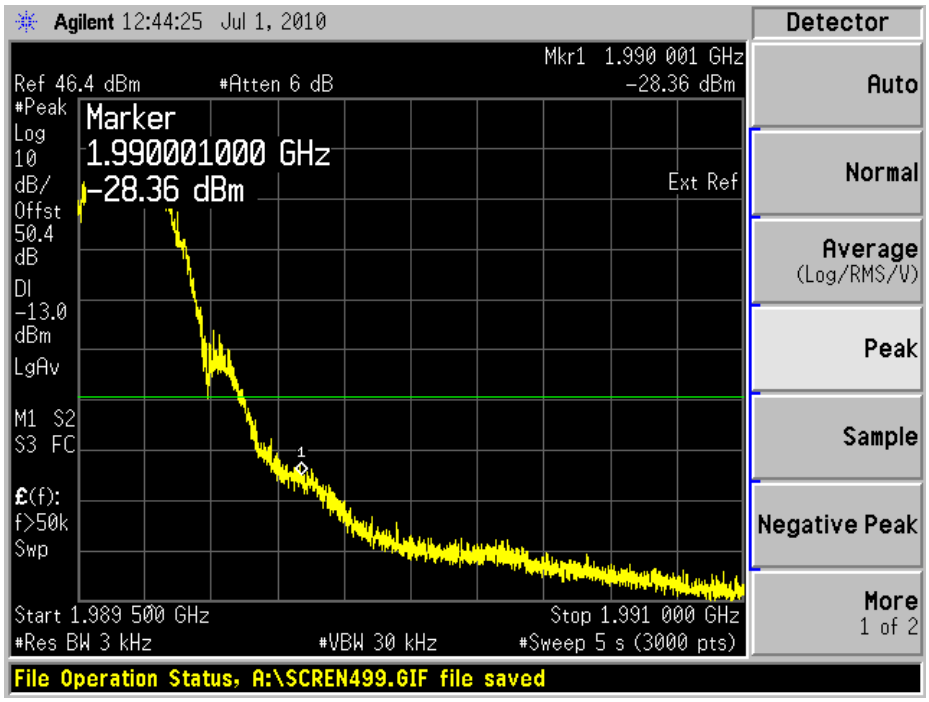
Product Service

Configuration 1 - Mode 5

GMSK - Edge Measurement with EUT Transmitting on P0 Power Level



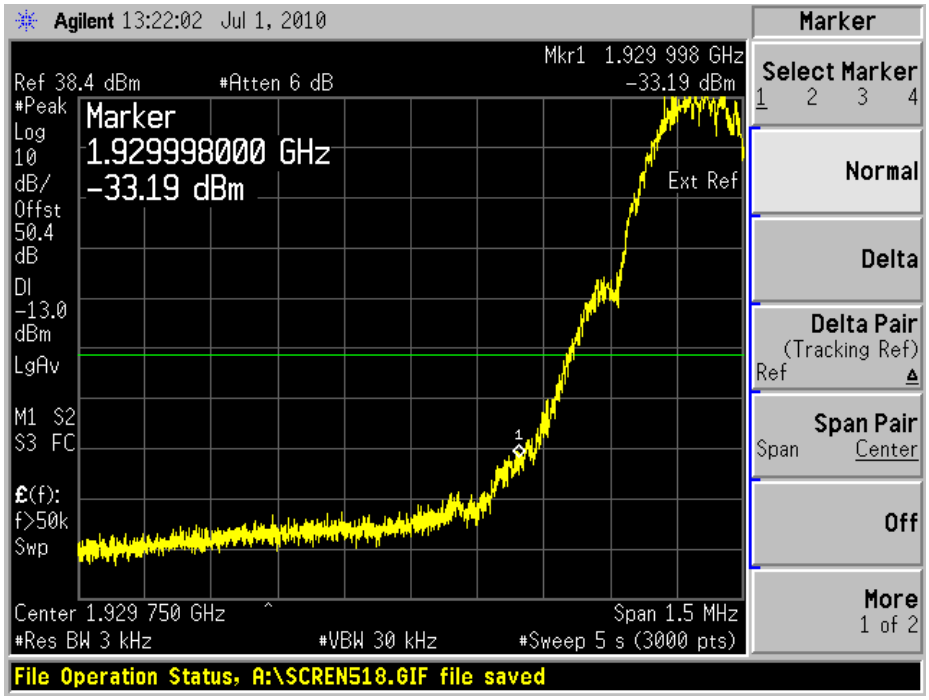
8PSK - Edge Measurement with EUT Transmitting on P0 Power Level



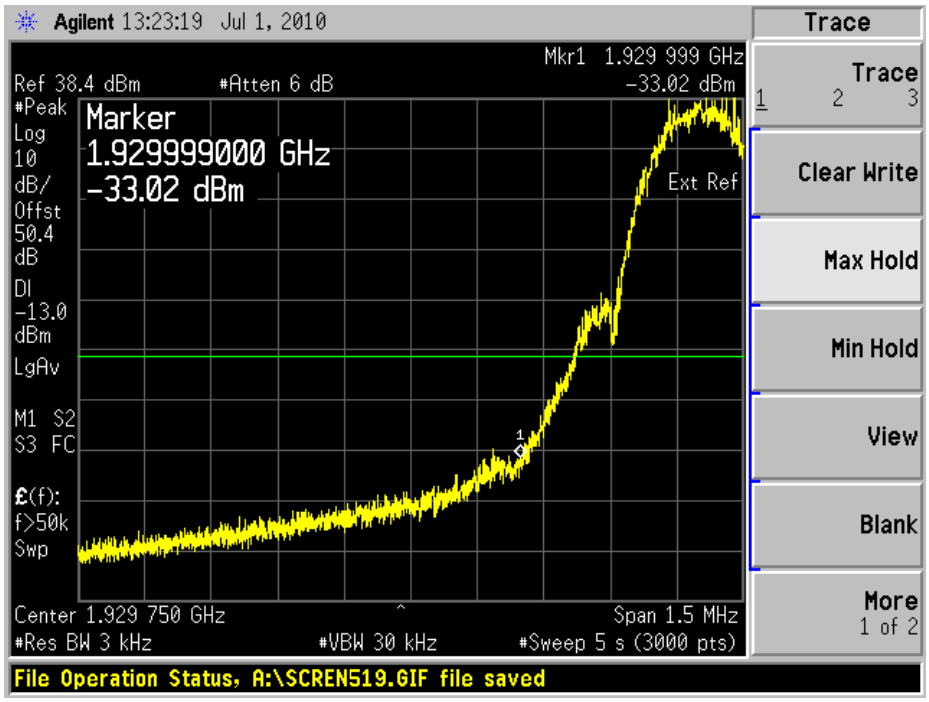
Product Service

Configuration 2 - Mode 4

GMSK - Edge Measurement with EUT Transmitting on P0 Power Level



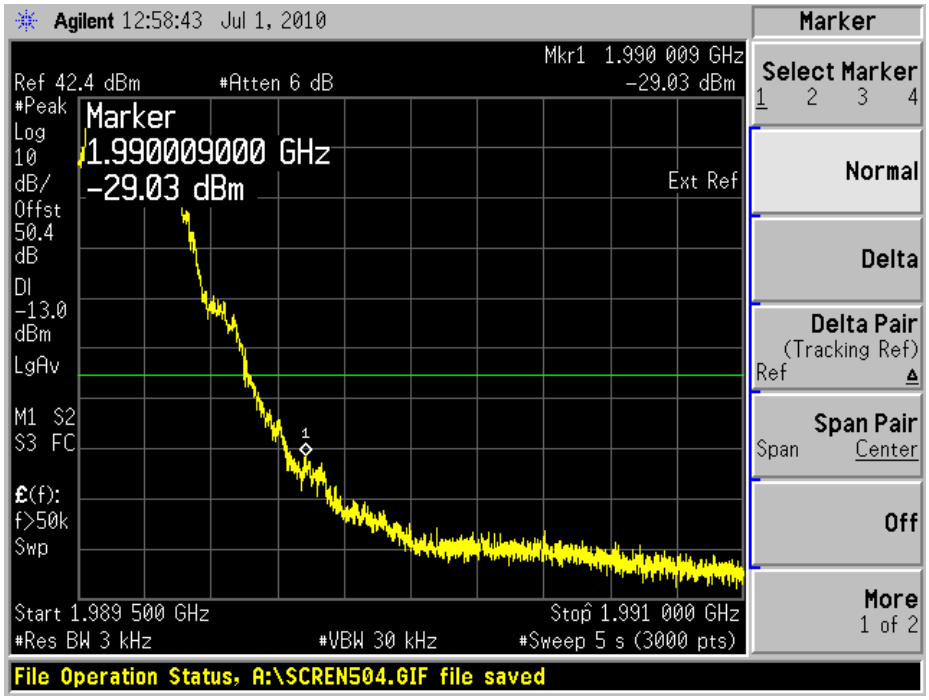
8PSK - Edge Measurement with EUT Transmitting on P0 Power Level



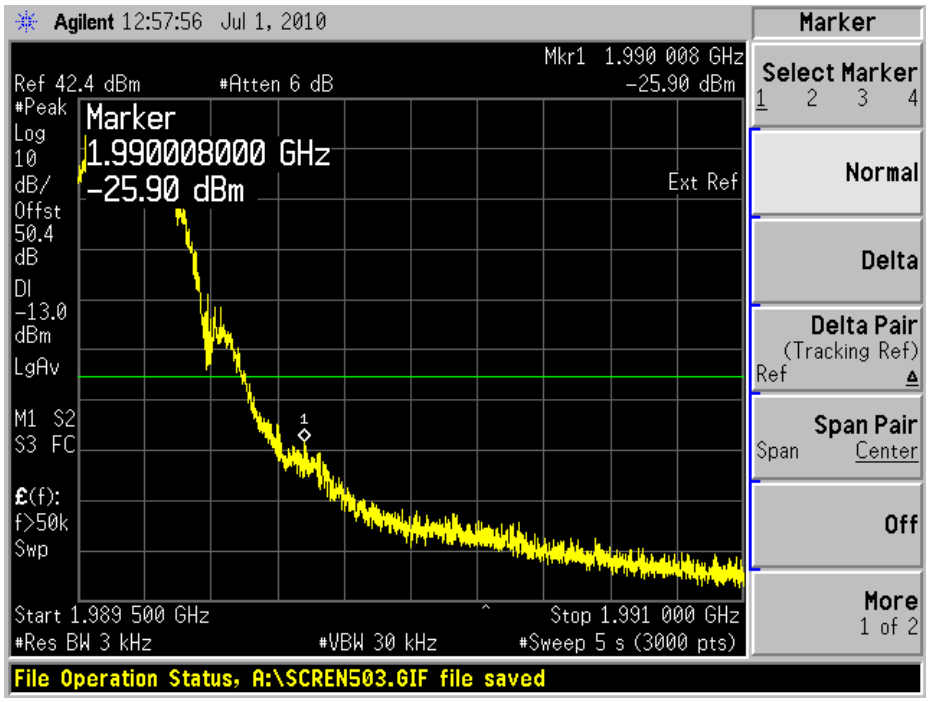
Product Service

Configuration 2 - Mode 5

GMSK - Edge Measurement with EUT Transmitting on P0 Power Level



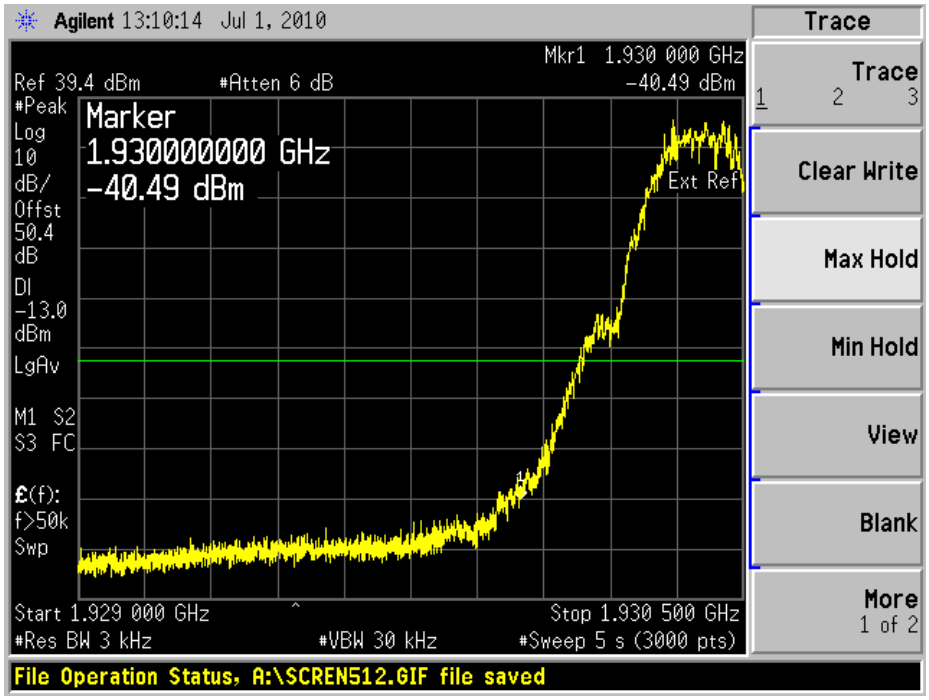
8PSK - Edge Measurement with EUT Transmitting on P0 Power Level



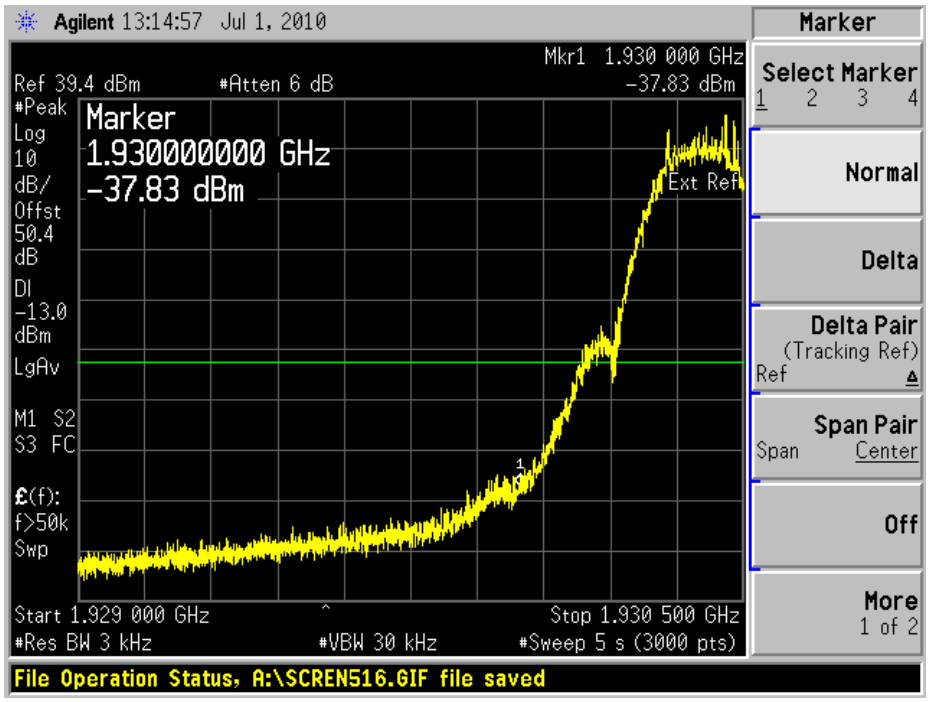
Product Service

Configuration 3 - Mode 4

GMSK - Edge Measurement with EUT Transmitting on P0 Power Level



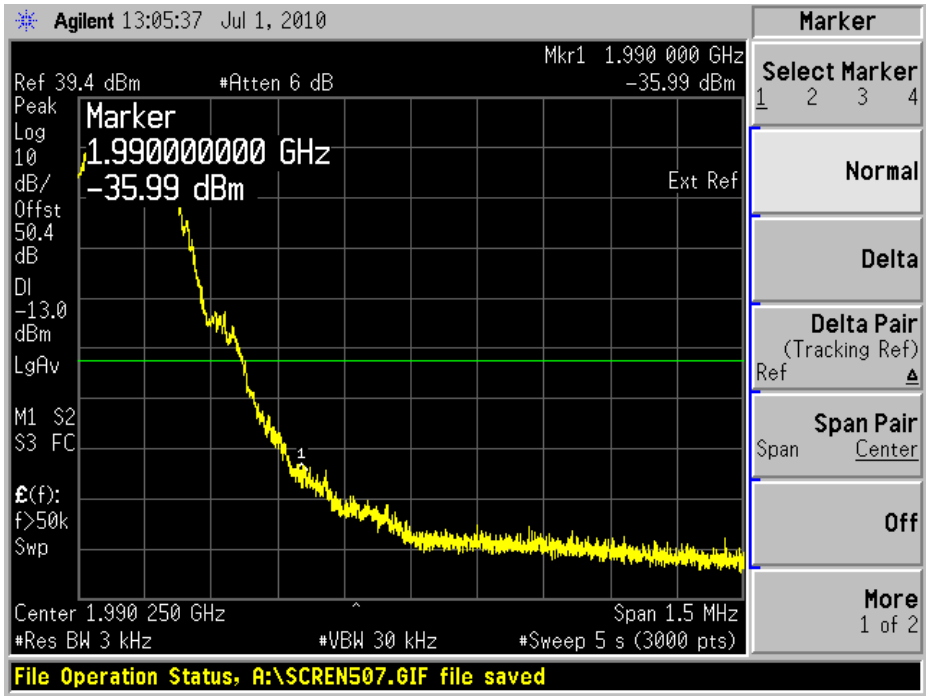
8PSK - Edge Measurement with EUT Transmitting on P0 Power Level



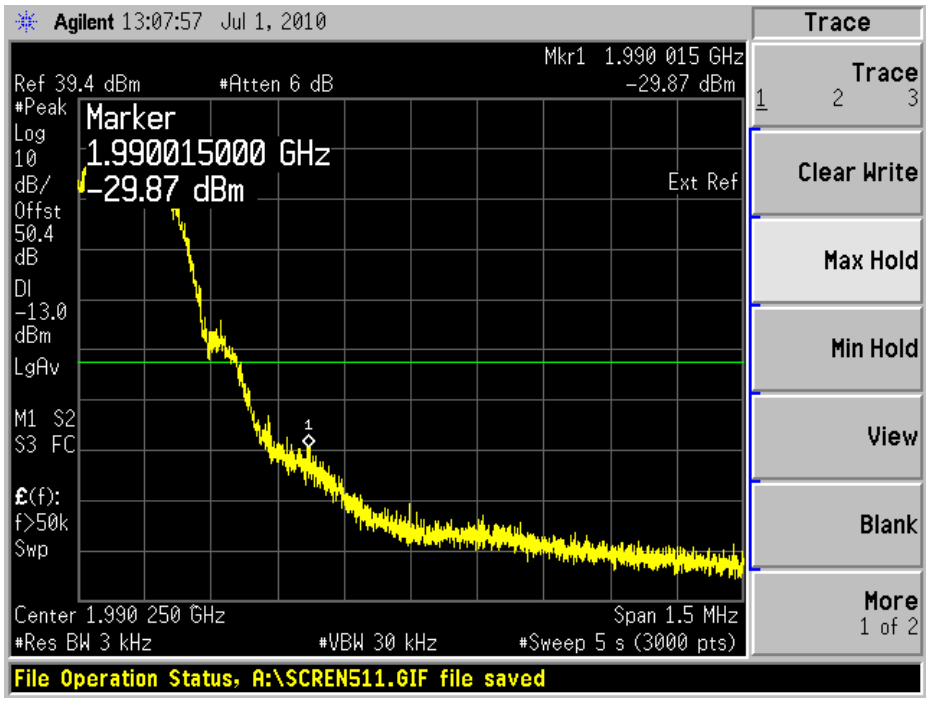
Product Service

Configuration 3 - Mode 5

GMSK - Edge Measurement with EUT Transmitting on P0 Power Level



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



Limit	-13dBm

2.6 RADIATED SPURIOUS EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 2: 2009, Clause 2.1053
FCC CFR 47 Part 24, 24.238(a)
Industry Canada RSS-133, Clause 6.5

2.6.2 Equipment Under Test

RUG 11 B2, S/N: CB4D438043

2.6.3 Date of Test and Modification State

22 June 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 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 – 1GHz were then formally measured using a Peak detector. Emissions identified within the range 1GHz – 20GHz were then formally measured using Peak and Average Detectors, as appropriate.

In the frequency Range 30MHz – 20GHz, the measurement was performed with a resolution bandwidth of 1MHz.

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

The limit was displayed, showing the -13dBm.

The test was performed with the EUT operating on all modes as described in section 1.4.3 and the results recorded 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 3

Configuration 3 - Mode 6
- Mode 7

Product Service

2.6.6 Environmental Conditions

	22 June 2010
Ambient Temperature	23.4°C
Relative Humidity	36.7%

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

GMSK

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.

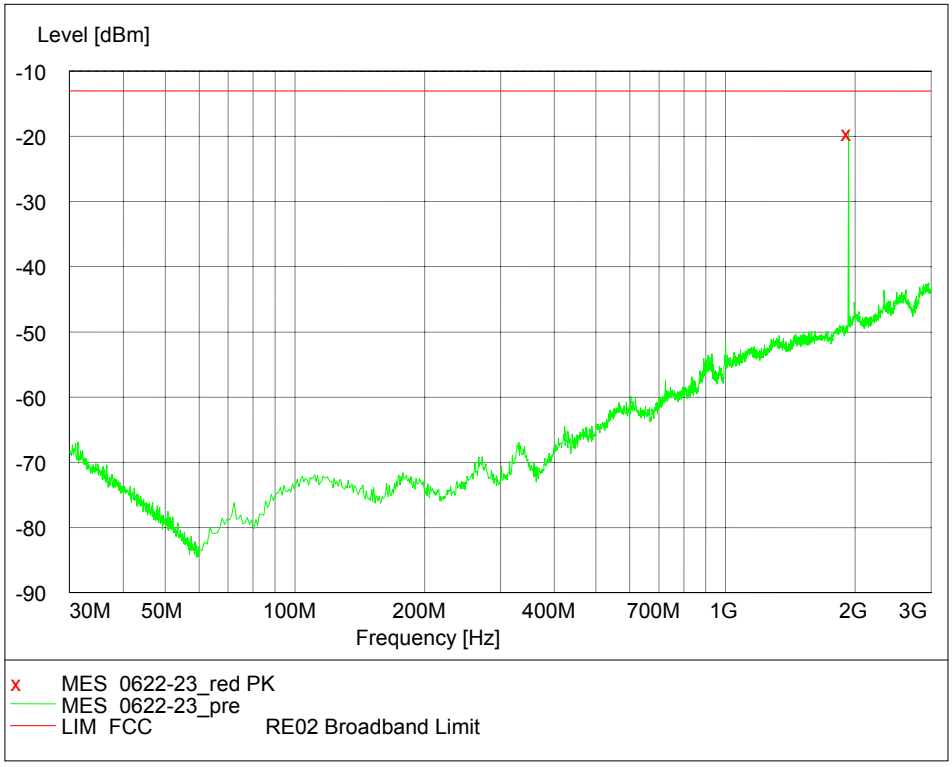
Configuration 1 - Mode 3

No emissions were detected within 35dB of the limit.

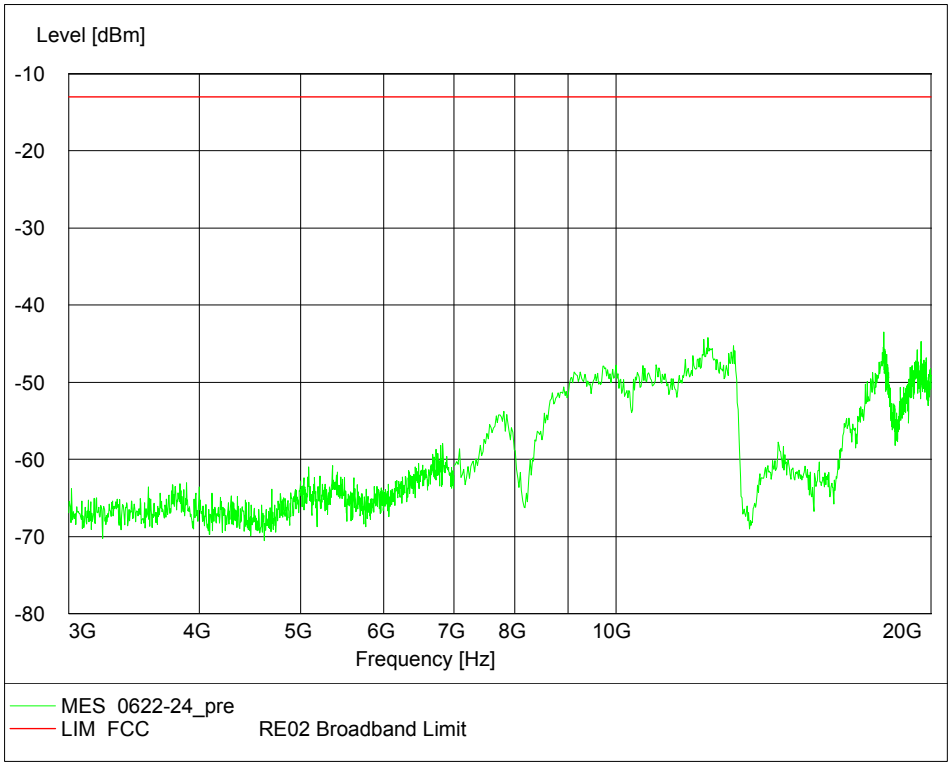
Product Service

Configuration 2 - Mode 1

30MHz – 3GHz:



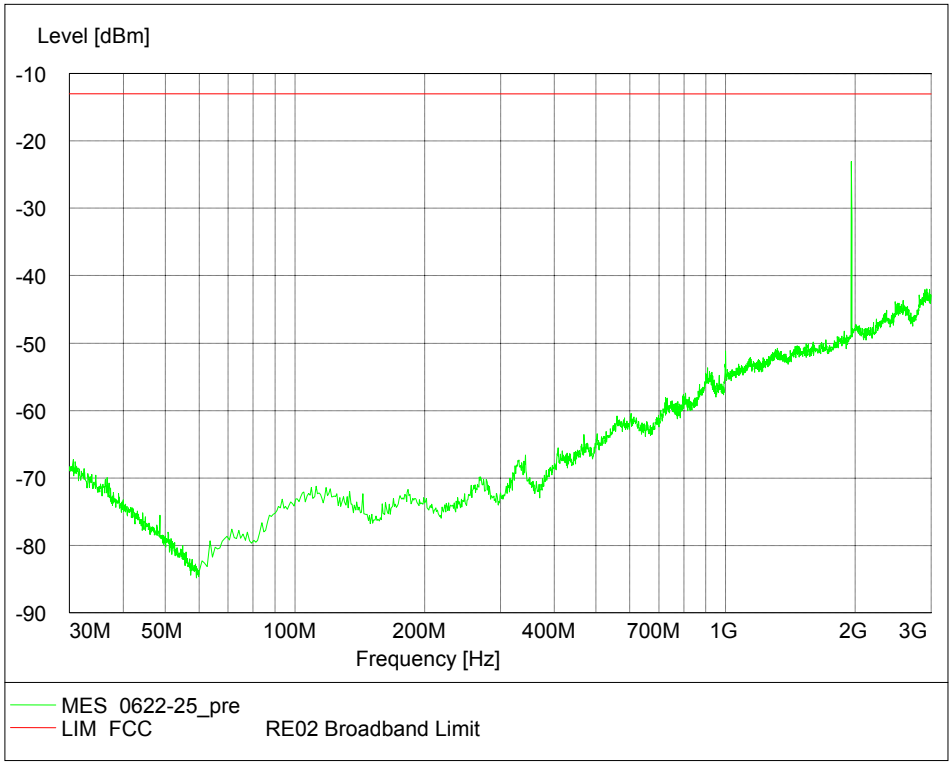
3GHz – 20GHz:



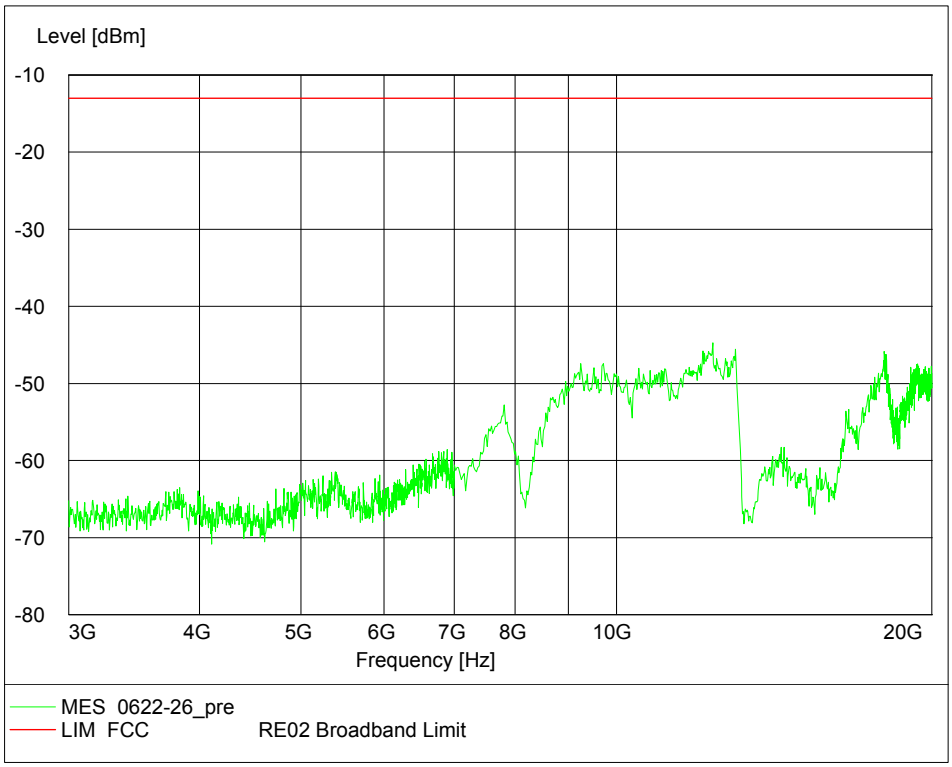
Product Service

Configuration 2 - Mode 2

30MHz – 3GHz:



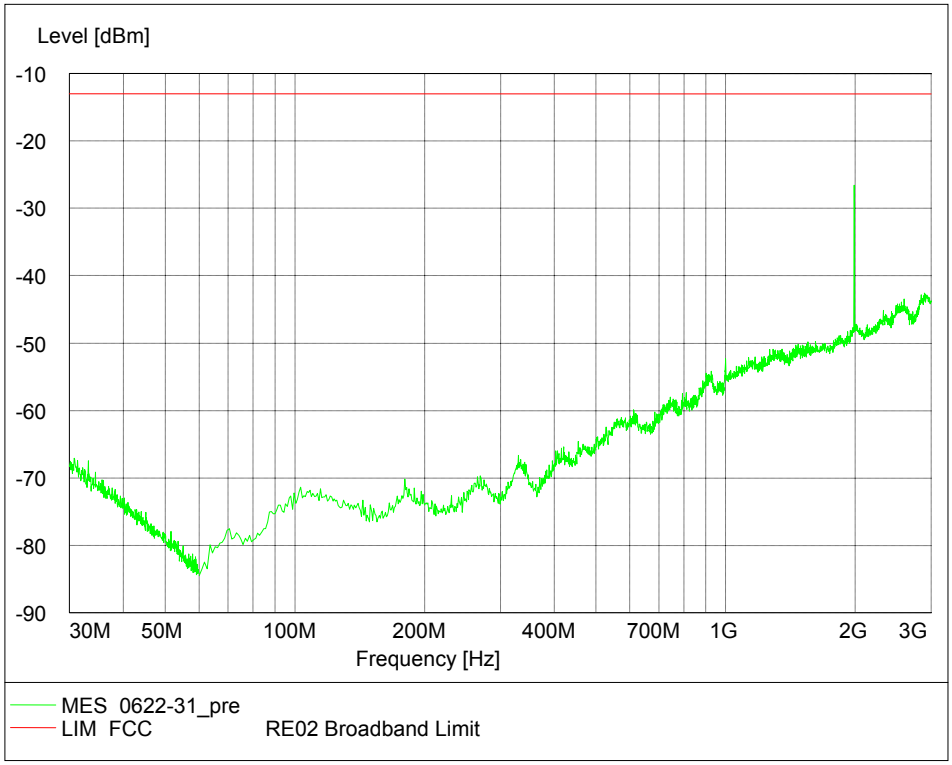
3GHz – 20GHz:



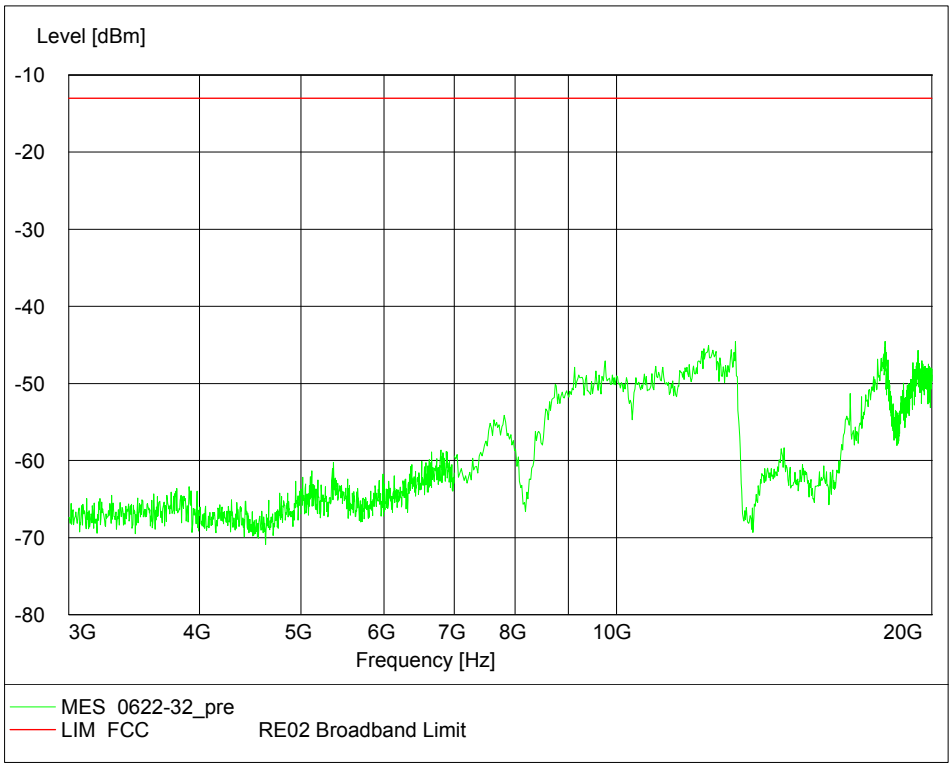
Product Service

Configuration 2 - Mode 3

30MHz – 3GHz:



3GHz – 20GHz:



Configuration 3 - Mode 6

No emissions were detected within 35dB of the limit.

Configuration 3 - Mode 7

No emissions were detected within 35dB of the limit.

Product Service

8PSK

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.

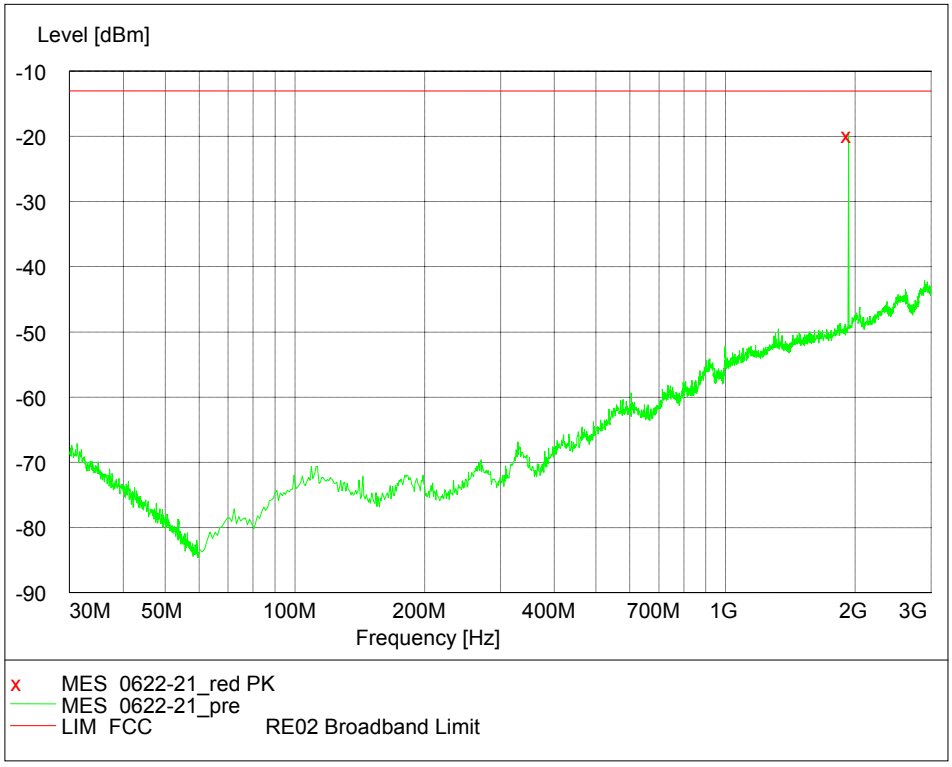
Configuration 1 - Mode 3

No emissions were detected within 35dB of the limit.

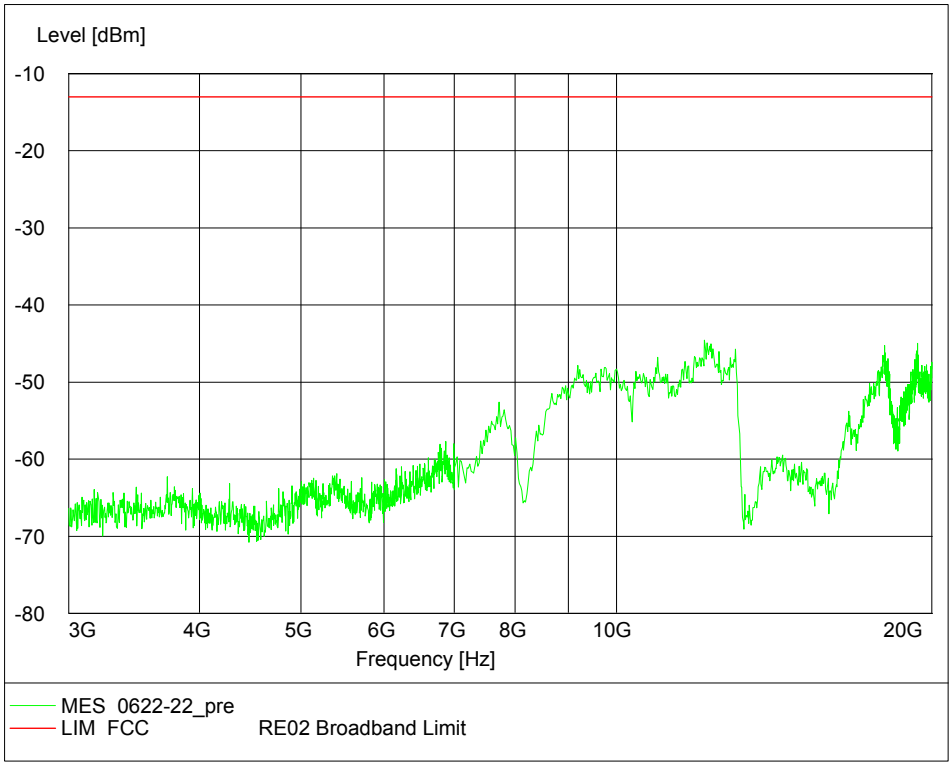
Product Service

Configuration 2 - Mode 1

30MHz – 3GHz:



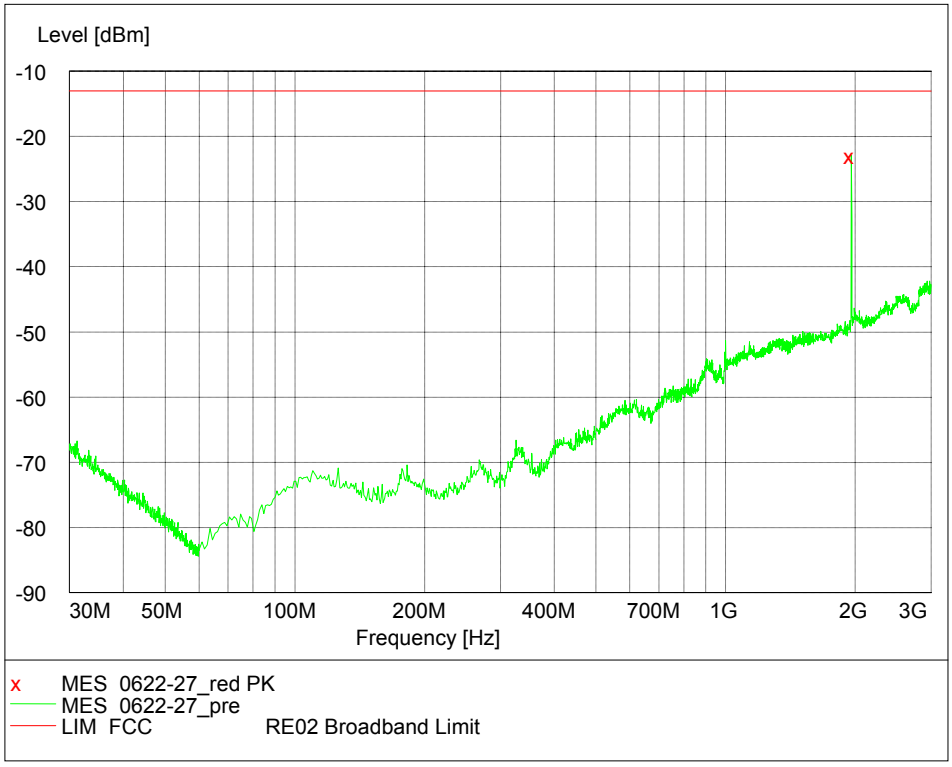
3GHz – 20GHz:



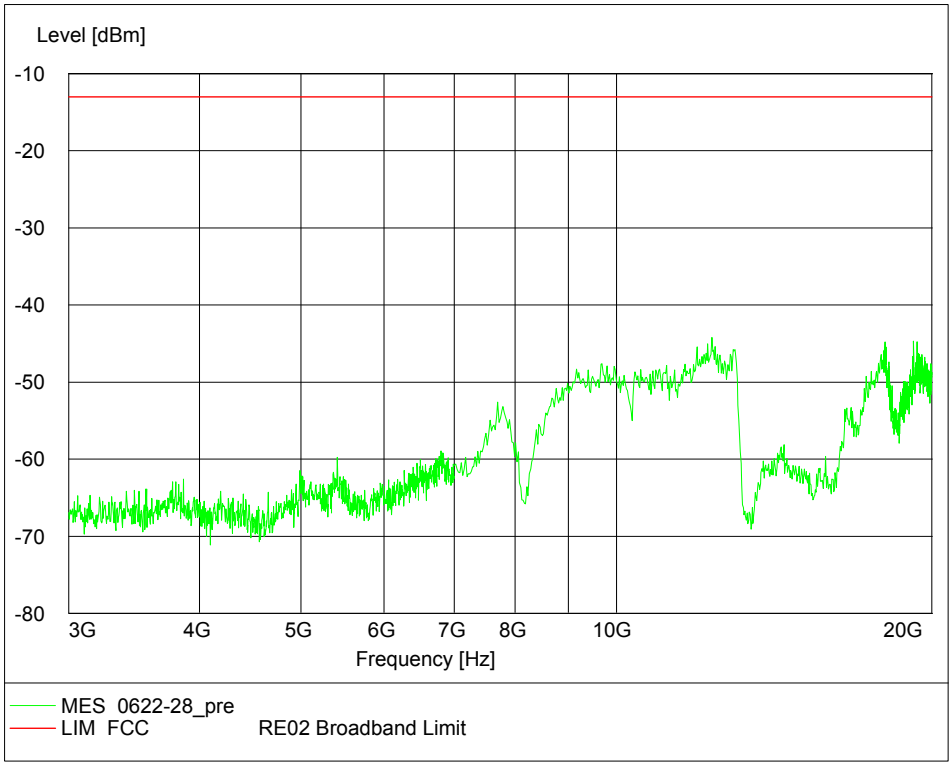
Product Service

Configuration 2 - Mode 2

30MHz – 3GHz:



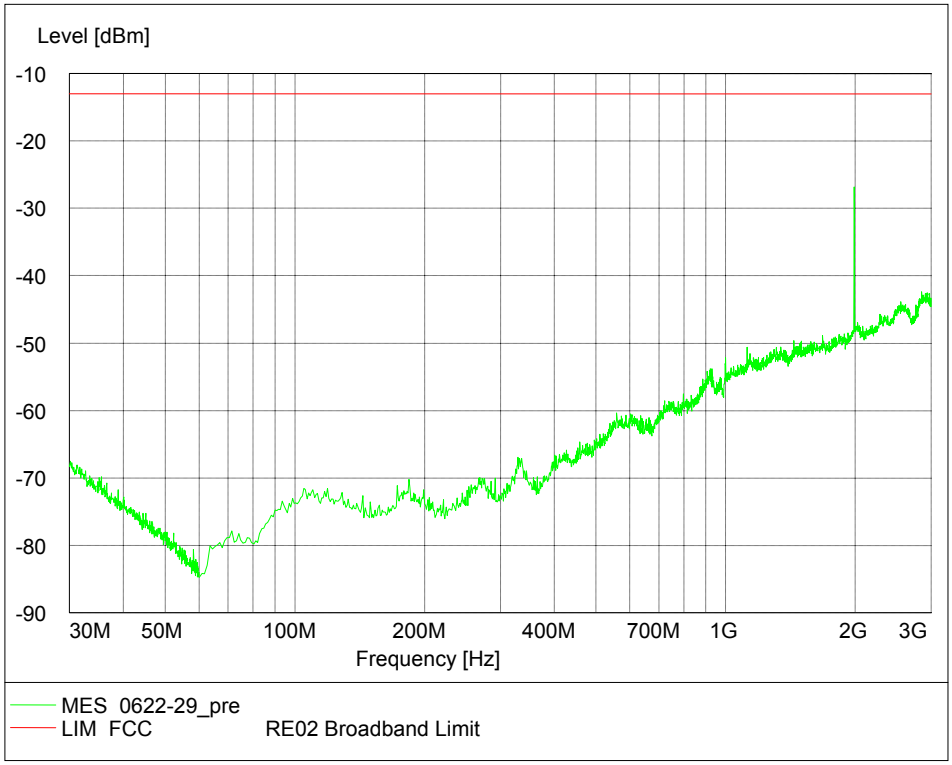
3GHz – 20GHz:



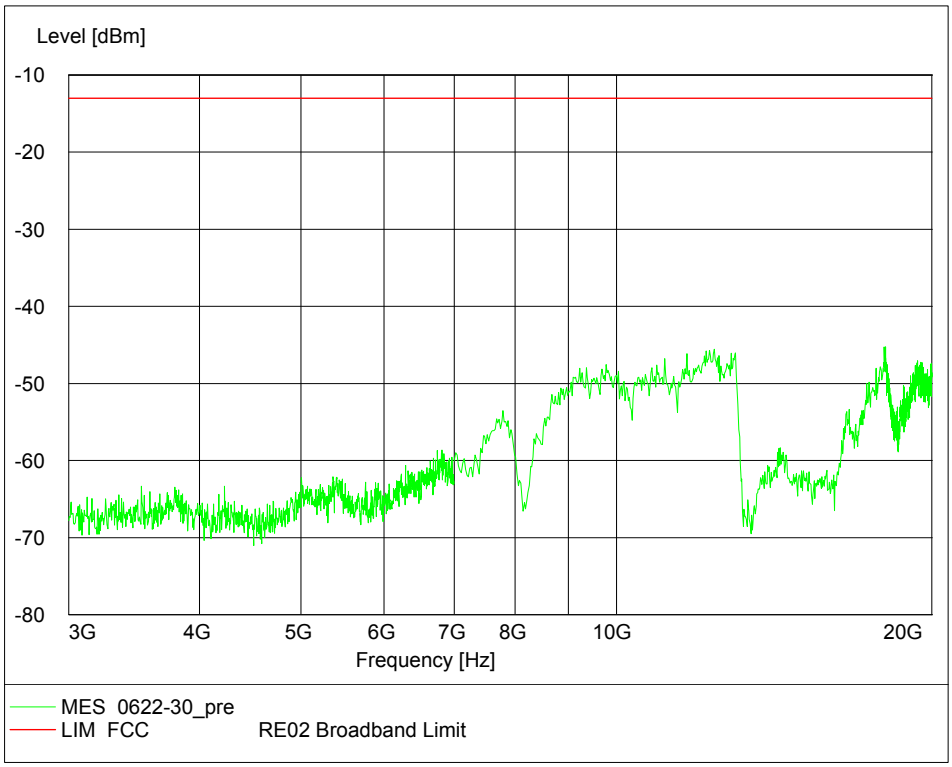
Product Service

Configuration 2 - Mode 3

30MHz – 3GHz:



3GHz – 20GHz:



Configuration 3 - Mode 6

No emissions were detected within 35dB of the limit.

Configuration 3 - Mode 7

No emissions were detected within 35dB of the limit.

Limit	-13dBm

Remarks

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

2.7 CONDUCTED SPURIOUS EMISSIONS

2.7.1 Specification Reference

FCC CFR 47 Part 2: 2009, Clause 2.1051
FCC CFR 47 Part 24, 24.238(a)
Industry Canada RSS-133, Clause 6.5

2.7.2 Equipment Under Test

RUG 11 B2, S/N: CB4D438043

2.7.3 Date of Test and Modification State

23 June to 6 July 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 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 a combination of a filter and attenuators and the frequency spectrum investigated from 9kHz to 20GHz. The EUT was set to transmit on maximum power. The EUT was tested on Bottom, Middle and Top channels for both modulation types. The resolution was set to 1MHz thus meeting the requirements of Part 24.238(b). The spectrum analyser detector was set to Peak.

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 10^{th} harmonic of the fundamental.

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

Configuration 1 - Mode 1
- Mode 2
- Mode 3

Configuration 2 - Mode 1
- Mode 2
- Mode 3

Configuration 3 - Mode 6
- Mode 7

Product Service

2.7.6 Environmental Conditions

	23 June 2010	24 June 2010	1 July 2010	6 July 2010
Ambient Temperature	25.0°C	26.5°C	24.4°C	26.6°C
Relative Humidity	37.1%	38.3%	36.8%	39.2%

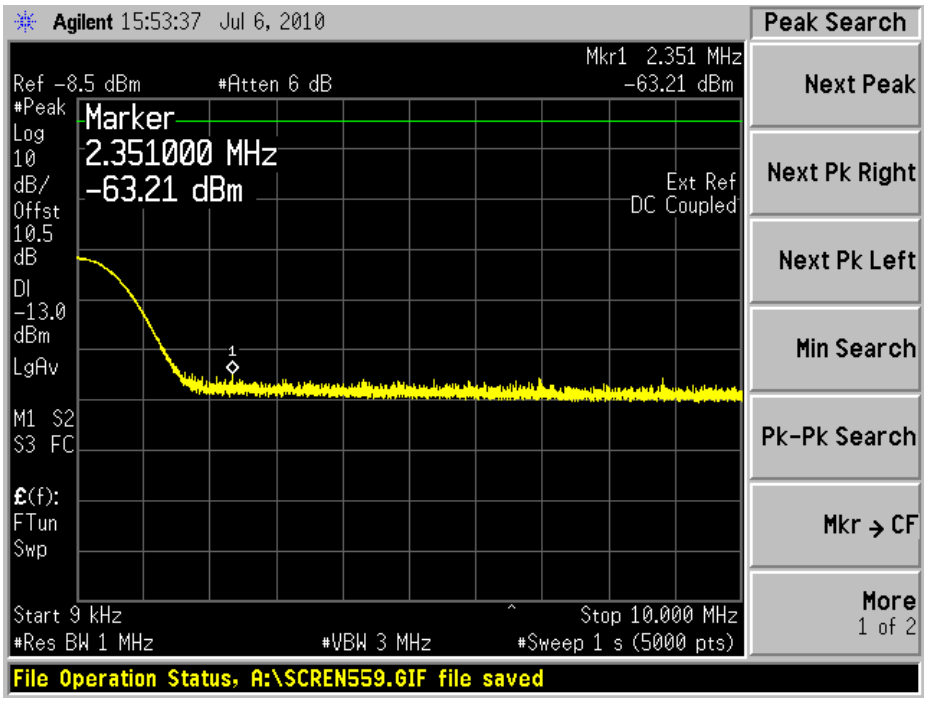
2.7.7 Test Results

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 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 measurement with a smaller RBW showed that it was related to the LO feedthrough, see below.

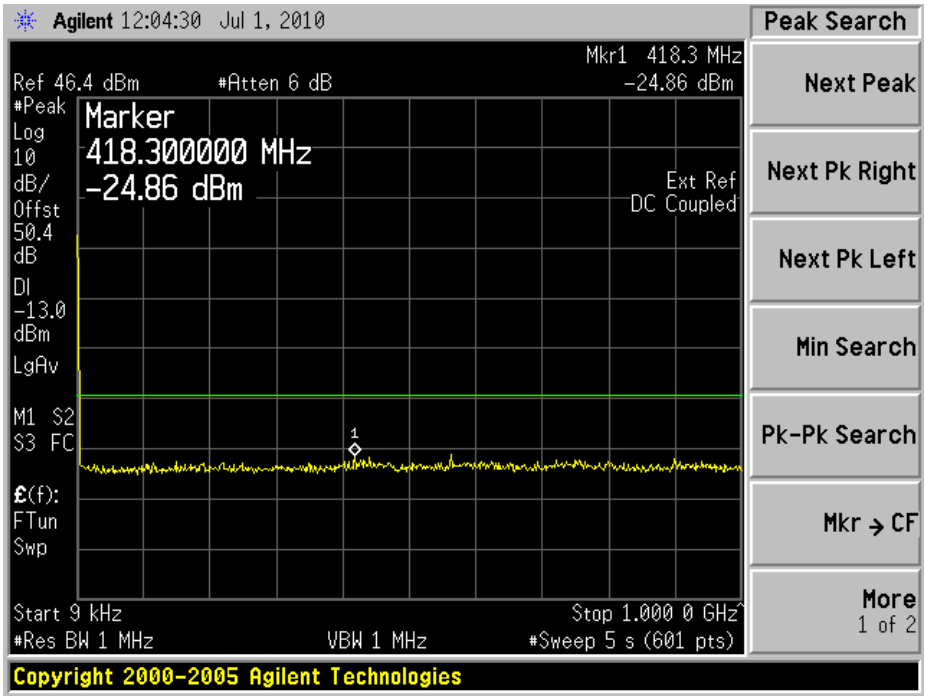


Product Service

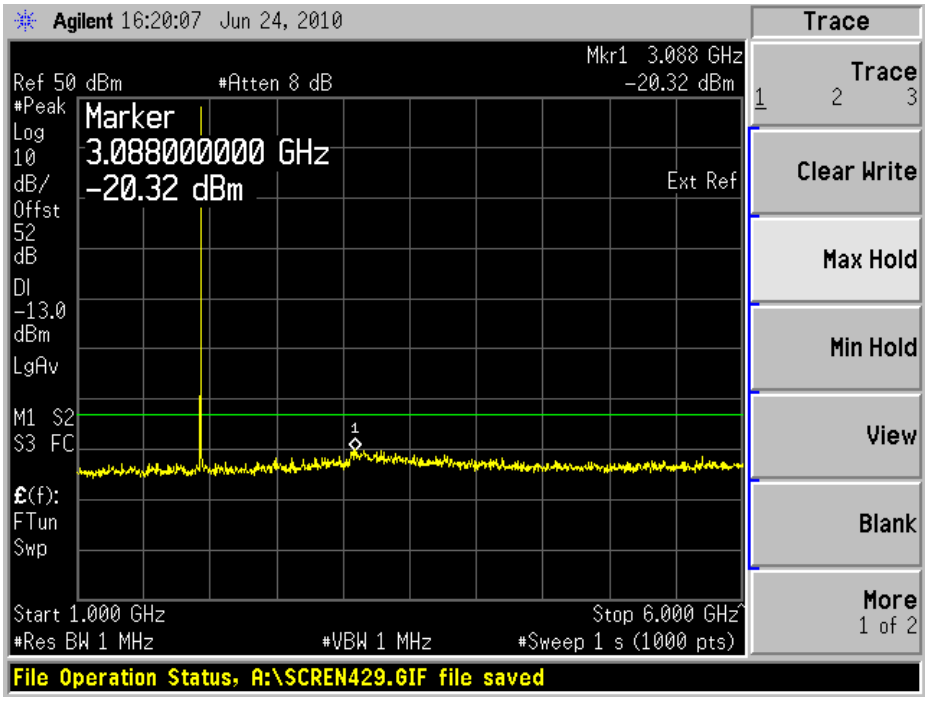
GMSK

Configuration 1 - Mode 1

9kHz to 1GHz



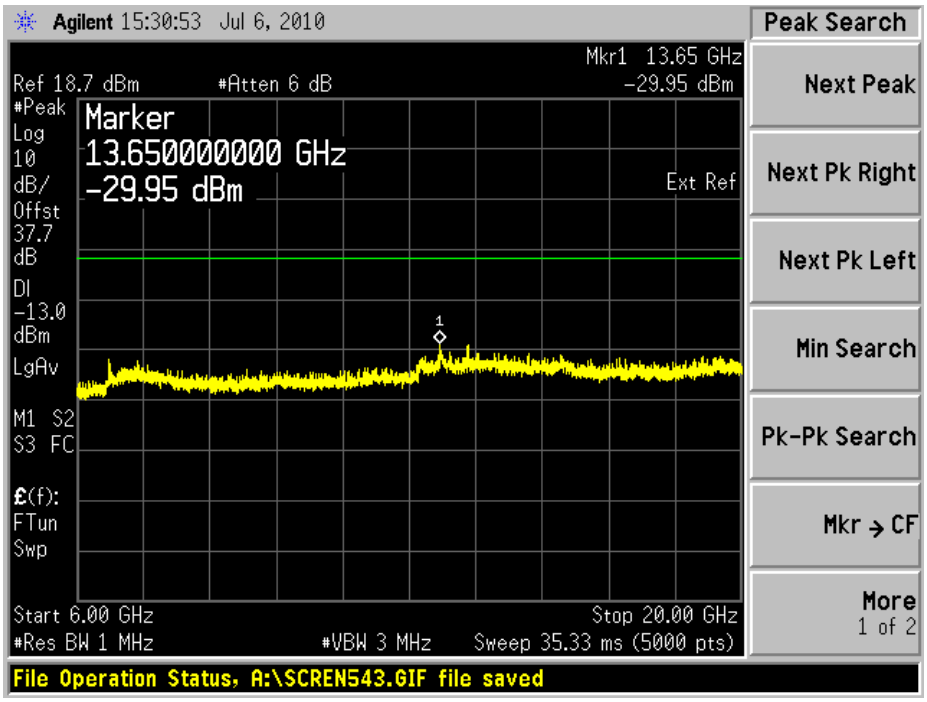
1GHz to 6GHz



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

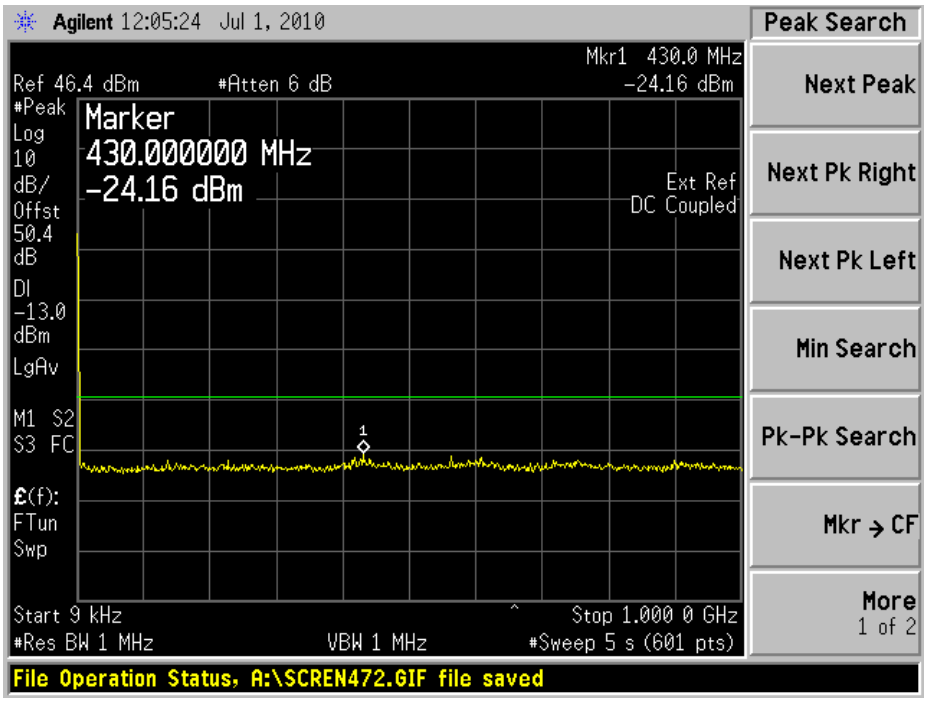
Product Service

6GHz to 20GHz



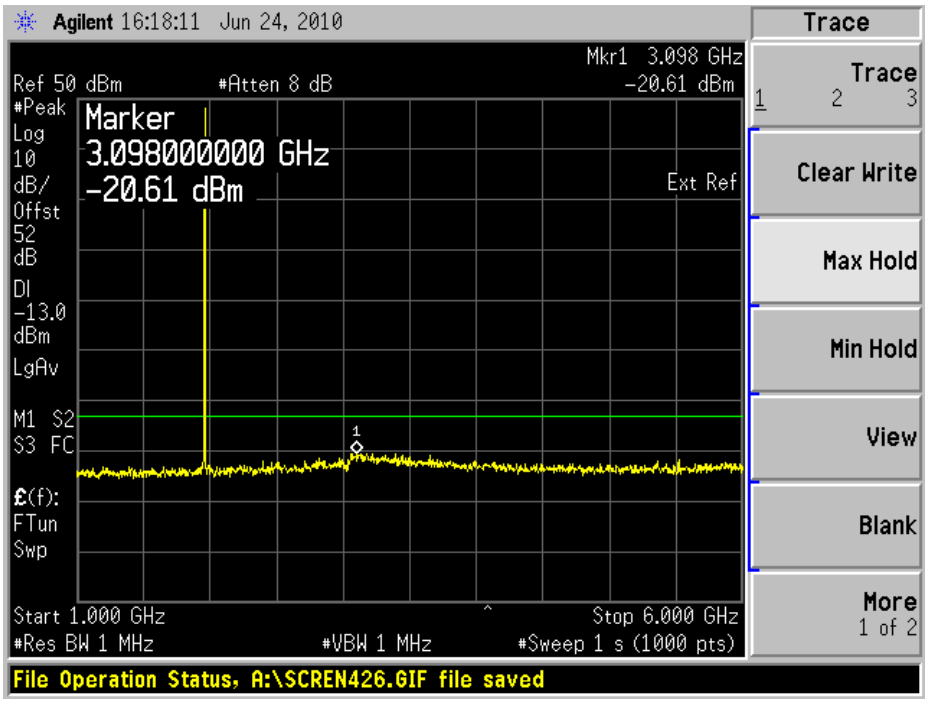
Configuration 1 - Mode 2

9kHz to 1GHz



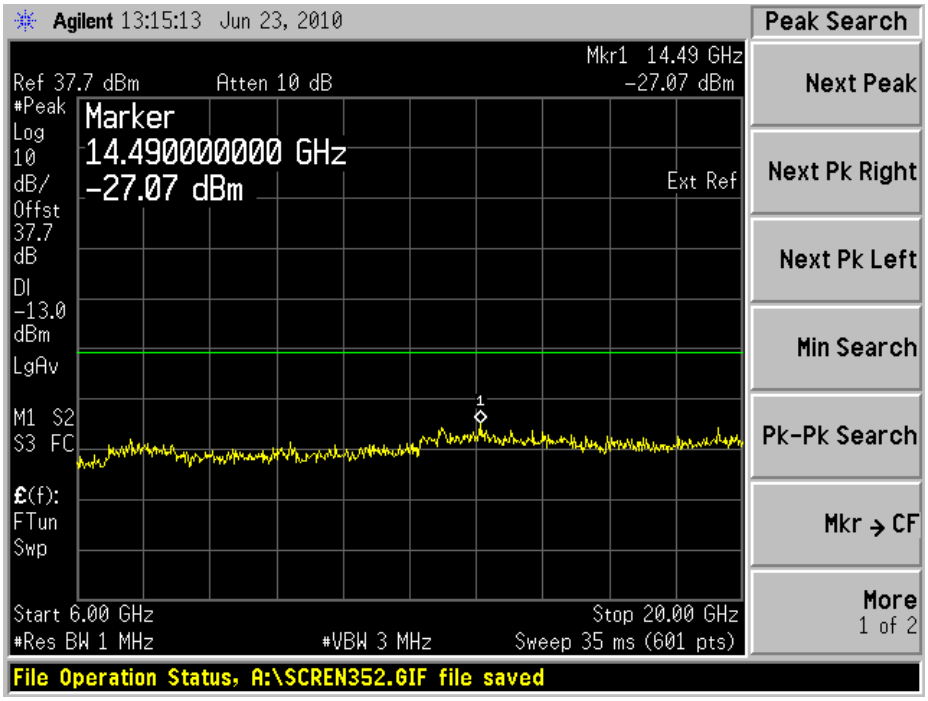
Product Service

1GHz to 6GHz



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

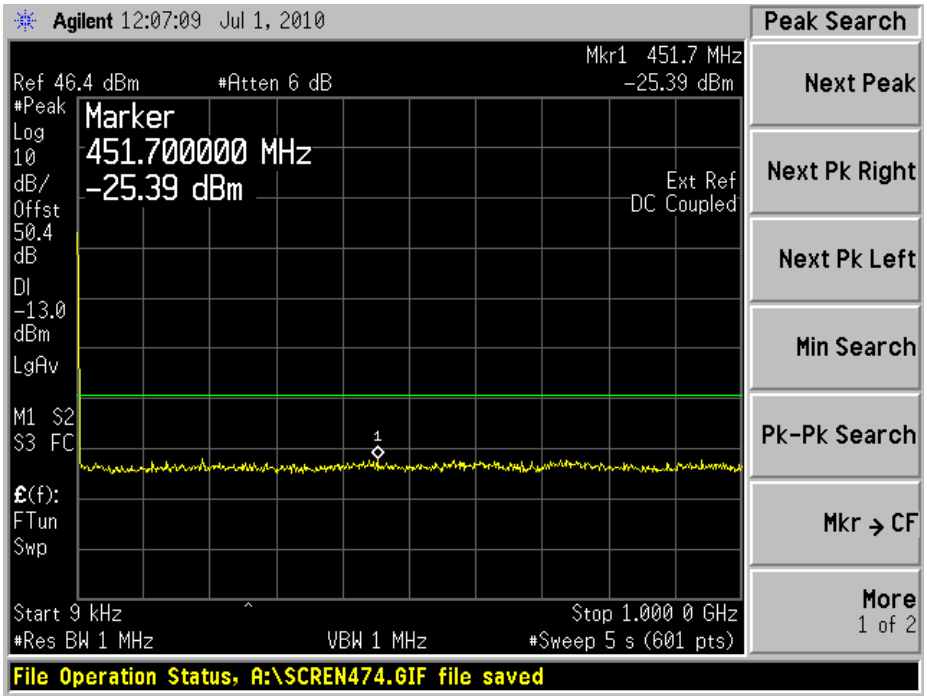
6GHz to 20GHz



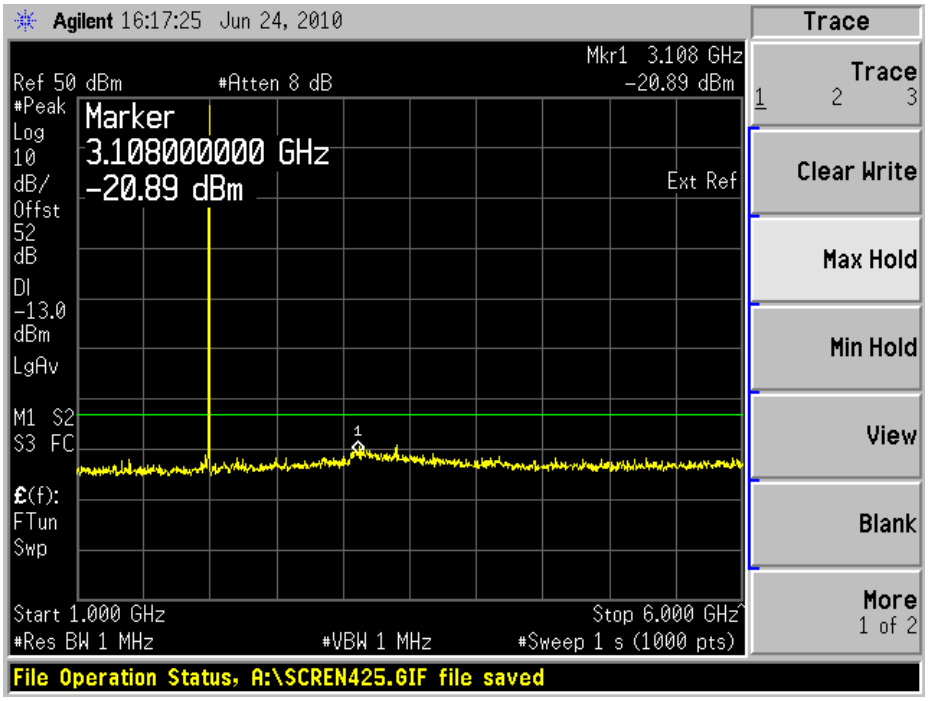
Product Service

Configuration 1 - Mode 3

9kHz to 1GHz



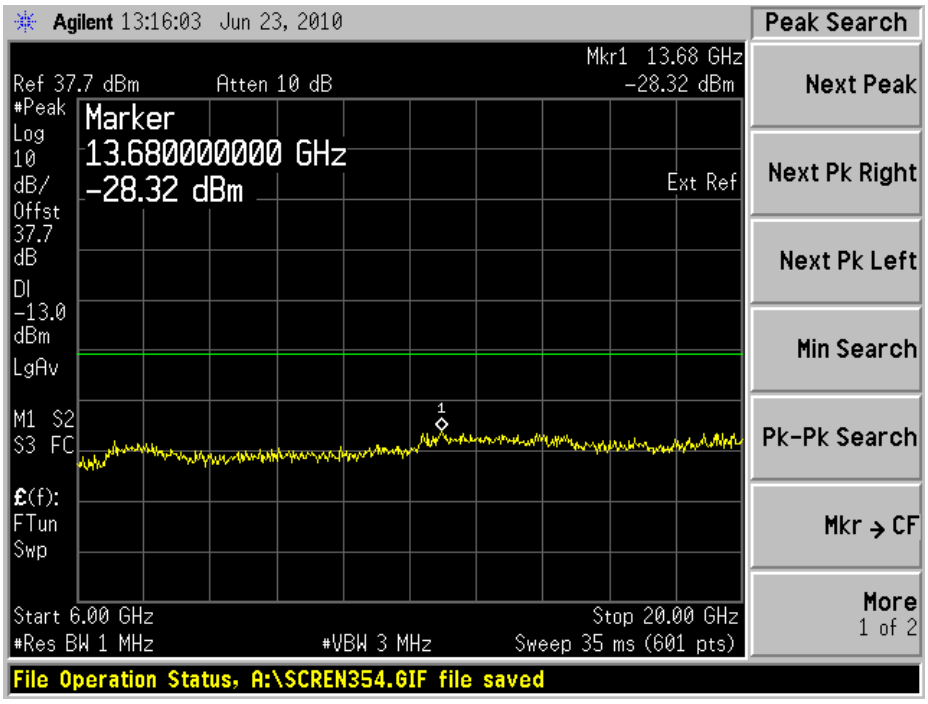
1GHz to 6GHz



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

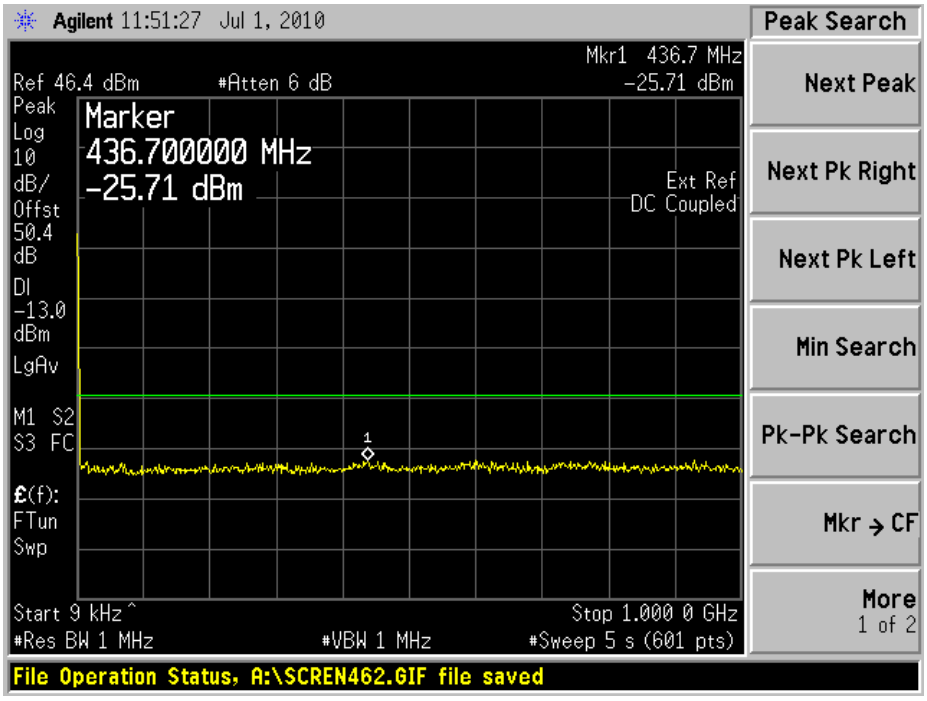
Product Service

6GHz to 20GHz



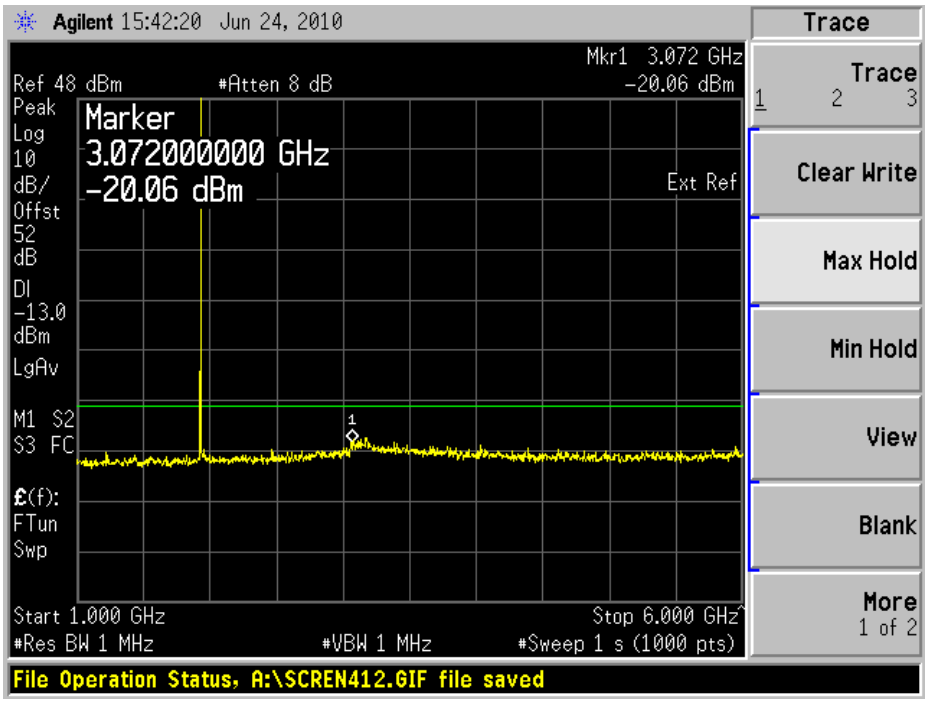
Configuration 2 - Mode 1

9kHz to 1GHz



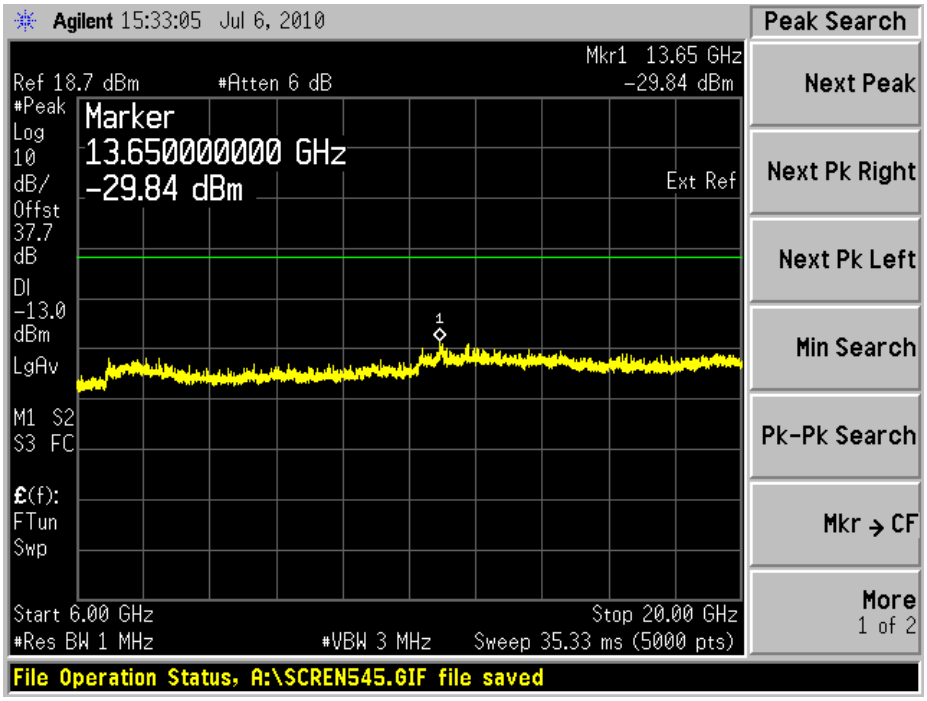
Product Service

1GHz to 6GHz



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

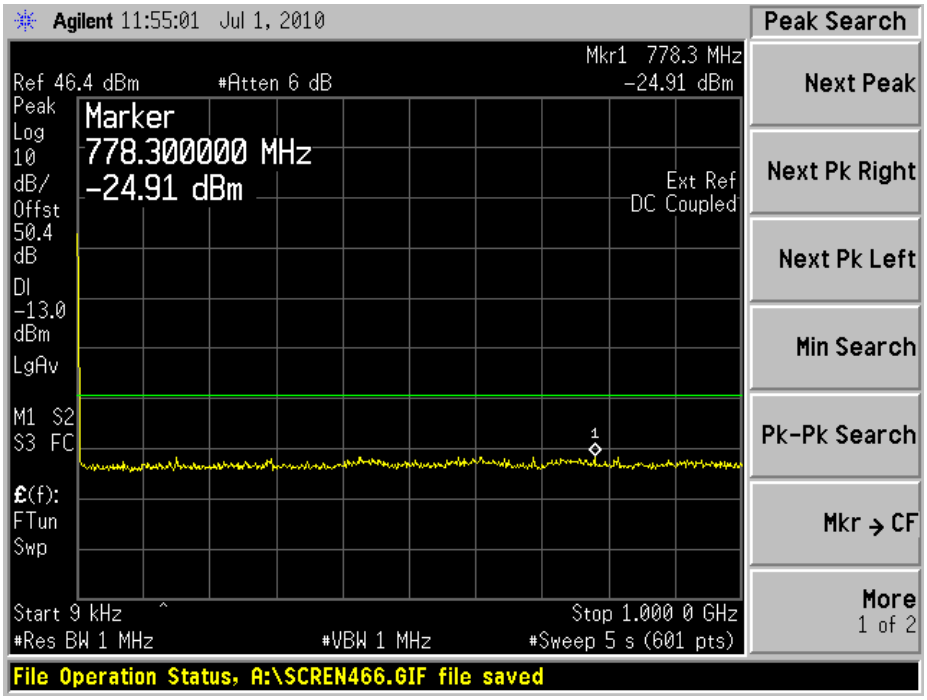
6GHz to 20GHz



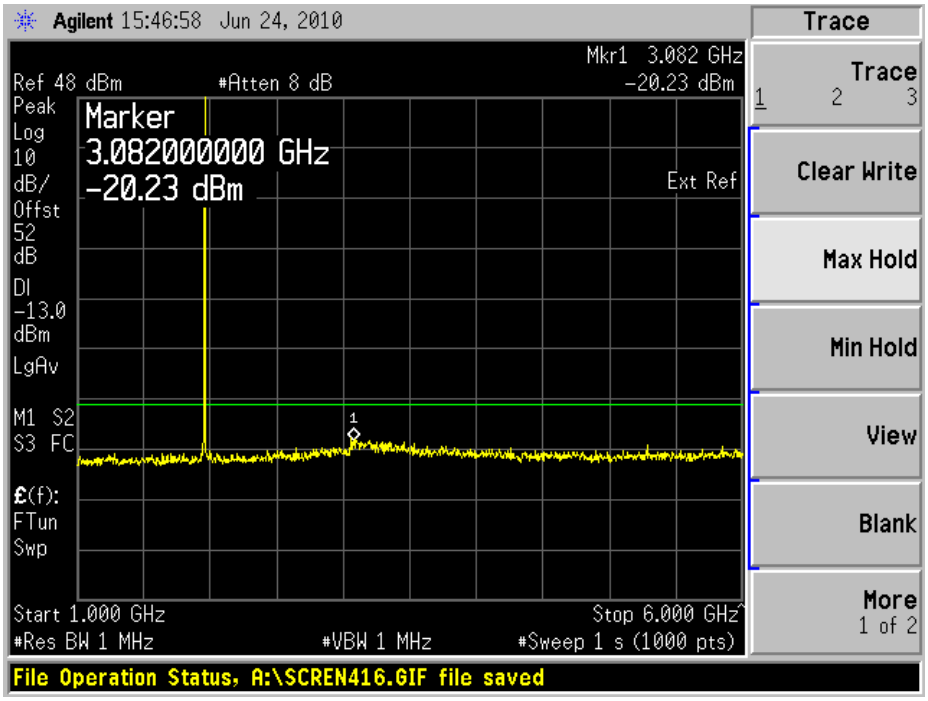
Product Service

Configuration 2 - Mode 2

9kHz to 1GHz



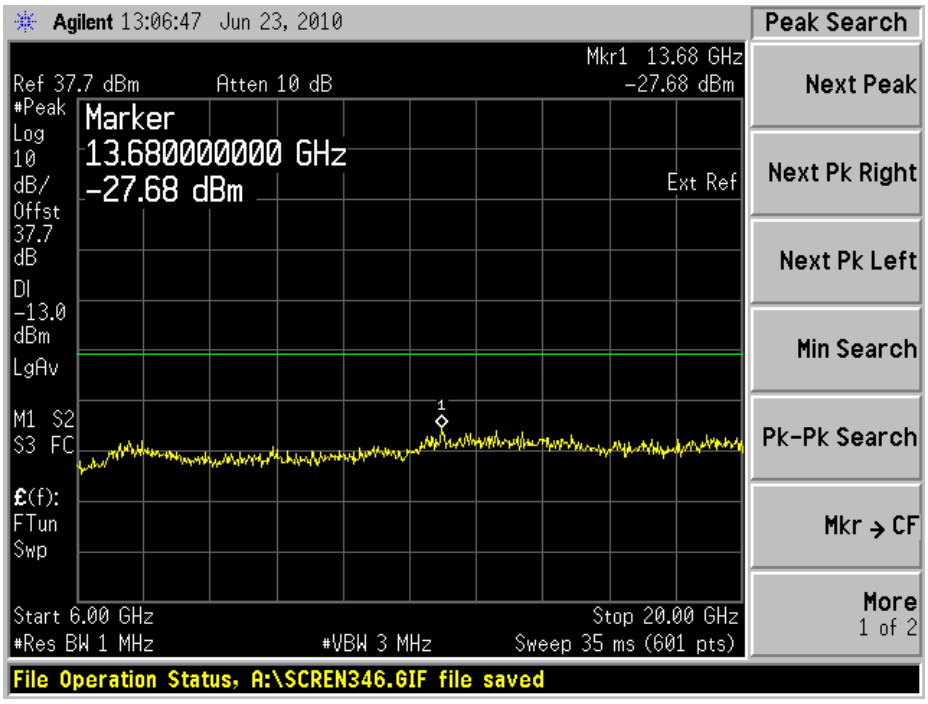
1GHz to 6GHz



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

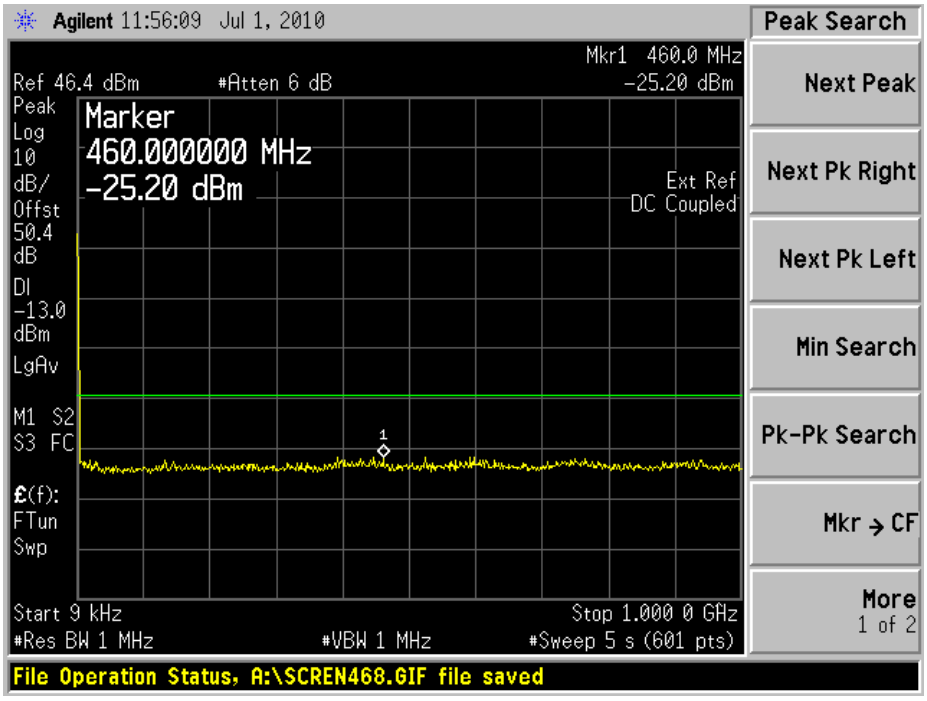
Product Service

6GHz to 20GHz



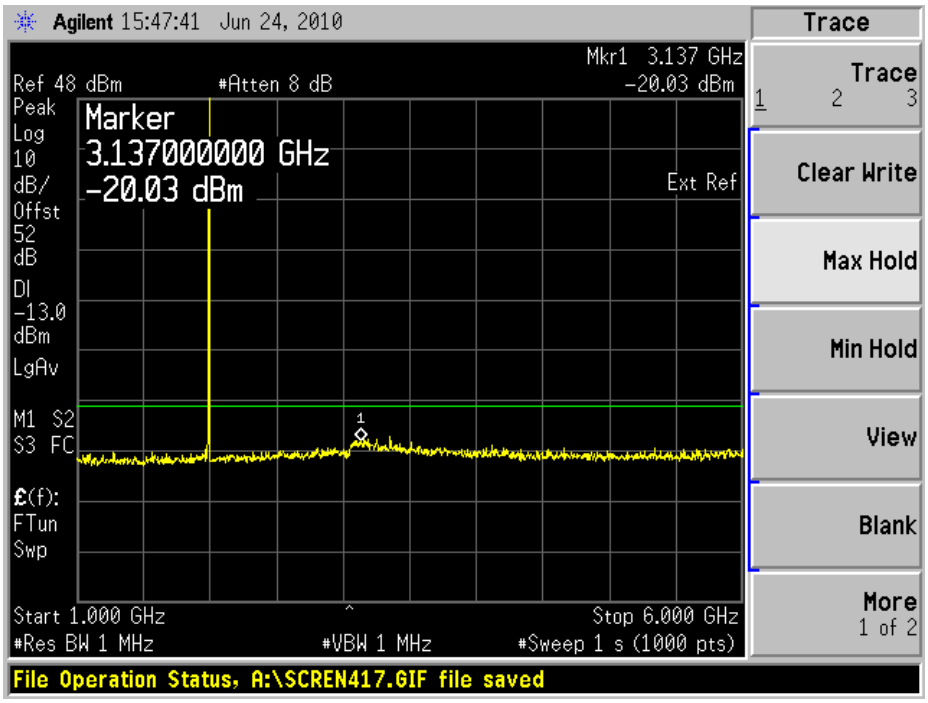
Configuration 2 - Mode 3

9kHz to 1GHz



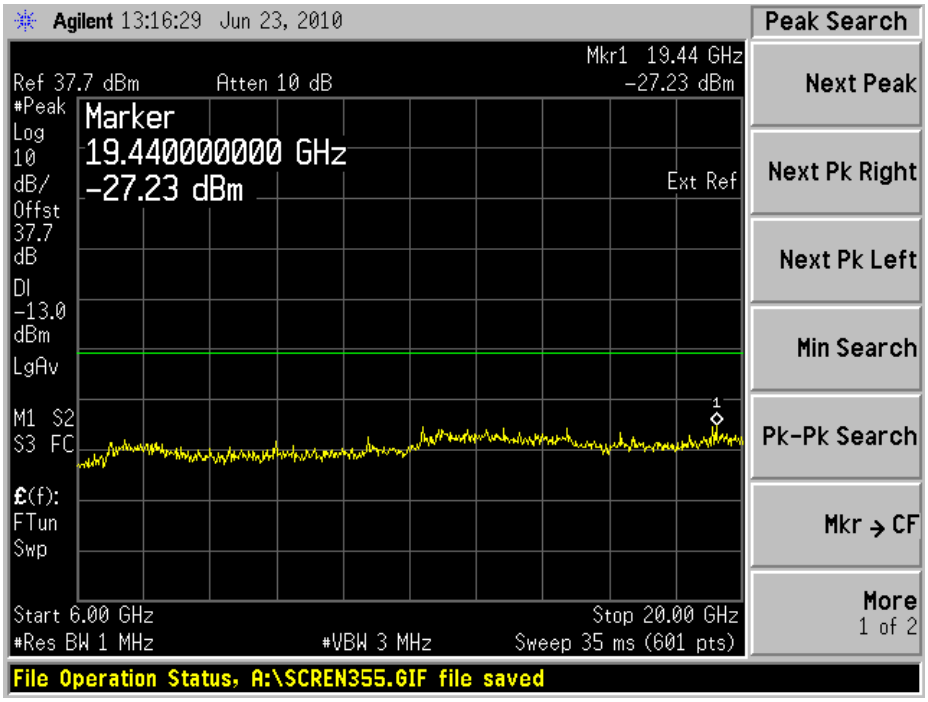
Product Service

1GHz to 6GHz



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

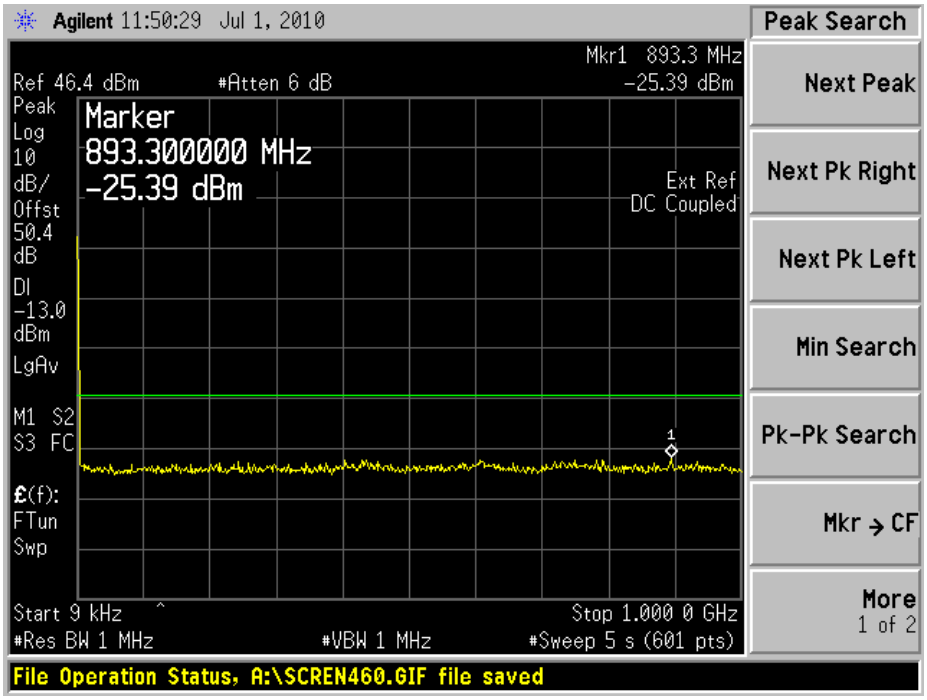
6GHz to 20GHz



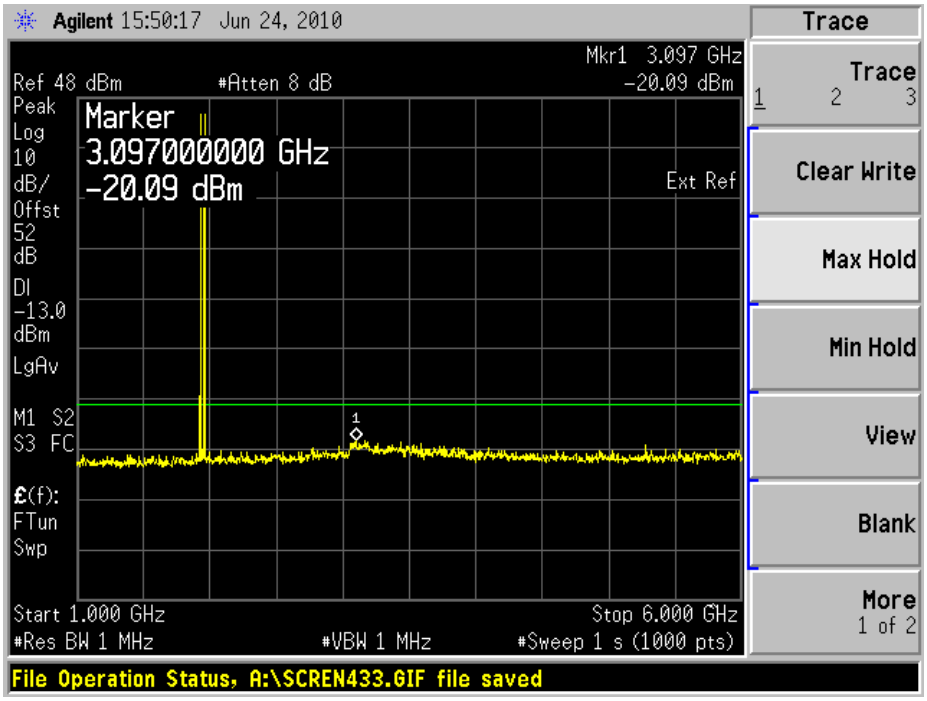
Product Service

Configuration 3 - Mode 6

9kHz to 1GHz



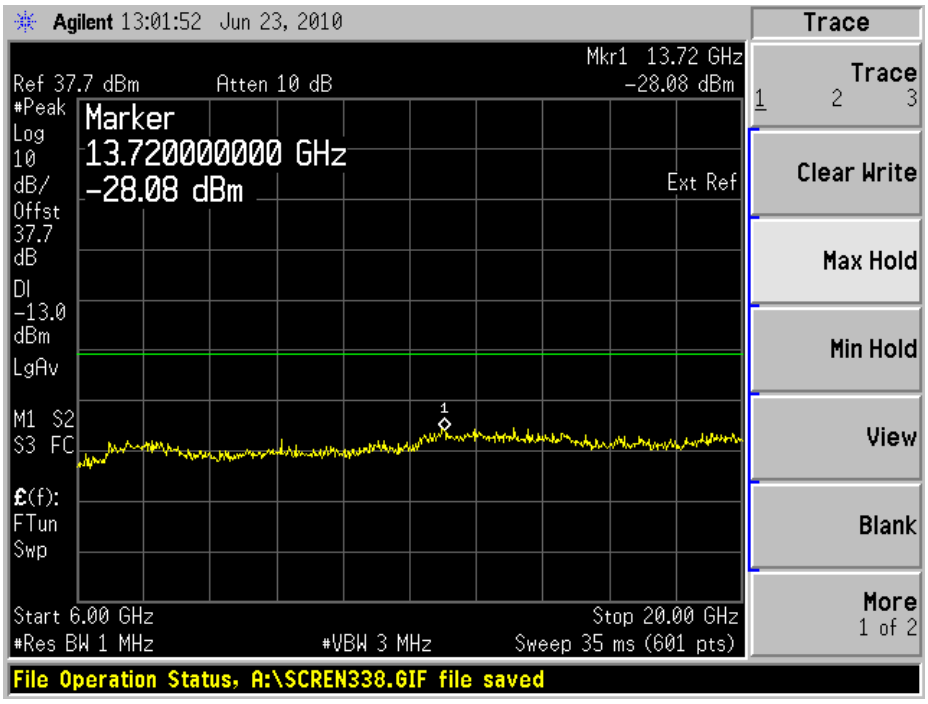
1GHz to 6GHz



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

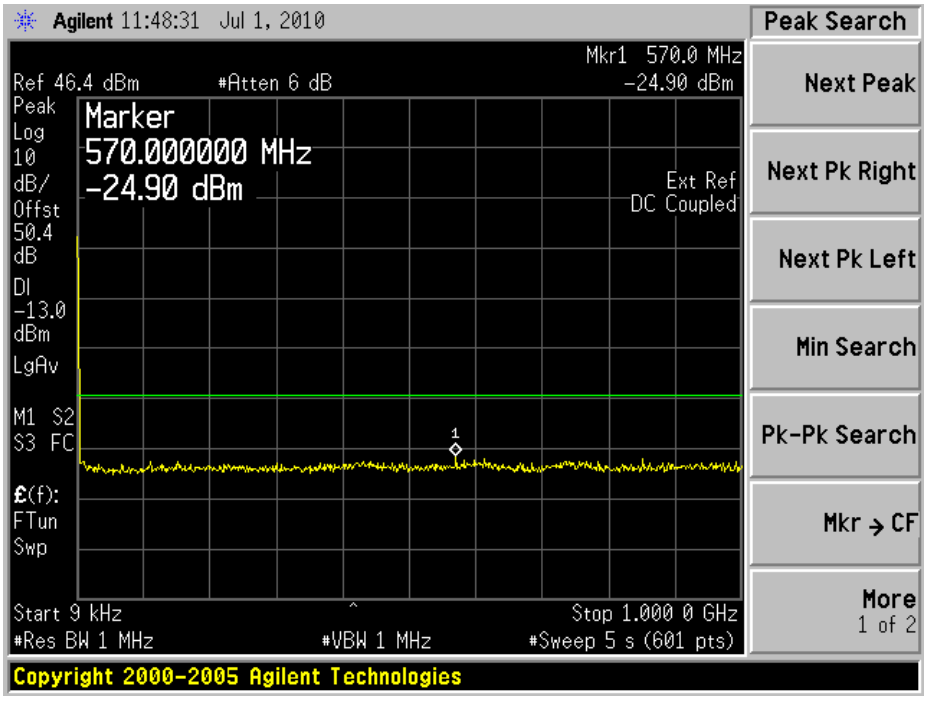
Product Service

6GHz to 20GHz



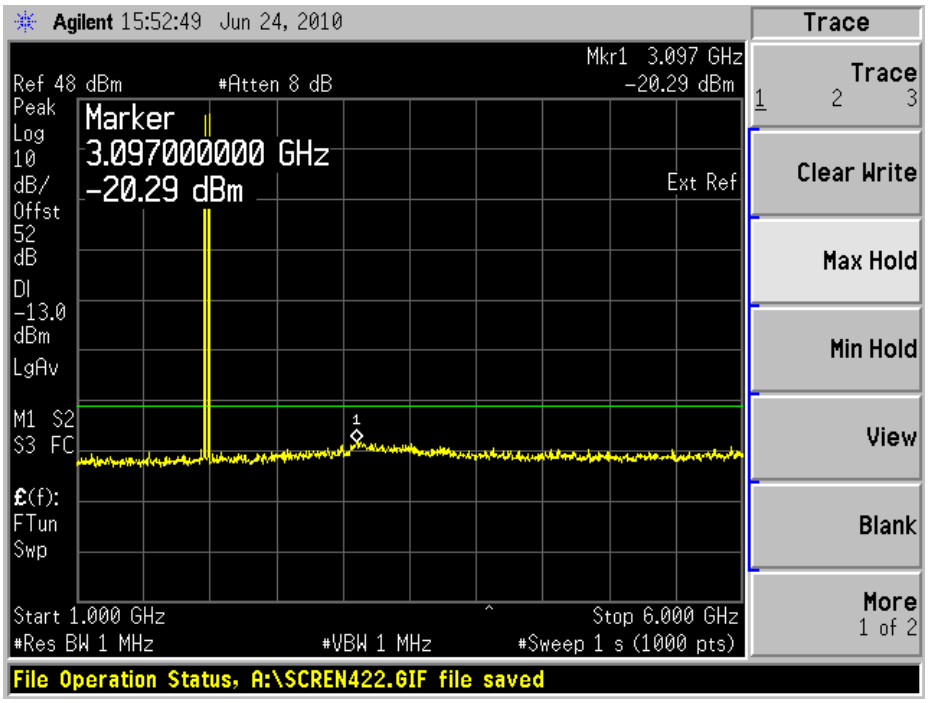
Configuration 3 - Mode 7

9kHz to 1GHz



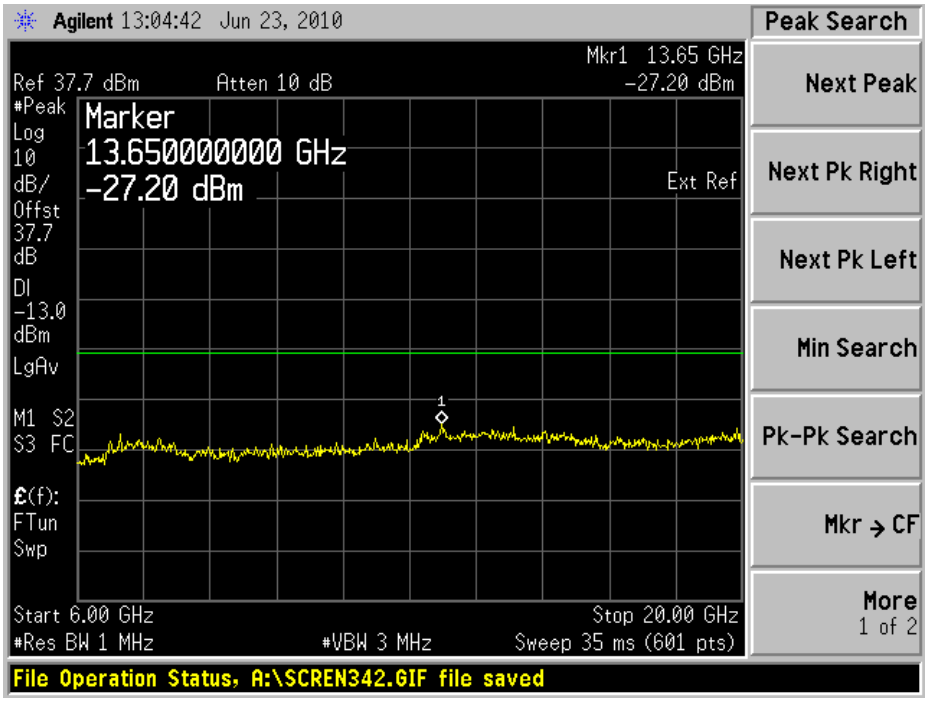
Product Service

1GHz to 6GHz



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

6GHz to 20GHz

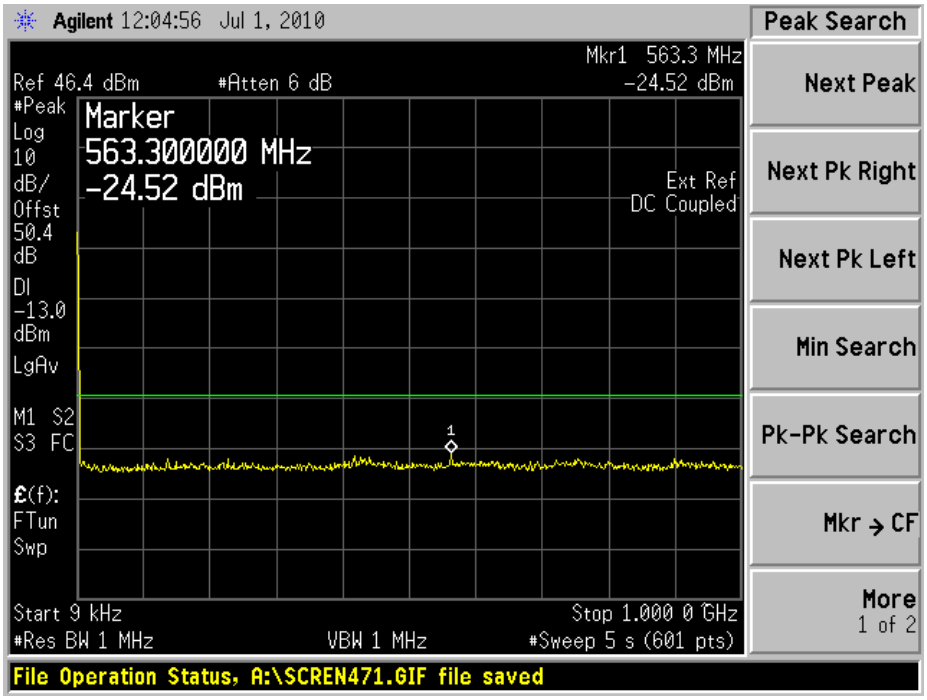


Product Service

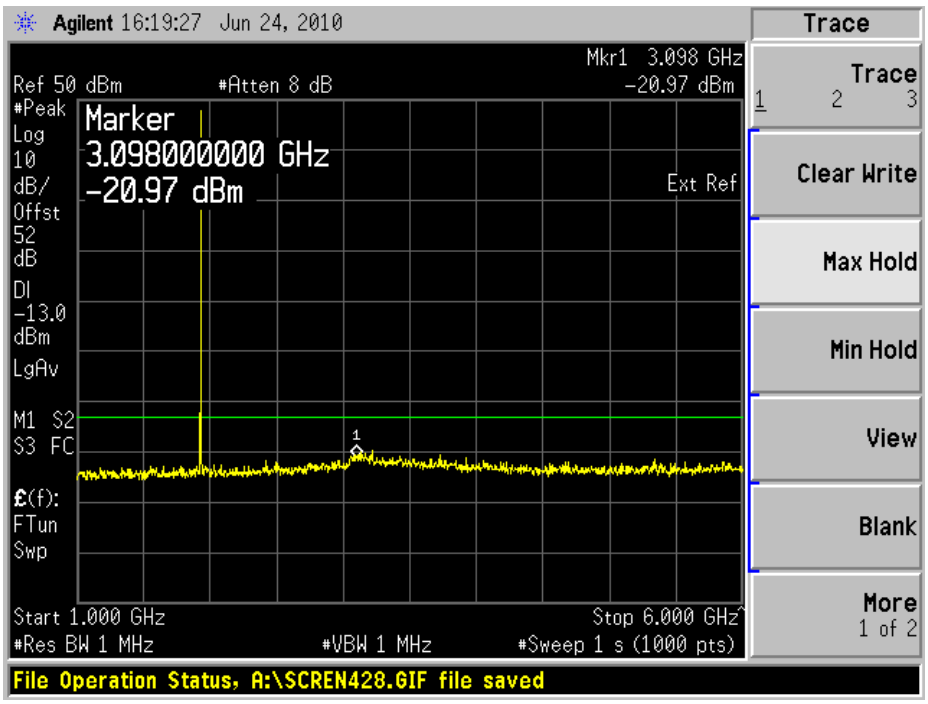
8PSK

Configuration 1 - Mode 1

9kHz to 1GHz



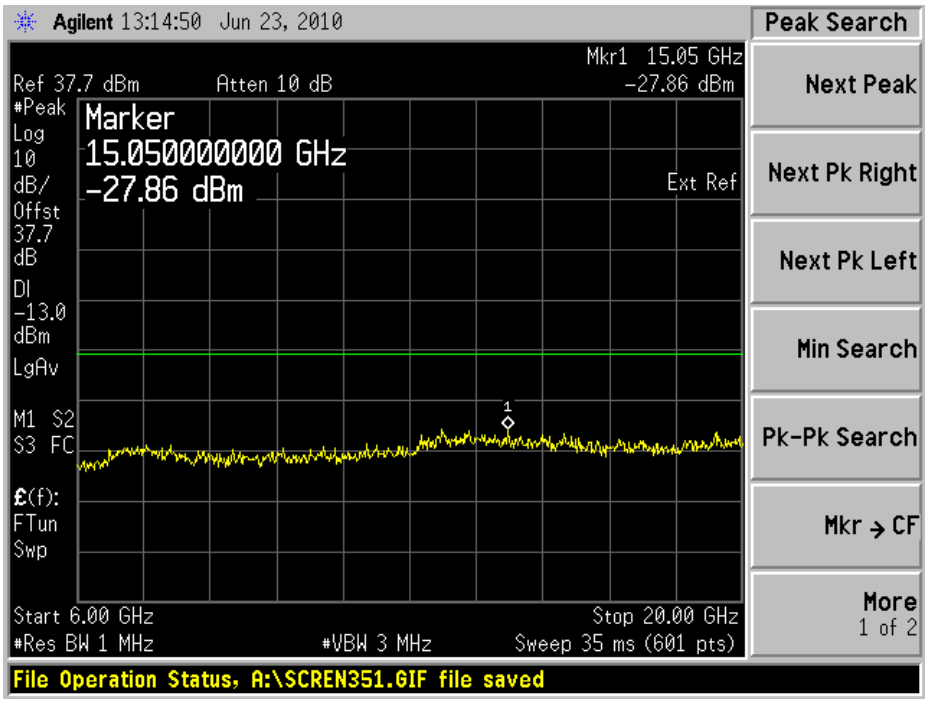
1GHz to 6GHz



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

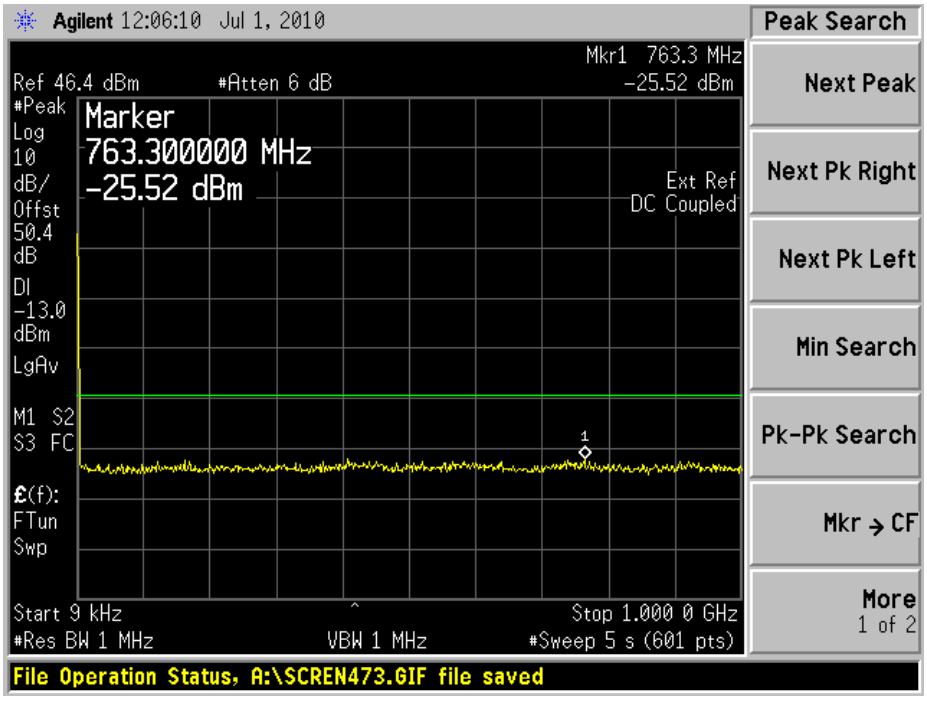
Product Service

6GHz to 20GHz



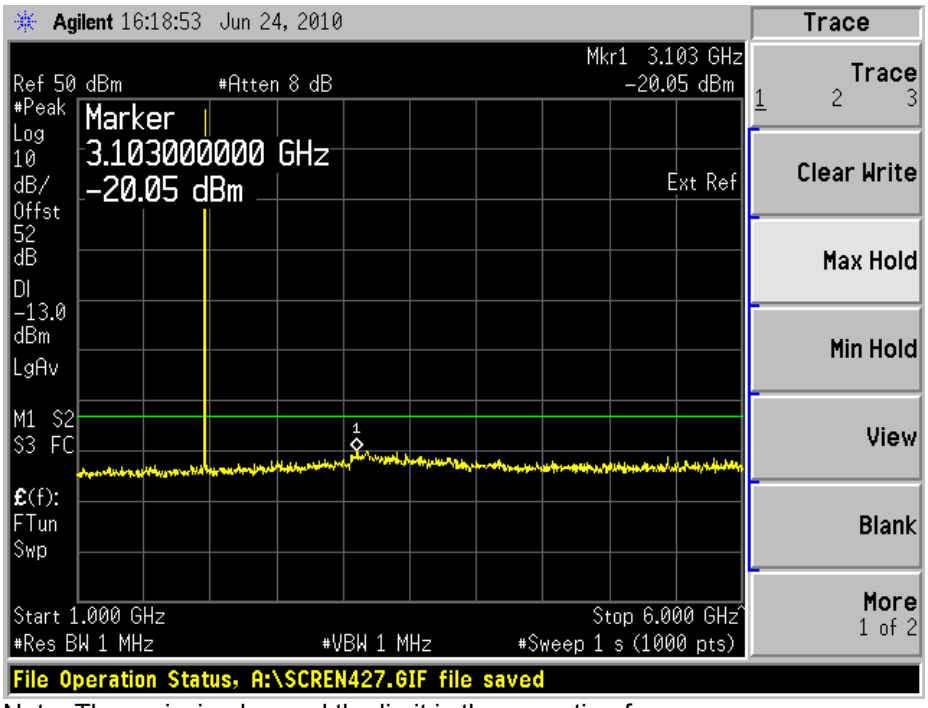
Configuration 1 - Mode 2

9kHz to 1GHz



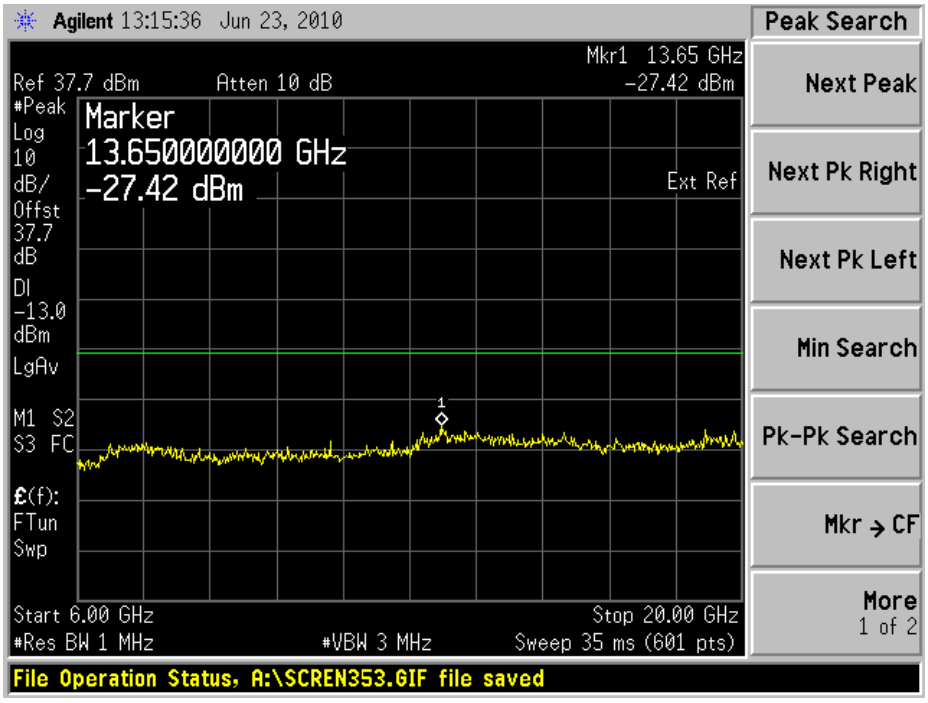
Product Service

1GHz to 6GHz



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

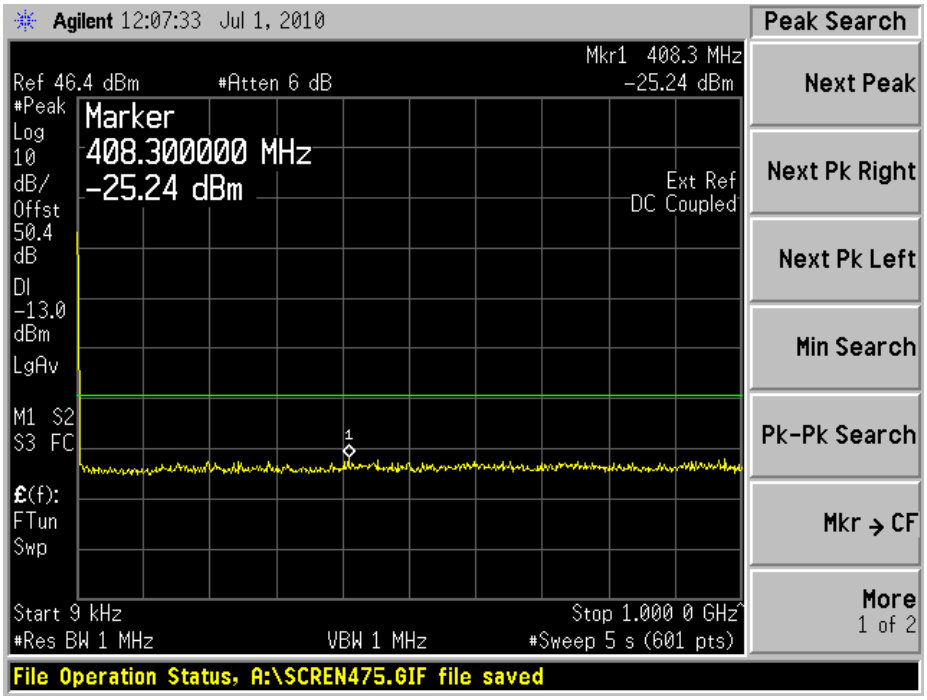
6GHz to 20GHz



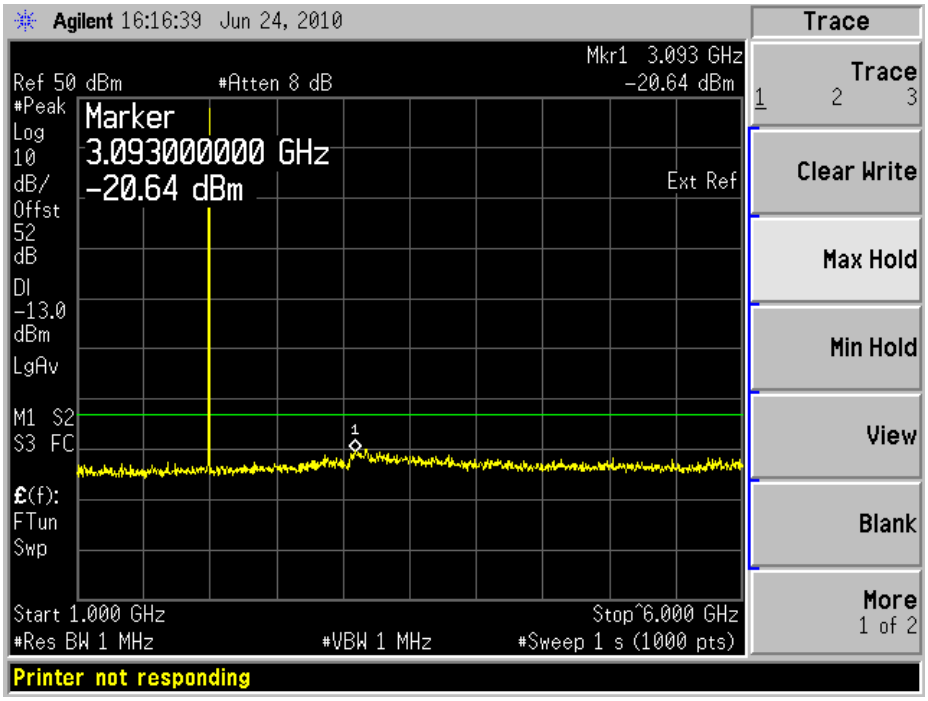
Product Service

Configuration 1 - Mode 3

9kHz to 1GHz



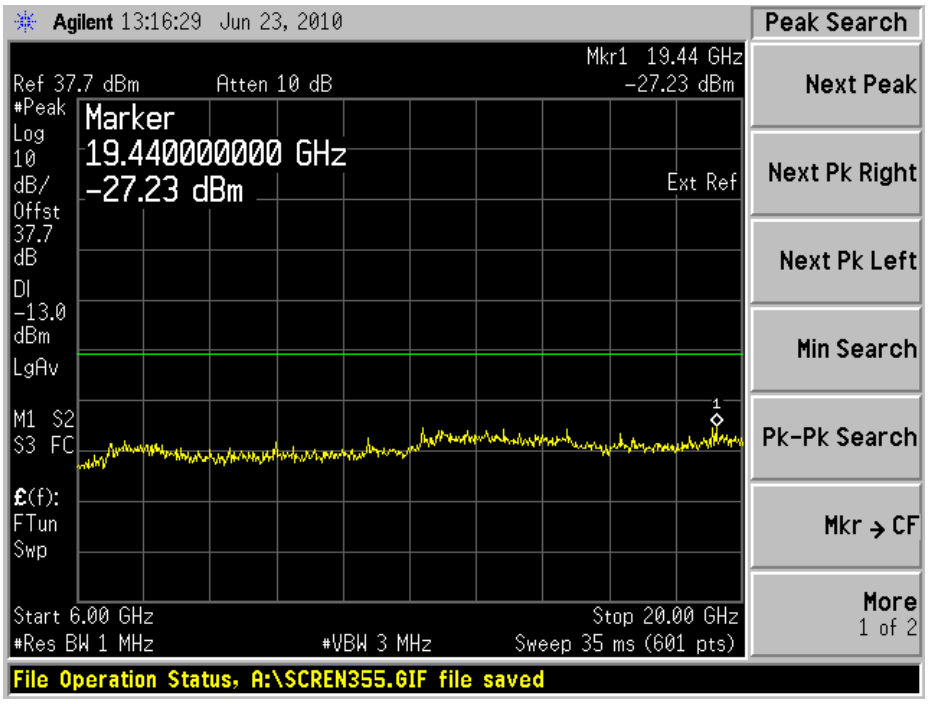
1GHz to 6GHz



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

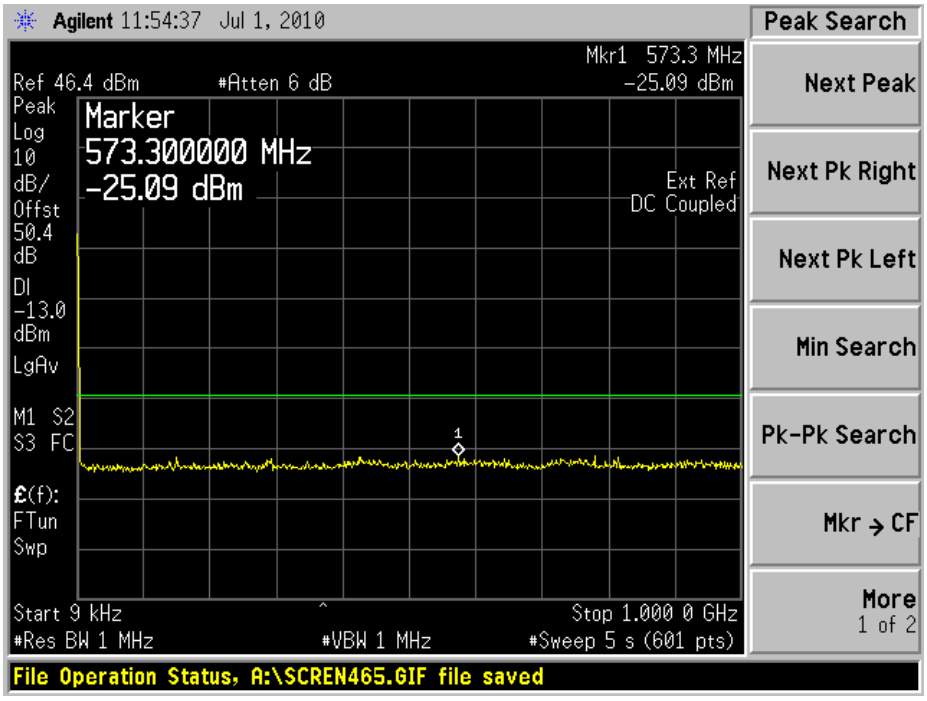
Product Service

6GHz to 20GHz



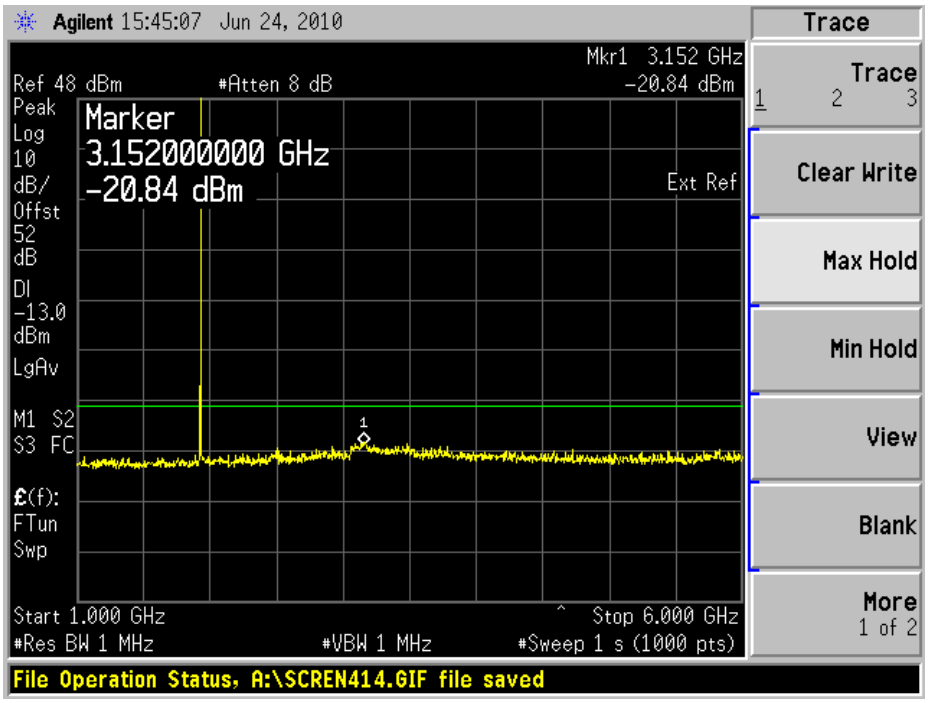
Configuration 2 - Mode 1

9kHz to 1GHz



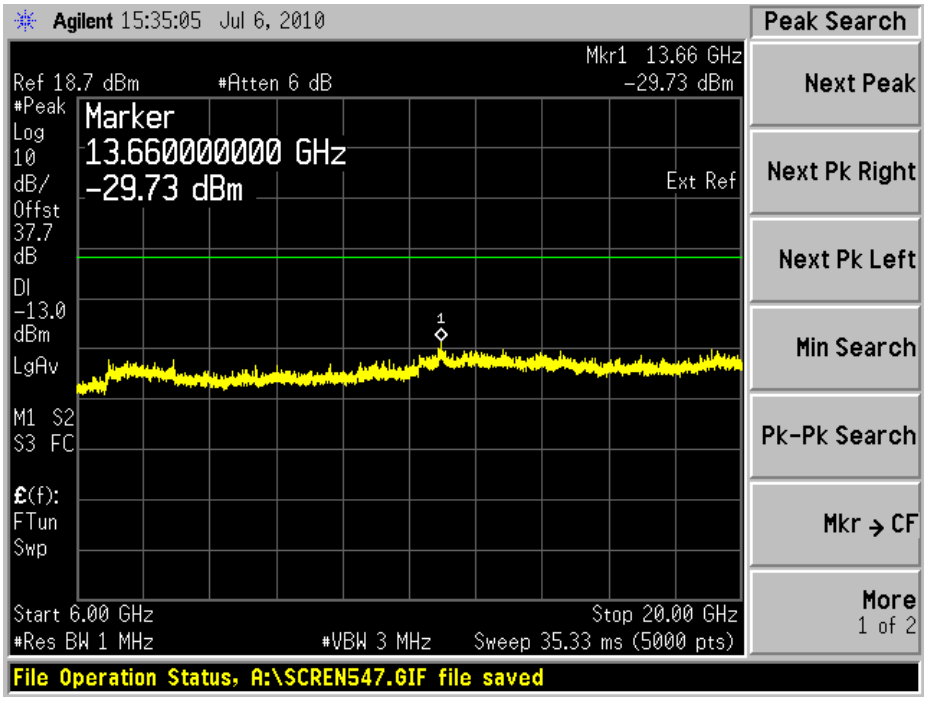
Product Service

1GHz to 6GHz



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

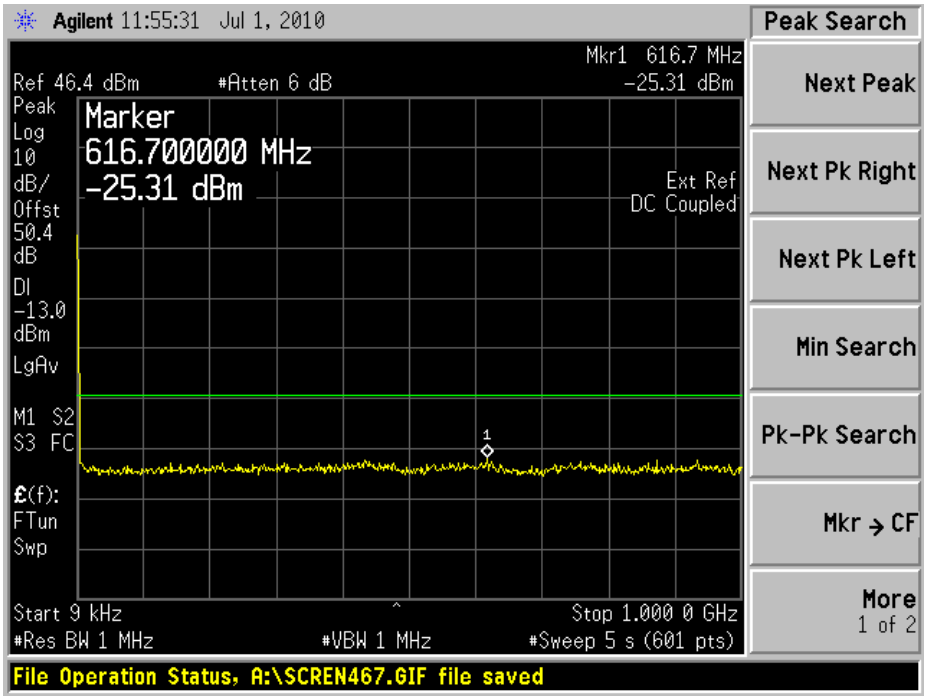
6GHz to 20GHz



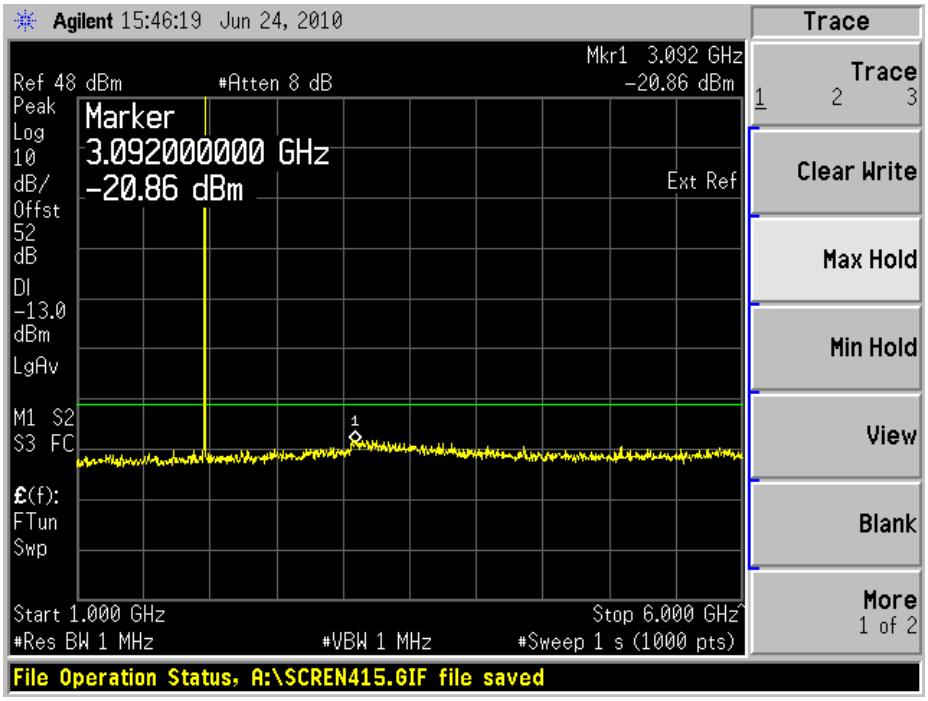
Product Service

Configuration 2 - Mode 2

9kHz to 1GHz



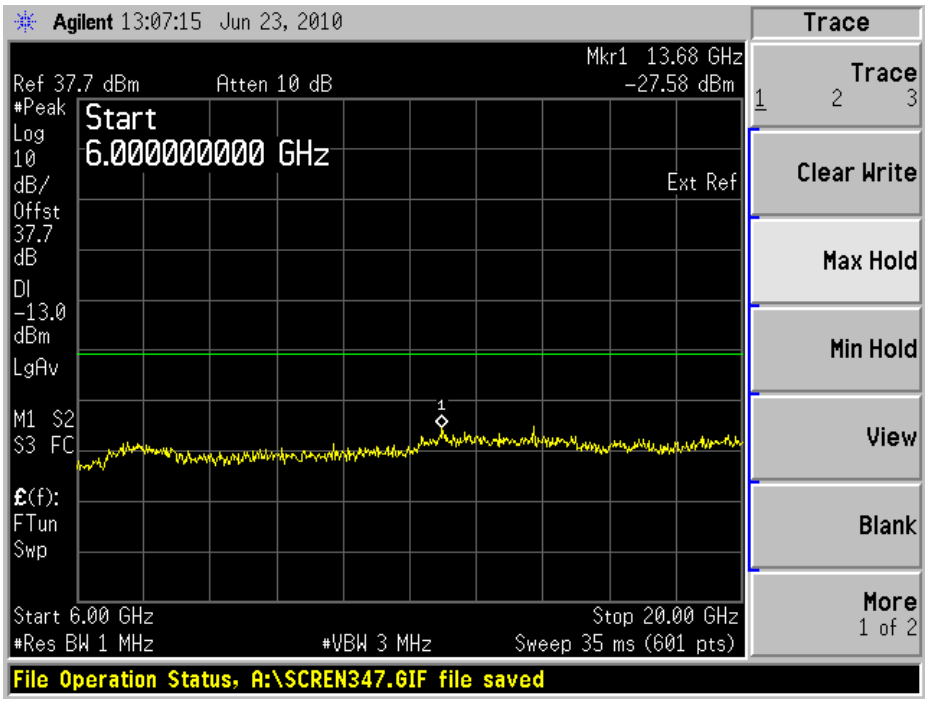
1GHz to 6GHz



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

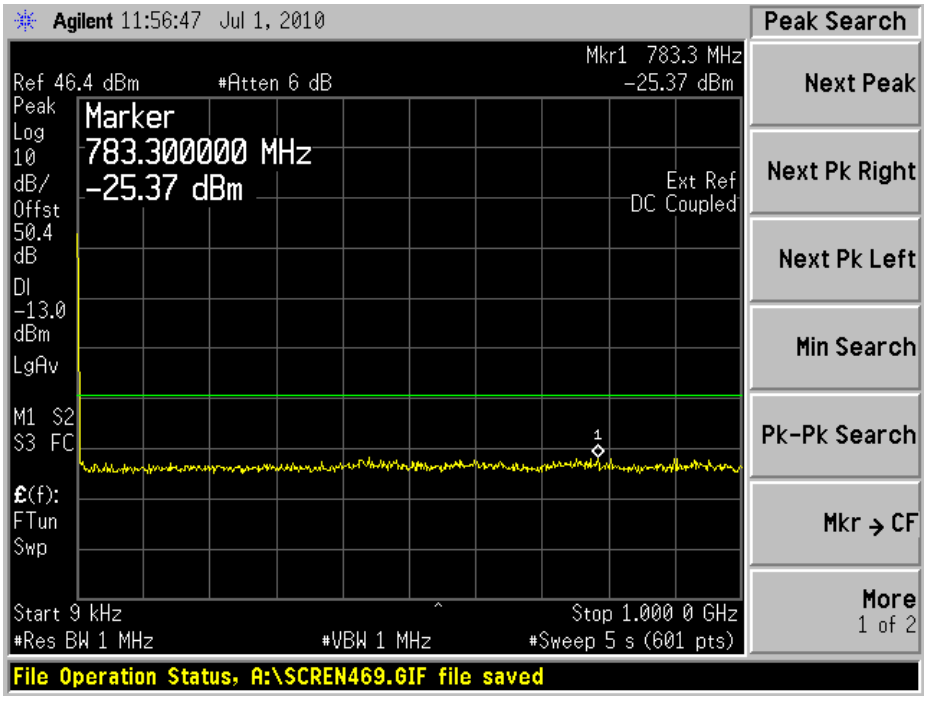
Product Service

6GHz to 20GHz



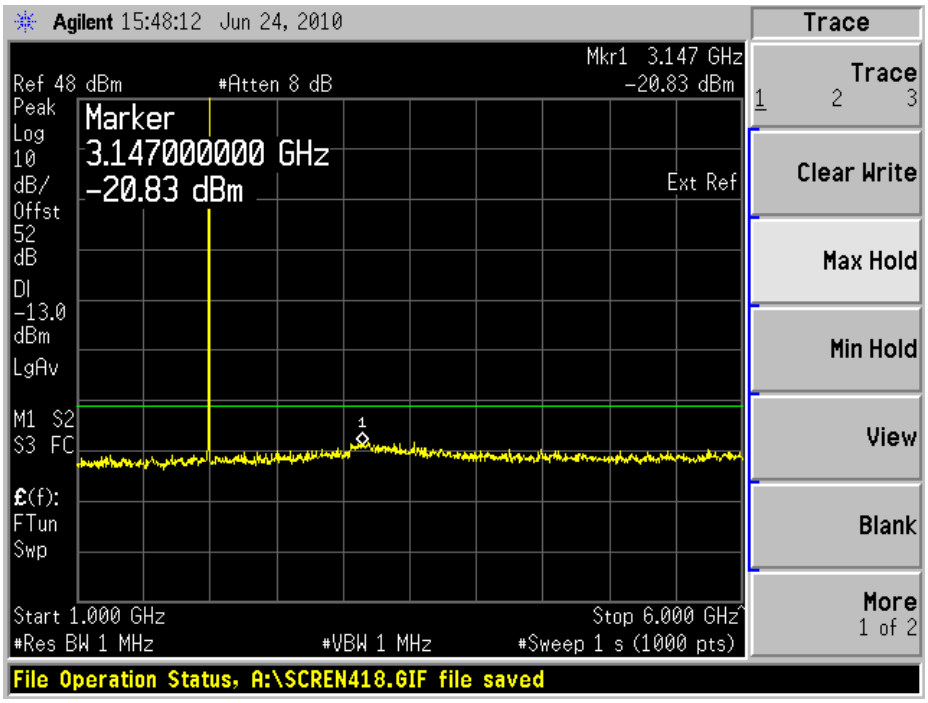
Configuration 2 - Mode 3

9kHz to 1GHz



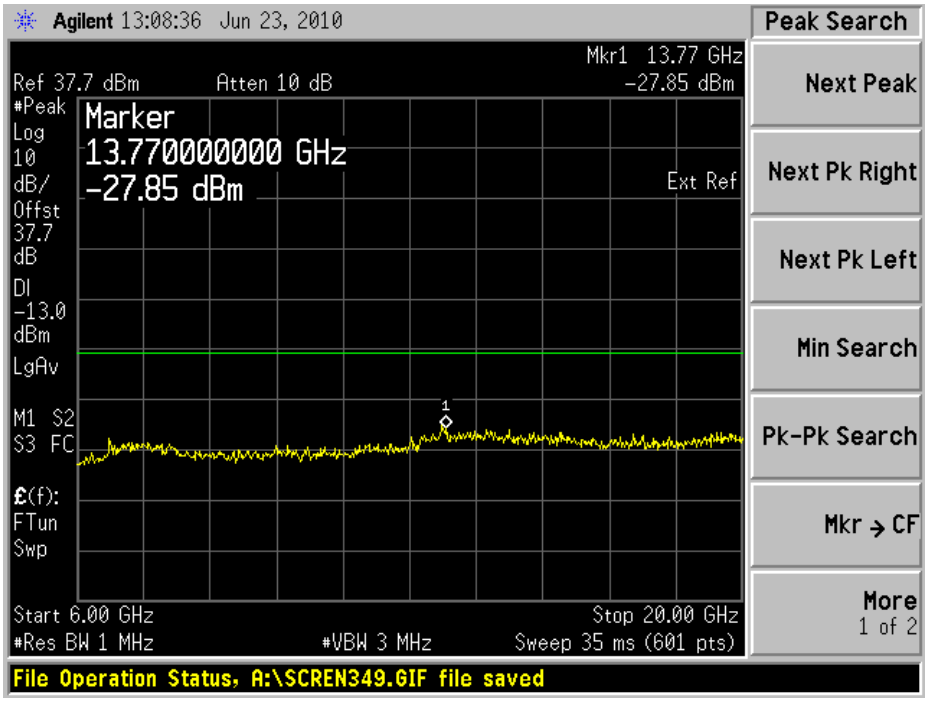
Product Service

1GHz to 6GHz



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

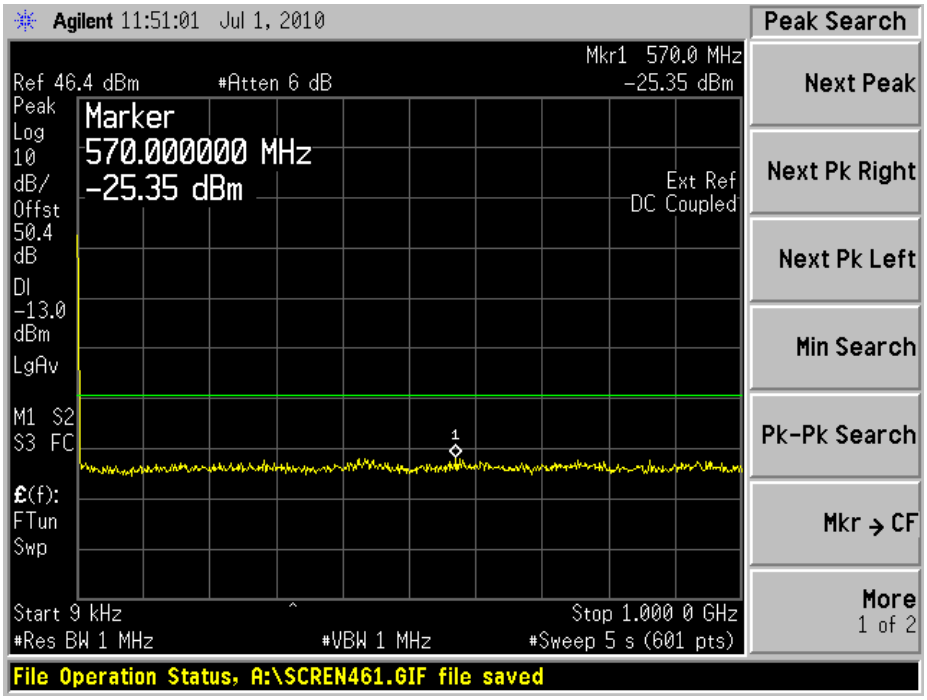
6GHz to 20GHz



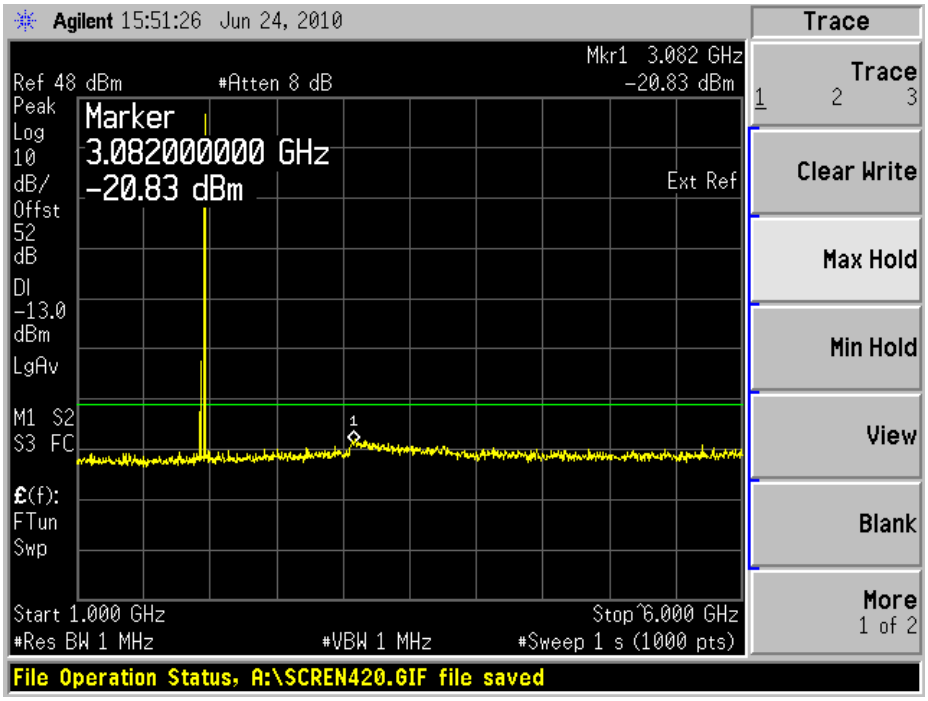
Product Service

Configuration 3 - Mode 6

9kHz to 1GHz



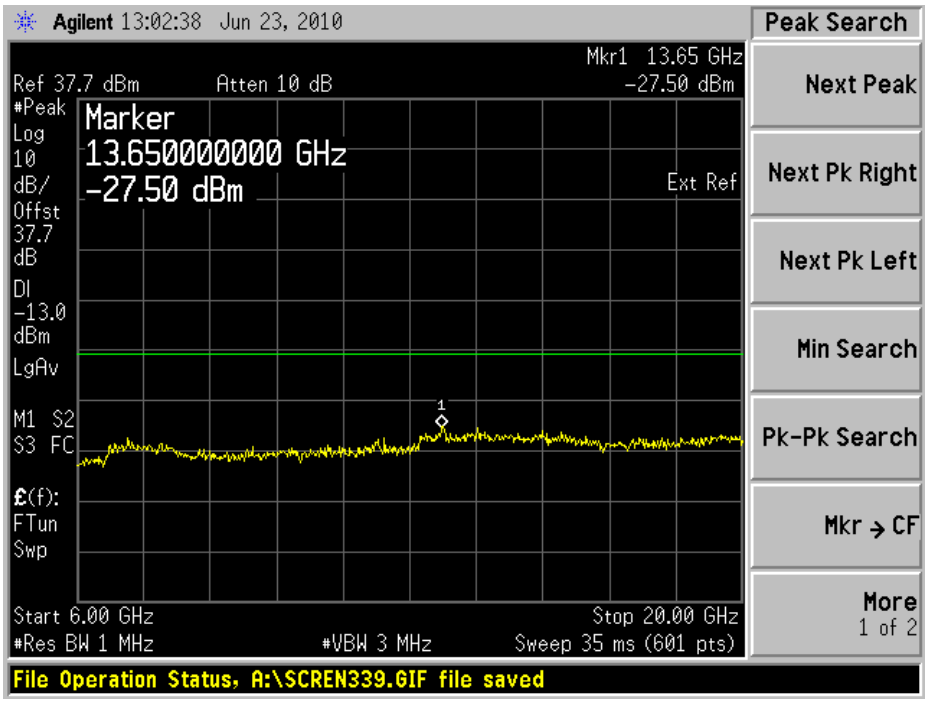
1GHz to 6GHz



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

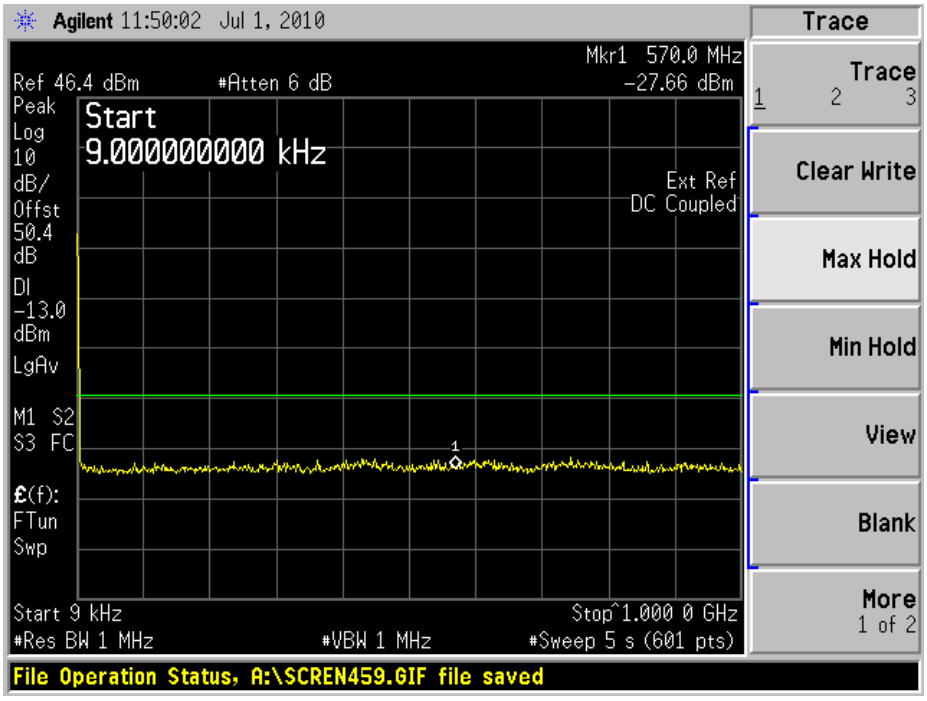
Product Service

6GHz to 20GHz



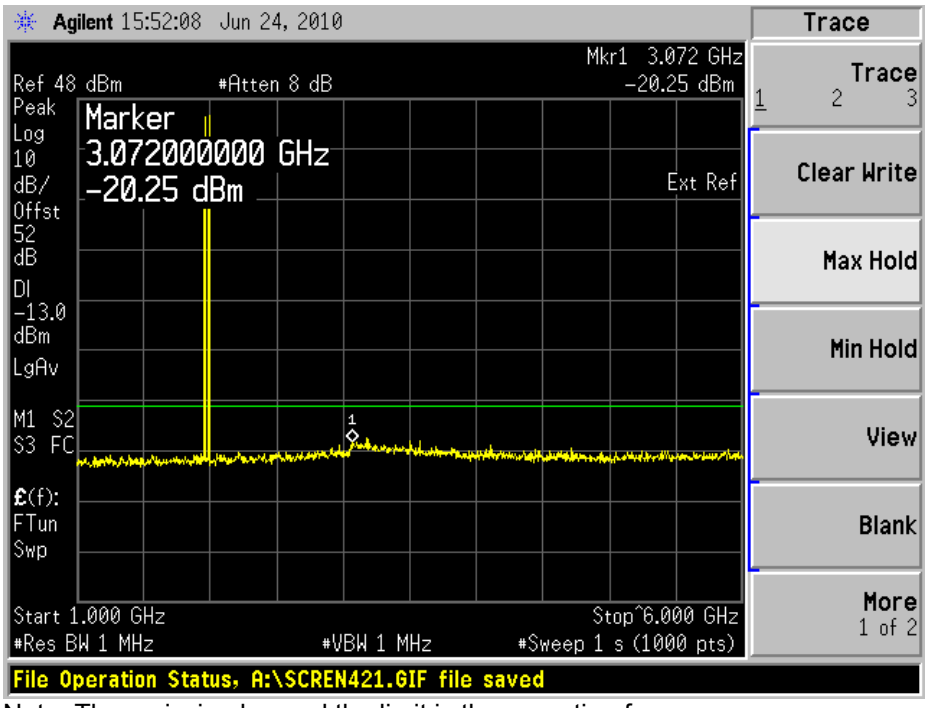
Configuration 3 - Mode 7

9kHz to 1GHz



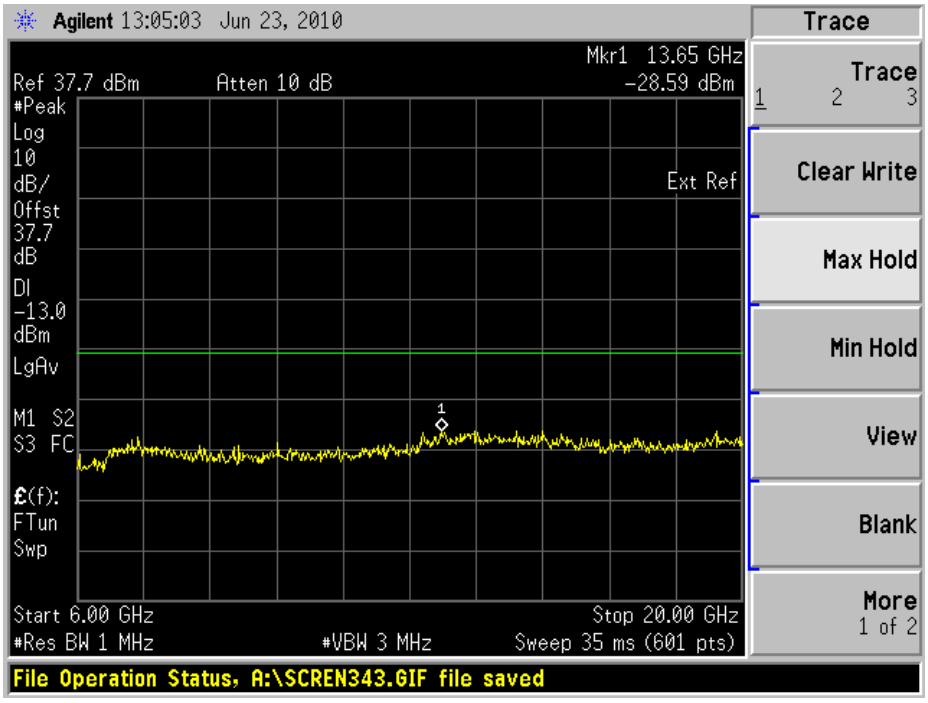
Product Service

1GHz to 6GHz



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

6GHz to 20GHz



Limit	-13dBm

2.8 RECEIVER SPURIOUS EMISSIONS

2.8.1 Specification Reference

Industry Canada RSS 133:2009 Clause 6.6

2.8.2 Equipment Under Test

RUG 11 B2, S/N: CB4D438043

2.8.3 Date of Test and Modification State

1 July 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 Industry Canada RSS 133:2009.

In accordance with RSS-Gen Clause 6(b), the receiver spurious emissions from the antenna terminal were measured. The frequency spectrum was investigated from 30MHz to 20GHz. One of the TRX ports of EUT was set to receiver mode under HC confirguration, EUT under UC and TCC configurations does not have receiver mode. The EUT was tested on Middle channel,The resolution was set to 1MHz thus meeting the requirements of RSS-Gen Clause 6(b). The spectrum analyser detector was set to Peak. The rigorous limit line was displayed, showing the –57dBm.

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

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

Configuration 3 - Mode 8

2.8.6 Environmental Conditions

	1 July 2010
Ambient Temperature	24.4°C
Relative Humidity	36.8%

Product Service

2.8.7 Test Results

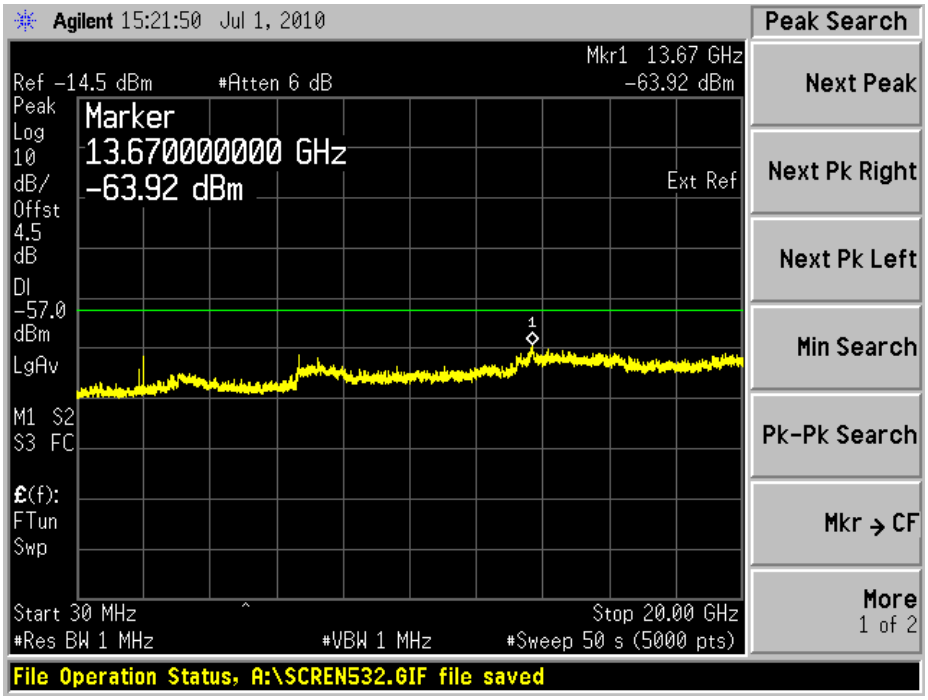
For the period of test the EUT met the requirements of Industry Canada RSS 133:2009 for Receiver Spurious Emissions.

The test results are shown below.

Configuration 3 - Mode 8

30MHz to 20GHz

Receiver mode



Limit	2nW or -57dBm (30-1000 MHz) 5nw or -53dBm (above 1 GHz)

Product Service

2.9 FREQUENCY STABILITY UNDER TEMPERATURE 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

RUG 11 B2, S/N: CB4D438043

2.9.3 Date of Test and Modification State

23 June 2010 – 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 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 –30ºC and +50ºC in 10º steps as per 2.1055.

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

Configuration 1 - Mode 2

2.9.6 Environmental Conditions

	23 June 2010
Ambient Temperature	25.0°C
Relative Humidity	37.1%

Product Service

2.9.7 Test Results

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

The test results are shown below

Power Supply: -48V DC

GMSK

Configuration 1 - Mode 2

Temperature Interval (ºC)	Deviation (Hz)
-30	23
-20	20
-10	-16
0	19
+10	-17
+20	-18
+30	19
+40	22
+50	-19

8PSK

Configuration 1 - Mode 2

Temperature Interval (ºC)	Deviation (Hz)
-30	-15
-20	-22
-10	18
0	-18
+10	-19
+20	-17
+30	-19
+40	-17
+50	-17

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.

2.10 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.10.1 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

2.10.2 Equipment Under Test

RUG 11 B2, S/N: CB4D438043

2.10.3 Date of Test and Modification State

23 June 2010 – 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 FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133.

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

2.10.6 Environmental Conditions

	23 June 2010
Ambient Temperature	25.0°C
Relative Humidity	37.1%

Product Service

2.10.7 Test Results

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

The test results are shown below

Temperature: 20°C

GMSK

Configuration 1 - Mode 2

DC Voltage (V)	Deviation (Hz)
-40.8	21
-48.0	-18
-55.2	20

8PSK

Configuration 1 - Mode 2

DC Voltage (V)	Deviation (Hz)
-40.8	19
-48.0	-17
-55.2	-16

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.

Product Service

SECTION 3

TEST EQUIPMENT USED

Product Service

3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	Serial No.	Calibration Due
Section 2.1, 2.2, 2.3, 2.4 2.5, 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	08011719	O/P MON
20dB Attenuator	Lucas Weinshel	48-20-34	AZ8947	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 – Frequency Stability Under Temperature and Voltage Variations				
Spectrum Analyser	Agilent	E4440A	MY46186610	2010/07/19
Network Analyzer	Agilent	8720D	US38431317	2010/10/26
40dB Attenuator	SHX	DTS100	08011719	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
TU Traceability Unscheduled

Product Service

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30MHz to 10GHz Amplitude	0.5dB*
Conducted Emissions	30MHz to 40GHz Amplitude	3.0dB*
Frequency Stability	30MHz to 2GHz Frequency	$<1x10^{-7}$
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Worst case error for both Time and Frequency measurement 12 parts in 10^6		

* In accordance with CISPR 16-4

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

UKAS TESTING 0141

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).