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# Report On

FCC and Industry Canada Testing of the  
Ericsson RRUS 11 B25 / KRC 131 146/1

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FCC ID: TA8AKRC131146-1  
IC ID: 287AB-AS1311461

Document 75916383 Report 01 Issue 1

January 2012



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**REPORT ON**

FCC and Industry Canada Testing of the  
Ericsson RRUS 11 B25 / KRC 131 146/1


Document 75916383 Report 01 Issue 1

January 2012

**PREPARED FOR**

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**PREPARED BY**

  
X Zhang  
Test Engineer

**APPROVED BY**

  
M Jenkins  
Authorised Signatory

**DATED**


19 January 2012

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**ENGINEERING STATEMENT**

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

Test Engineer(s);

  
X Zhang

  
C Zhang





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## **SECTION 1**

### **REPORT SUMMARY**

FCC and Industry Canada Testing of the  
Ericsson RRUS 11 B25 / KRC 131 146/1



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Ericsson RRUS 11 B25 / KRC 131 146/1 to the requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133.

Testing was carried out in support of a C2PC application for Grant of RRUS 11 B25 / KRC 131 146/1 to include CDMA wireless network.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Ericsson AB
Product Name	RRUS 11 B25
Part Number	KRC 131 146/1
IC Model Number	AS1311461
Serial Number(s)	CB25472392, CB25537412
Software Version	CXP9013268%6_R44EY
Hardware Version	R3A
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 24: 2011 Industry Canada RSS-133 issue 5: 2009
Incoming Release Date	Declaration of Build Status 11 December 2011
Order Number Date	PTP 12 November 2011
Start of Test	14 December 2011
Finish of Test	28 December 2011
Name of Engineer(s)	X Zhang C Zhang
Related Document(s)	ANSI C63.4: 2009 FCC CFR 47 Part 2: 2010 Industry Canada RSS-GEN Issue 3: 2010



## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 24 and Industry Canada RSS-133, is shown below.

Configuration 1 – Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 24	RSS-133 and RSS-GEN					
	24.232 (a)	6.4	Effective Radiated Power	1931.25MHz		N/A	No integral antenna.
				1960.00MHz		N/A	
				1988.75MHz		N/A	
				1931.25MHz + 1945.00MHz		N/A	
				1960.00MHz + 1973.75MHz		N/A	
				1975.00MHz + 1988.75MHz		N/A	
2.1	2.1046, 24.232 (a)	6.4	Maximum Peak Output Power - Conducted	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz + 1945.00MHz	0	Pass	
				1960.00MHz + 1973.75MHz	0	Pass	
				1975.00MHz + 1988.75MHz	0	Pass	
2.2	24.232 (d)	6.4	Peak – Average Ratio	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz + 1945.00MHz	0	Pass	
				1960.00MHz + 1973.75MHz	0	Pass	
				1975.00MHz + 1988.75MHz	0	Pass	
2.3	2.1047 (d)	6.2	Modulation Characteristics	1931.25MHz		N/A	-
				1960.00MHz	0	Pass	
				1988.75MHz		N/A	
				1931.25MHz + 1945.00MHz		N/A	
				1960.00MHz + 1973.75MHz		N/A	
				1975.00MHz + 1988.75MHz		N/A	
2.4	2.1049, 24.238 (b)	RSS-Gen 4.6.1	Occupied Bandwidth	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz + 1945.00MHz		N/A	
				1960.00MHz + 1973.75MHz		N/A	
				1975.00MHz + 1988.75MHz		N/A	



Configuration 1 – Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 24	RSS-133 and RSS-GEN					
2.5	2.1051, 24.238 (b)	6.5	Spurious Emissions at Antenna Terminals ( $\pm 1$ MHz)	1931.25MHz	0	Pass	-
				1960.00MHz		N/A	
				1988.75MHz	0	Pass	
				1931.25MHz + 1933.75MHz	0	Pass	
				1960.00MHz + 1975.00MHz		N/A	
				1986.25MHz + 1988.75MHz	0	Pass	
2.6	2.1053, 24.238 (a)	6.5	Radiated Spurious Emissions	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz + 1945.00MHz		N/A	
				1960.00MHz + 1973.75MHz	0	Pass	
				1975.00MHz + 1988.75MHz		N/A	
2.7	2.1051, 24.238 (a)	6.5	Conducted Spurious Emissions	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz + 1945.00MHz	0	Pass	
				1960.00MHz + 1973.75MHz	0	Pass	
				1975.00MHz + 1988.75MHz	0	Pass	
2.8	2.1055, 24.235	6.3	Frequency Stability Under Temperature Variations	1931.25MHz		N/A	-
				1960.00MHz	0	Pass	
				1988.75MHz		N/A	
				1931.25MHz + 1945.00MHz		N/A	
				1960.00MHz + 1973.75MHz		N/A	
				1975.00MHz + 1988.75MHz		N/A	
2.9	2.1055, 24.235	6.3	Frequency Stability Under Voltage Variations	1931.25MHz		N/A	-
				1960.00MHz	0	Pass	
				1988.75MHz		N/A	
				1931.25MHz + 1945.00MHz		N/A	
				1960.00MHz + 1973.75MHz		N/A	
				1975.00MHz + 1988.75MHz		N/A	



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Configuration 1 – Radio Equipment							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 2 and 24	RSS-133 and RSS-GEN					
2.10	-	6.6	Receiver Spurious Emissions	1931.25MHz	0	Pass	-
				1960.00MHz	0	Pass	
				1988.75MHz	0	Pass	
				1931.25MHz + 1945.00MHz		N/A	
				1960.00MHz + 1973.75MHz		N/A	
				1975.00MHz + 1988.75MHz		N/A	

N/A – Not Applicable



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## 1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Equipment
MANUFACTURER	Ericsson AB
PRODUCT NAME	RRUS 11 B25
PART NUMBER	KRC 131 146/1
IC Model Number	AS1311461
SERIAL NUMBER(s)	CB25472392, CB25537412
HARDWARE VERSION	R3A
SOFTWARE VERSION	CXP9013268%6_R44EY
TRANSMITTER OPERATING RANGE	TX: 1931.25MHz - 1988.75MHz RX: 1851.25MHz - 1908.75MHz
MODULATIONS	QPSK, 8PSK, 16QAM
INTERMEDIATE FREQUENCIES	--
ITU DESIGNATION OF EMISSION	1M25F9W
CHANNEL BANDWIDTH	1.25 MHz
OUTPUT POWER (RMS) (W or dBm)	Single Carrier: 1 x 46.0dBm (1 x 40W) Multi Carrier (x 2): 2 x 43.0dBm (2 x 20W)
NUMBER OF ANTENNA PORTS	2 TX/RX ports
SUPPORTED CONFIGURATION	Dual Single Carrier or Multi Carrier. Both RF chains are identical
FCC ID	TA8AKRC131146-1
IC ID	287AB-AS1311461
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The equipment is the Radio Part of CDMA Base Station.

Signature

Date

03 January 2012

D of B S Serial No

75916383/01

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



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## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) RRUS 11 B25 / KRC 131 146/1 is an Ericsson Radio Equipment working in the public mobile service 1900MHz band which provides communication connections to CDMA1900 network. The RRUS 11 B25 / KRC 131 146/1 operates from a -48V DC supply.

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



Equipment Under Test



## 1.4.2 Test Configuration

### Configuration 1: Radio Equipment

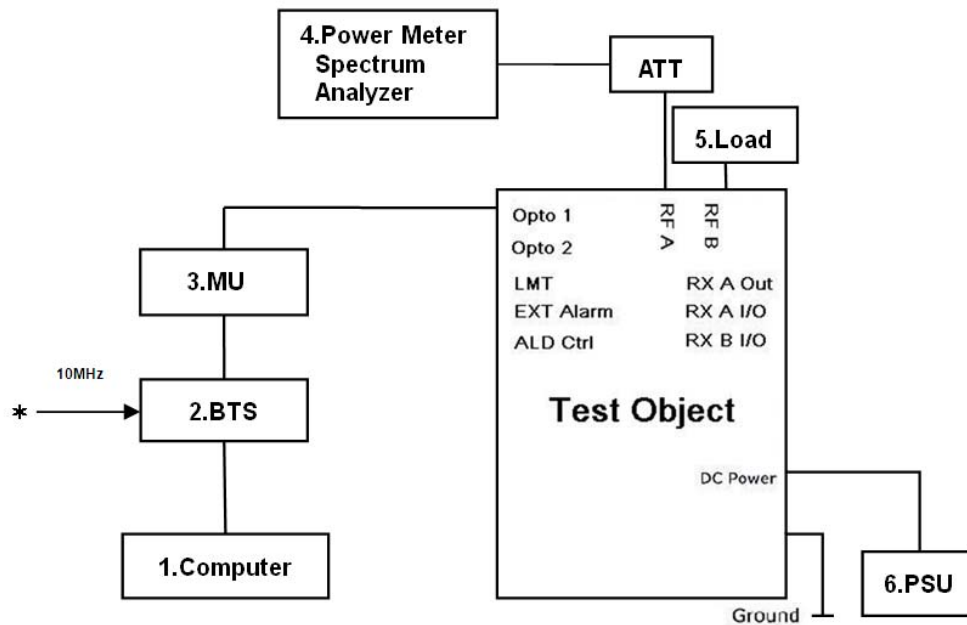
The EUT was configured in accordance with FCC CFR 47 Part 24 and Industry Canada RSS-133.

The RRUS 11 B25 / KRC 131 146/1 supports CDMA with QPSK, 8PSK and 16QAM modulations at 1900MHz. The setting below was found to be representative for all traffic scenarios when several settings with the different modulations and the number of carriers were tested to find the worst case setting. These settings were used for all measurements if not otherwise noted:

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

The EUT has two TX/RX ports and it can be configured to transmit with 1900MHz single or multi carrier at both RF output connectors. All TX measurements were performed on the combined TX/RX output connector RF A. Limited complementary TX measurements were done at connector RF B to verify identical performance for both transmitter chains. RX testing was performed on the RX connector RF B of the EUT when the EUT was set as single Transmitter. The complete testing was performed with the EUT transmitting at maximum RF power unless otherwise stated.

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

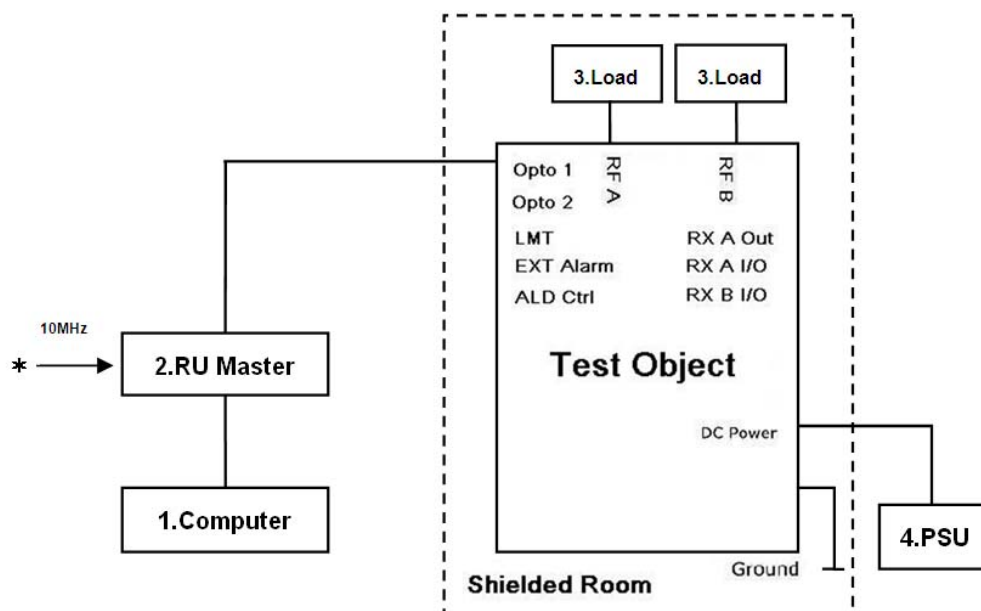
**Test Setup, Conducted Measurement:**

Test Object	Part Number	Version	Serial Number
Radio Part	RRUS 11 B25 / KRC 131 146/1	R3A	CB25472392

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	HP DC5100SFF	--	CNG6510B8B
2	BTS 602	--	--	--
	DBU	NTLK70AA	06	NNTMPX00M151
	XCEM-A	NTLK86AAE5	02	NNTMPX00MPRG
	DOM-A	NTLK78AAE5	02	NNTMPX00LLDX
	DOM-A	NTLK78AAE5	02	NNTMPX00LEGW
3.	MU	--	--	--
	DUL20 01	KDU 137 533/4	R1D	CB4K440243
	XMU0201	KDU137 754/1	R1A	C825297574
	SUP 6601	1/BFL 901 009/1	R3B	BR80910315
4	Power Meter	HP E4418B	--	US39251254
	Thermal Power Sensor	HP 8482A	--	3318A29942
	Spectrum Analyzer	Agilent E4440A	--	MY48250517
5	Load	MCLI TNN-15..150	--	120
6	Power Supply	XFR 60-46	--	E00103273



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**Test Setup, Radiated Measurement:**

Test Object	Part Number	Version	Serial Number
Radio Part	RRUS 11 B25 / KRC 131 146/1	R3A	CB25537412

No.	Auxiliary Equipment	Part Number / Model Type	Version	Serial Number
1	Computer	ADVANTECH 610H	--	ATB5103888
2.	RU Master	LPC 102 400/5	R1B	Y01E722654
3	Load	TF100	--	09121631
	Load	TF100	--	09121602
4	Power Supply	DH1716-5D	--	200360033

#### 1.4.3 Modes of Operation

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

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

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

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

Mode 4 - Channel No. 25 + 300: 1931.25MHz + 1945.00MHz (B and B+13.75MHz)

Mode 5 - Channel No. 600 + 875: 1960.00MHz + 1973.75MHz (M and M+13.75MHz)

Mode 6 - Channel No. 900 + 1175: 1975.00MHz + 1988.75MHz (T-13.75MHz and T)

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

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

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



## **1.5 TEST CONDITIONS**

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

The EUT was powered from a -48V DC supply.

## **1.6 DEVIATIONS FROM THE STANDARD**

No deviations from the applicable test standards or test plan were made during testing.

## **1.7 MODIFICATION RECORD**

No modifications were made to the EUT during testing.

## **1.8 ALTERNATIVE TEST SITE**

Testing has been performed under the following site registrations:

FCC Accreditation 910917:

The State Radio Monitoring Centre, No.80 Beilishi Road Xicheng District Beijing, China.

Industry Canada Accreditation 7308A:

The State Radio Monitoring Centre, No.80 Beilishi Road Xicheng District Beijing, China.



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## **SECTION 2**

### **TEST DETAILS**

FCC and Industry Canada Testing of the  
Ericsson RRUS 11 B25 / KRC 131 146/1



## **2.1 MAXIMUM PEAK OUTPUT POWER - CONDUCTED**

### **2.1.1 Specification Reference**

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

### **2.1.2 Equipment Under Test**

RRUS 11 B25 / KRC 131 146/1, S/N: CB25472392

### **2.1.3 Date of Test and Modification State**

14, 15 and 16 December 2011 – Modification State 0

### **2.1.4 Test Equipment Used**

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

### **2.1.5 Test Method and Operating Modes**

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

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

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

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

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

### **2.1.6 Environmental Conditions**

	14 December 2011	15 December 2011	16 December 2011
Ambient Temperature	21.4°C	20.5°C	21.3°C
Relative Humidity	41.6%	42.3%	42.5%



### 2.1.7 Test Results

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

The test results are shown below

#### Single Carrier

##### Configuration 1 - Mode 1, 2 and 3

#### QPSK

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 (Bottom)	1931.25	52.9	46.08	40.55
600 (Middle)	1960.00	52.9	46.06	40.36
1175 (Top)	1988.75	52.9	46.05	40.27

#### 8PSK

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 (Bottom)	1931.25	52.9	45.63	36.56
600 (Middle)	1960.00	52.9	45.53	35.73
1175 (Top)	1988.75	52.9	45.53	35.73

#### 16QAM

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25 (Bottom)	1931.25	52.9	45.60	36.31
600 (Middle)	1960.00	52.9	45.54	35.81
1175 (Top)	1988.75	52.9	45.53	35.73

**Multi Carrier (1x2): one carrier transmitting with the other carrier disabled.**Configuration 1 - Mode 4, 5 and 6QPSK

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25	1931.25	52.9	43.07	20.28
600	1960.00	52.9	43.13	20.56
1175	1988.75	52.9	43.12	20.51

8PSK

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25	1931.25	52.9	42.48	17.70
600	1960.00	52.9	42.61	18.23
1175	1988.75	52.9	42.59	18.15

16QAM

Channel No.	Frequency (MHz)	Path Loss (dB)	Result (dBm) RMS	Result (W) RMS
25	1931.25	52.9	42.51	17.82
600	1960.00	52.9	42.60	18.20
1175	1988.75	52.9	42.59	18.16

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

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



## **2.2 PEAK – AVERAGE RATIO**

### **2.2.1 Specification Reference**

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

### **2.2.2 Equipment Under Test**

RRUS 11 B25 / KRC 131 146/1, S/N: CB25472392

### **2.2.3 Date of Test and Modification State**

19, 20 and 21 December 2011 – Modification State 0

### **2.2.4 Test Equipment Used**

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

### **2.2.5 Test Method and Operating Modes**

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

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

The spectrum analyzer Measurement bandwidth was set to 2MHz for single carrier and 2 carriers 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  
- Mode 4  
- Mode 5  
- Mode 6

### **2.2.6 Environmental Conditions**

	19 December 2011	20 December 2011	21 December 2011
Ambient Temperature	20.8°C	20.5°C	21.5°C
Relative Humidity	40.4%	42.5%	43.5%



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## 2.2.7 Test Results

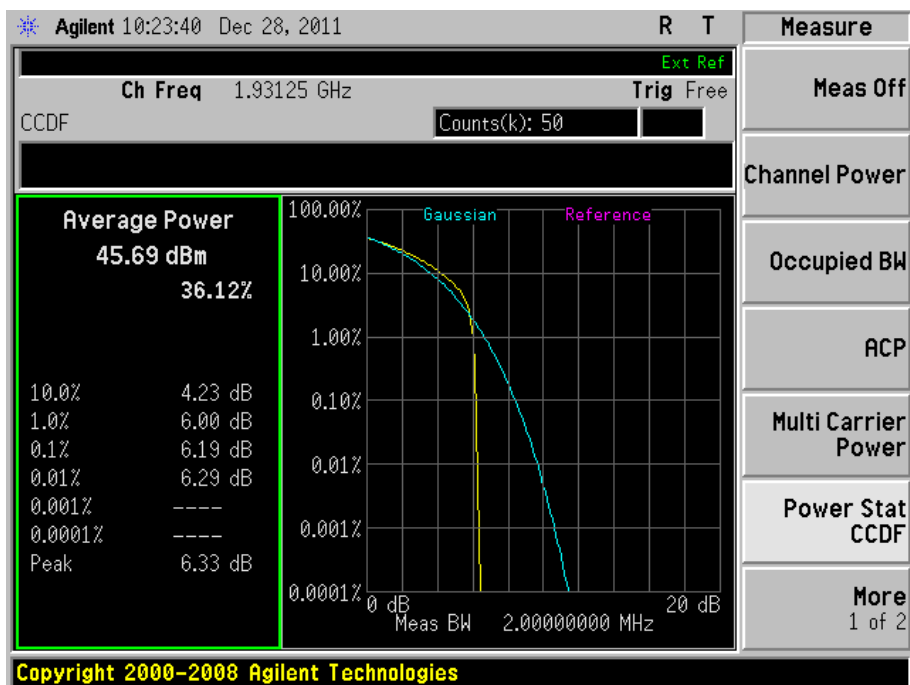
For the period of test the EUT met the requirements of FCC CFR 47 Part 24 and Industry Canada RSS-133 for Peak – Average Ratio.

The test results are shown below.

### Single Carrier

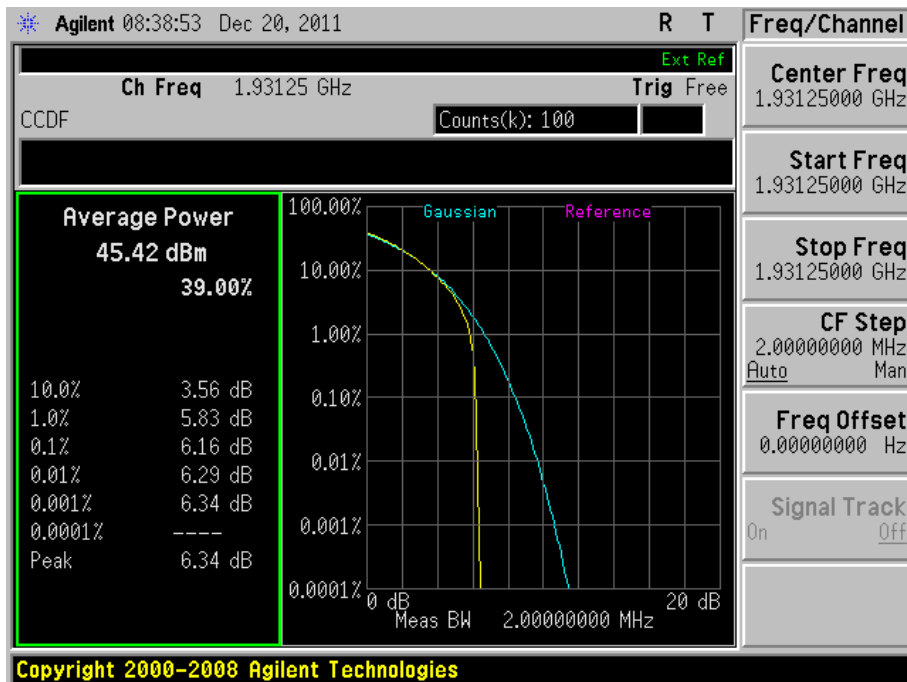
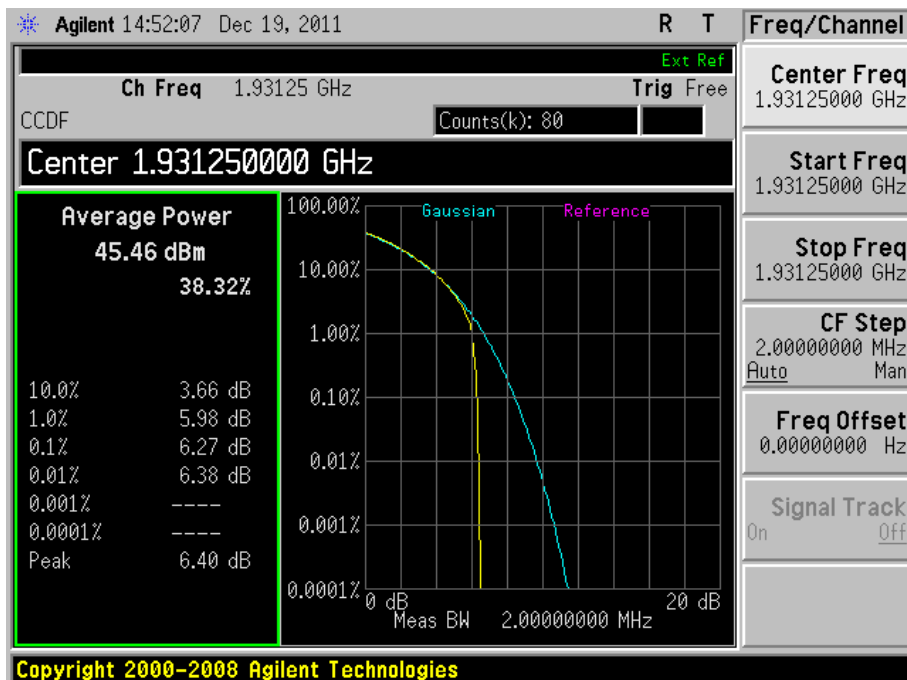
#### Configuration 1 - Mode 1

#### QPSK



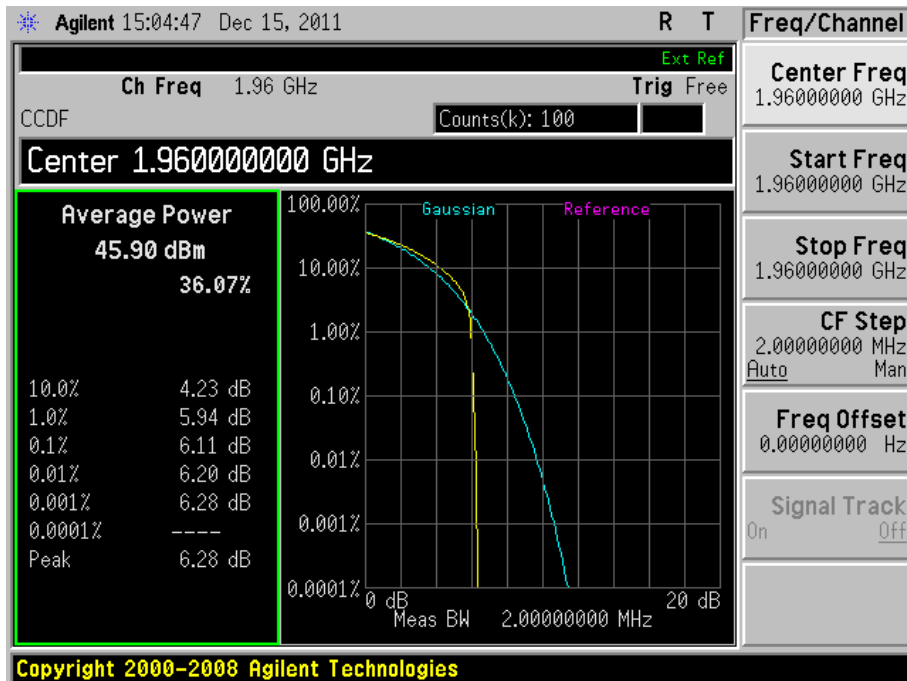
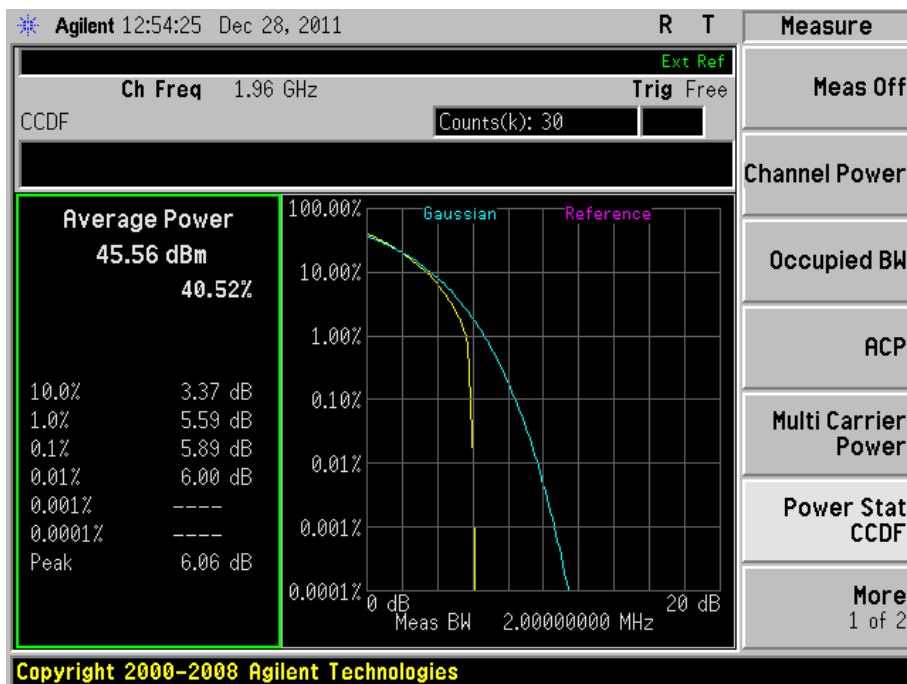


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8PSK16QAM

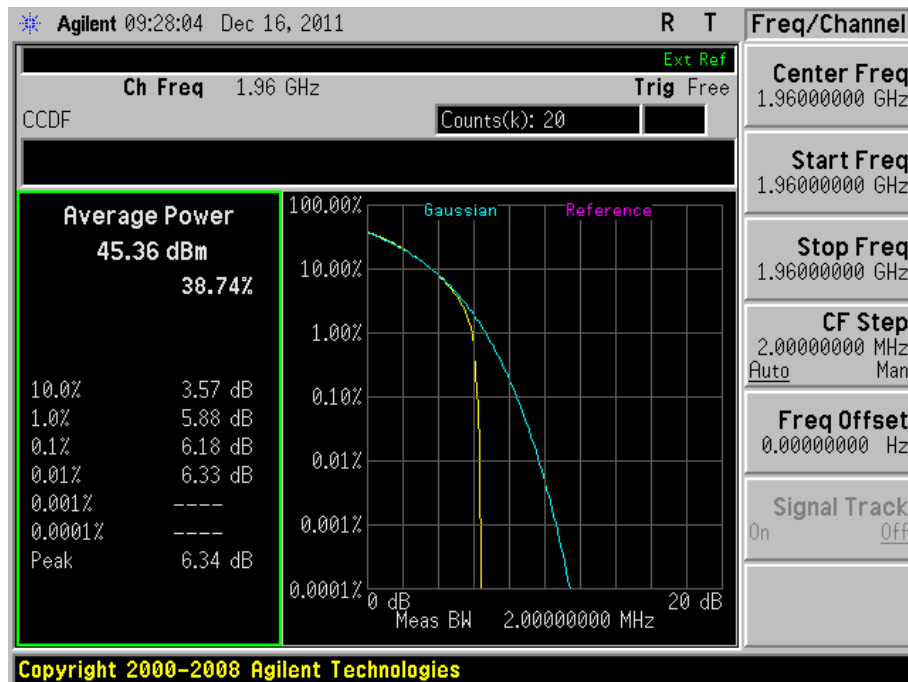
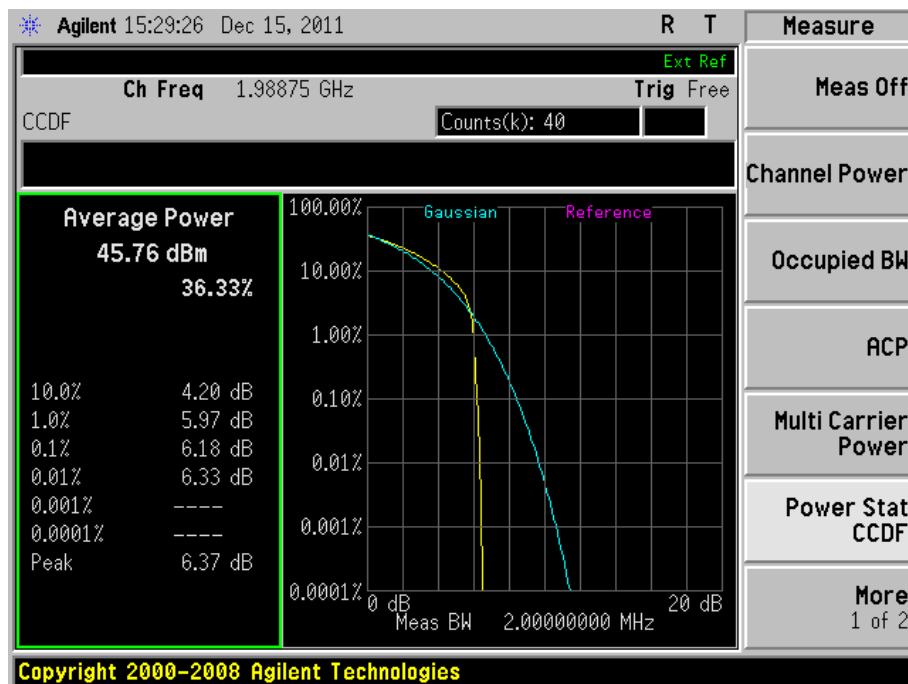


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Configuration 1 - Mode 2QPSK8PSK

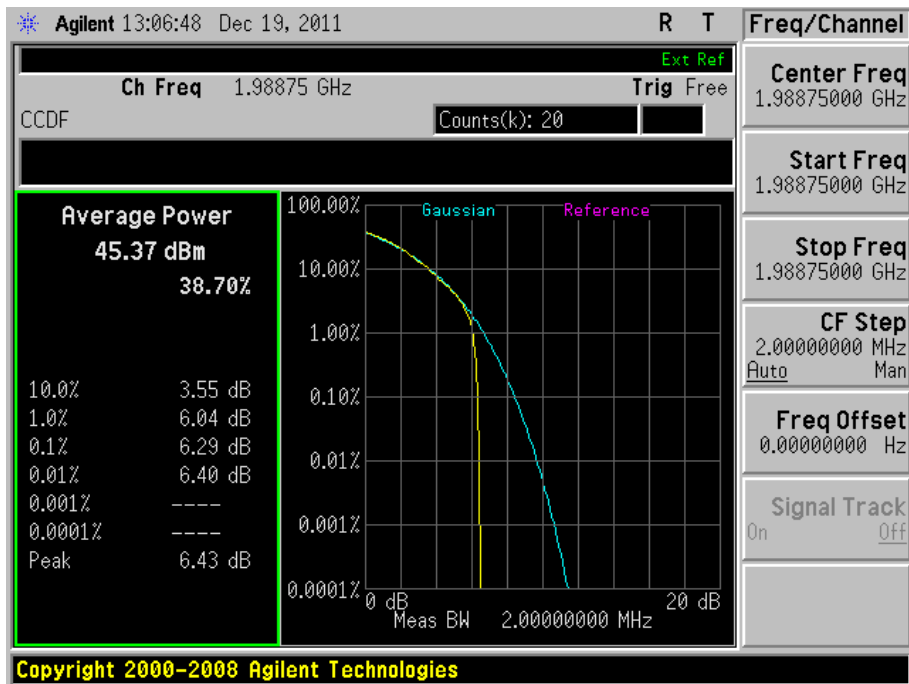
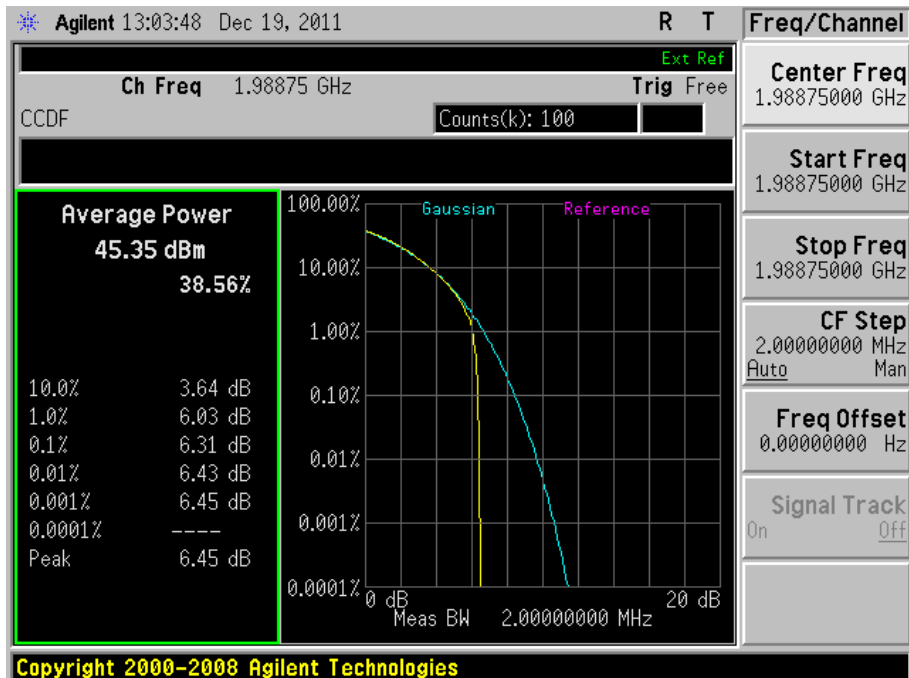


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16QAMConfiguration 1 - Mode 3QPSK

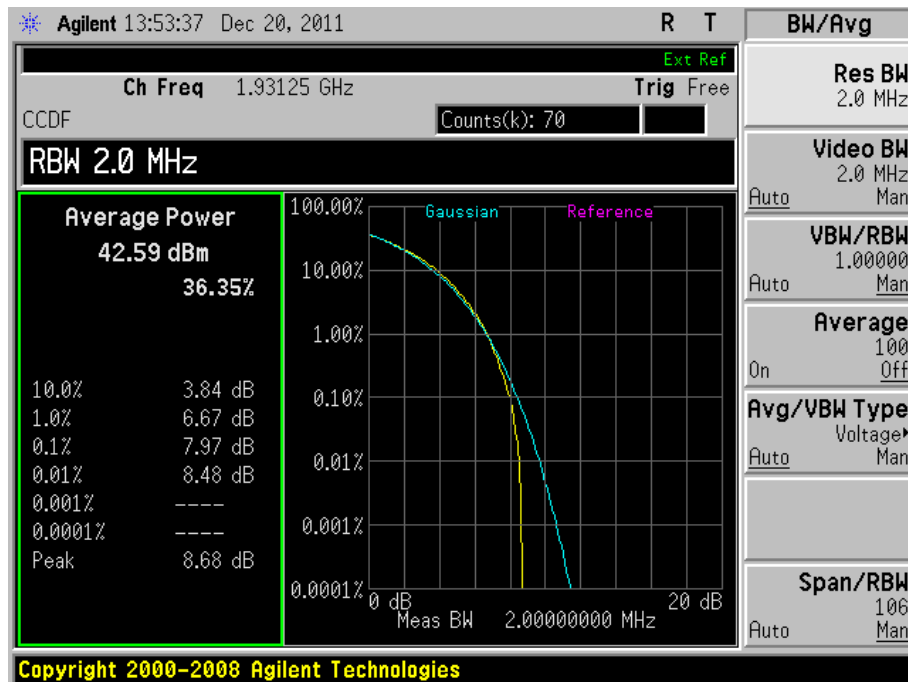
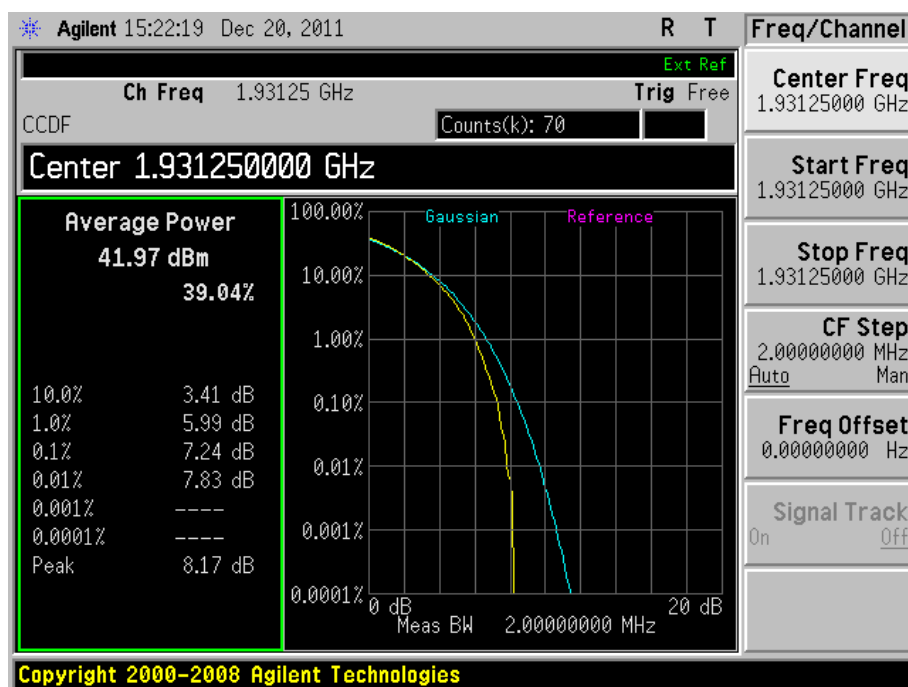


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8PSK16QAM

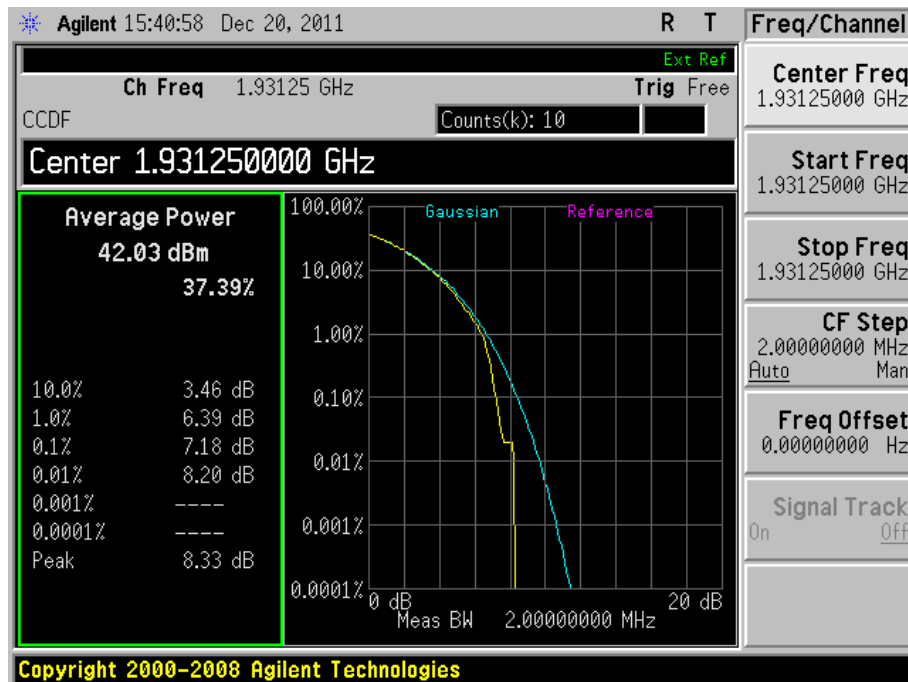
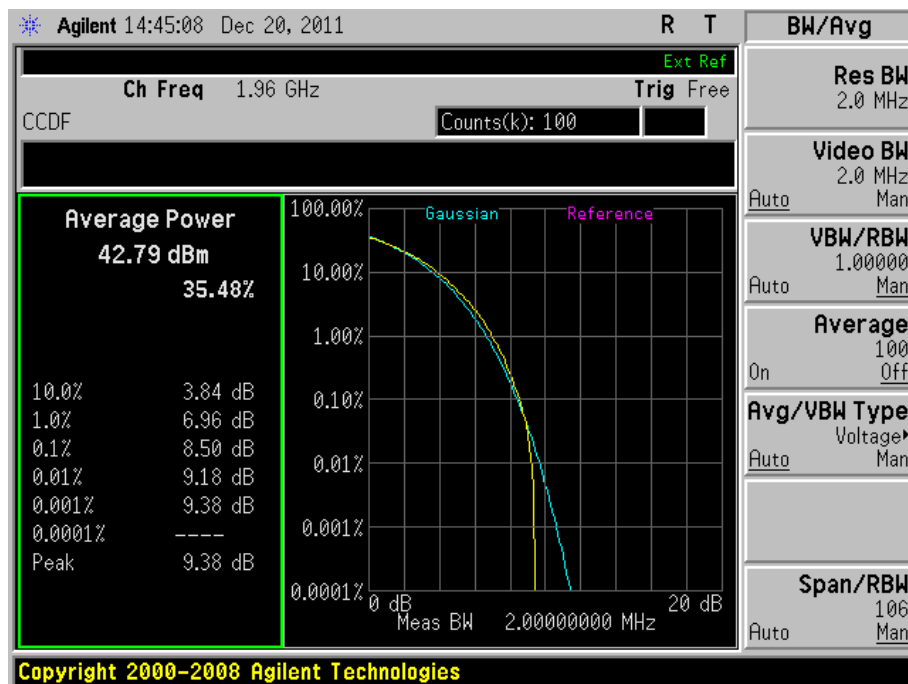


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**Multi Carrier (1x2): one carrier transmitting with the other carrier disabled**Configuration 1 - Mode 4QPSK8PSK

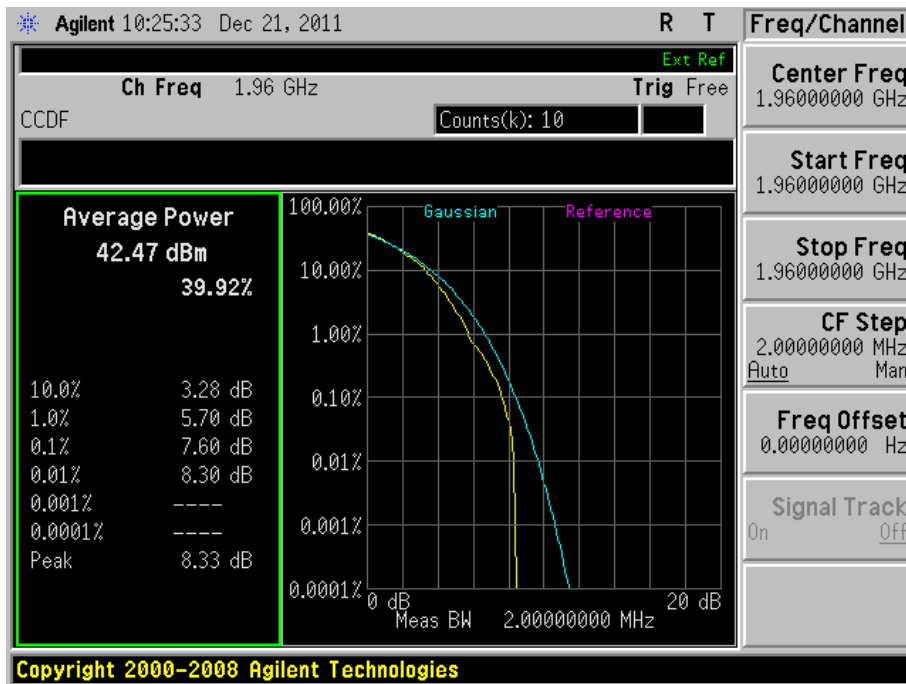


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16QAMConfiguration 1 - Mode 5QPSK

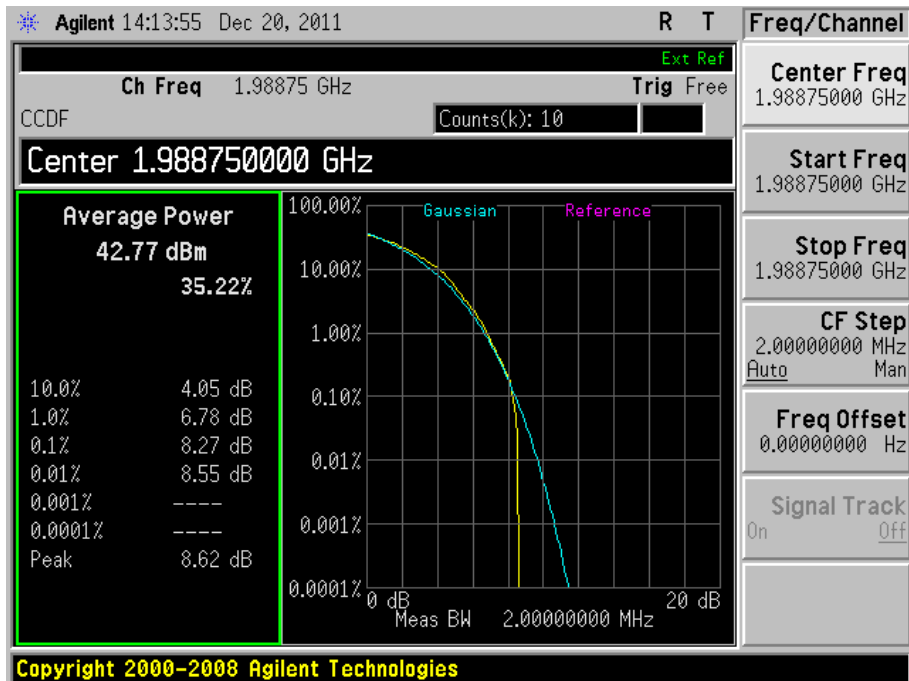
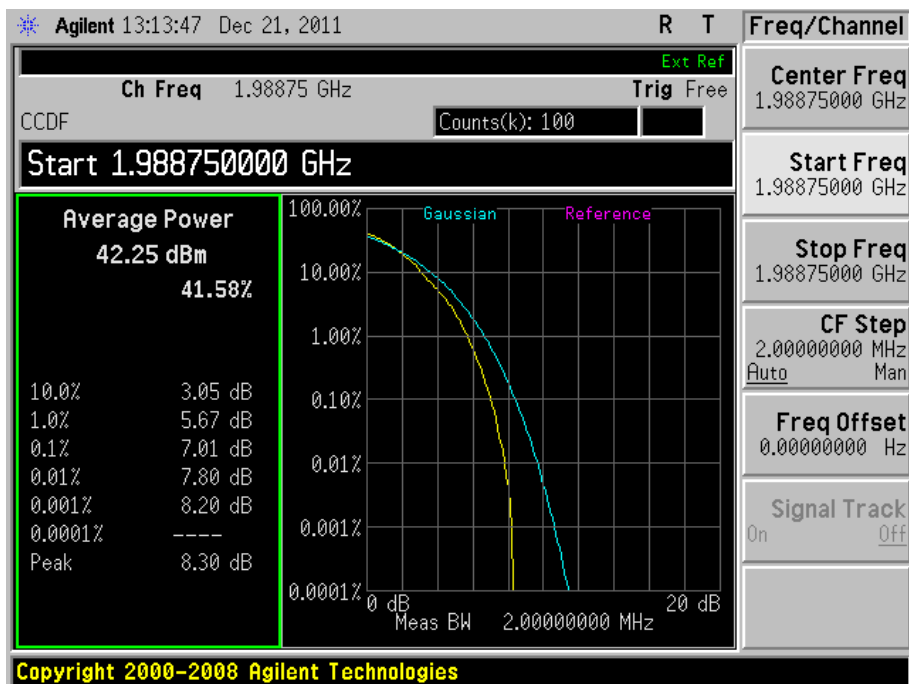


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8PSK16QAM

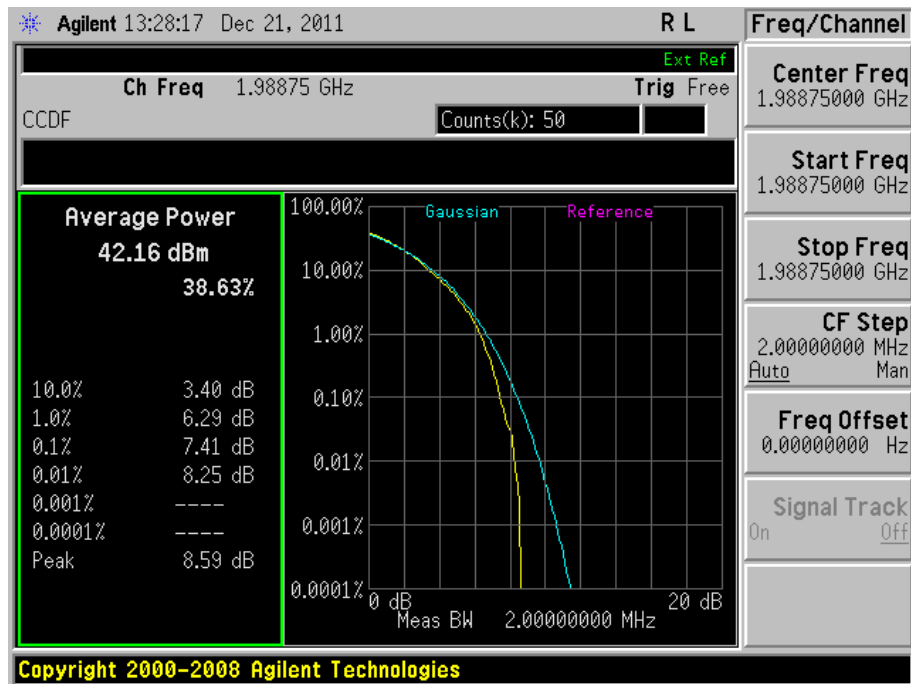


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Configuration 1 - Mode 6QPSK8PSK



Product Service

16QAM

Limit	13dB
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Remarks

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



## **2.3 MODULATION CHARACTERISTICS**

### **2.3.1 Specification Reference**

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

### **2.3.2 Equipment Under Test**

RRUS 11 B25 / KRC 131 146/1, S/N: CB25472392

### **2.3.3 Date of Test and Modification State**

16 and 19 December 2011 – Modification State 0

### **2.3.4 Test Method and Operating Modes**

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

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

The EUT supports QPSK, 8PSK and 16QAM modulations.

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

Configuration 1 - Mode 2

### **2.3.5 Environmental Conditions**

	16 December 2011	19 December 2011
Ambient Temperature	21.3°C	20.8°C
Relative Humidity	42.5%	40.4%



Product Service

### 2.3.6 Test Result

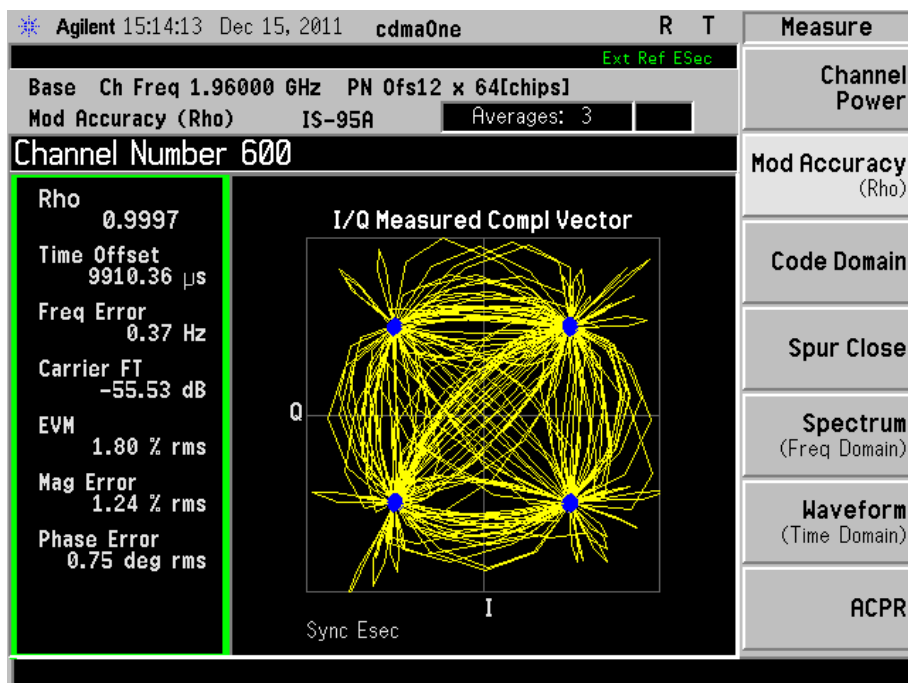
Plots are shown on the following showing the EUT transmitting with all of the modulations:

The test results are shown below

#### Single Carrier

#### Configuration 1 - Mode 2

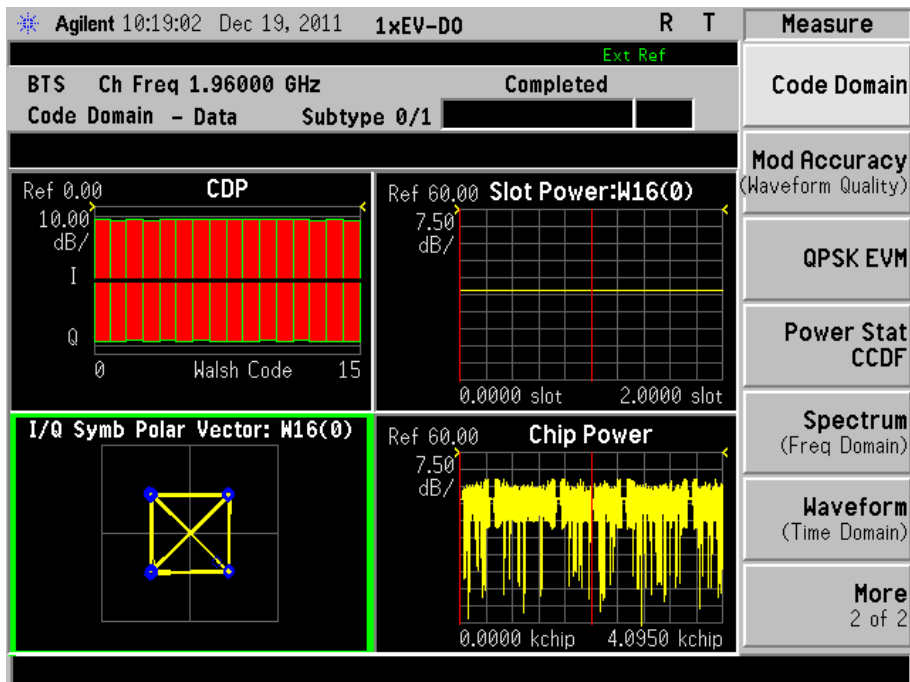
EUT transmitting with QPSK (Voice) modulation:



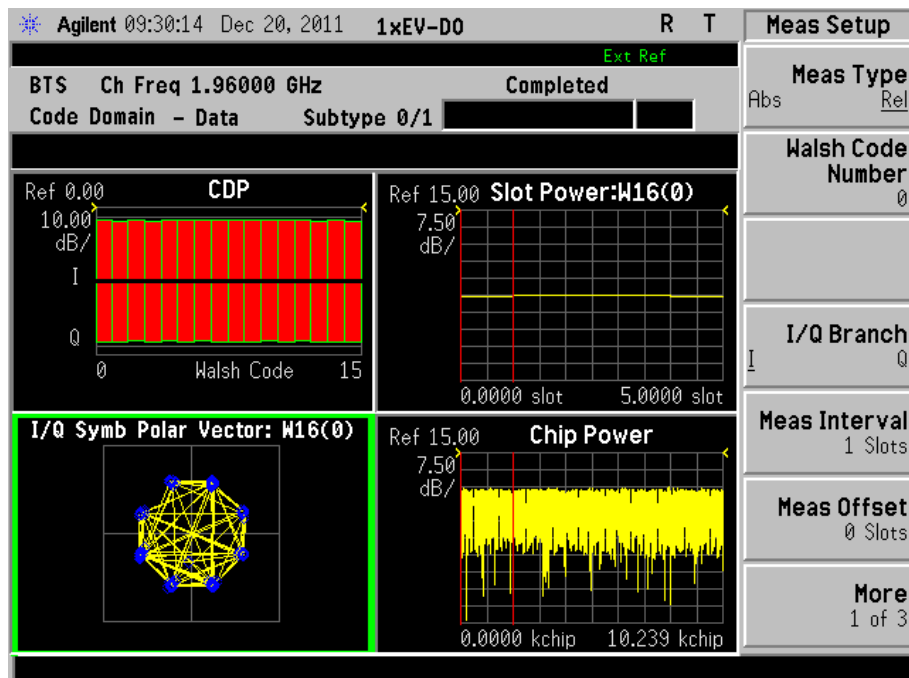


Product Service

EUT transmitting with QPSK modulation:



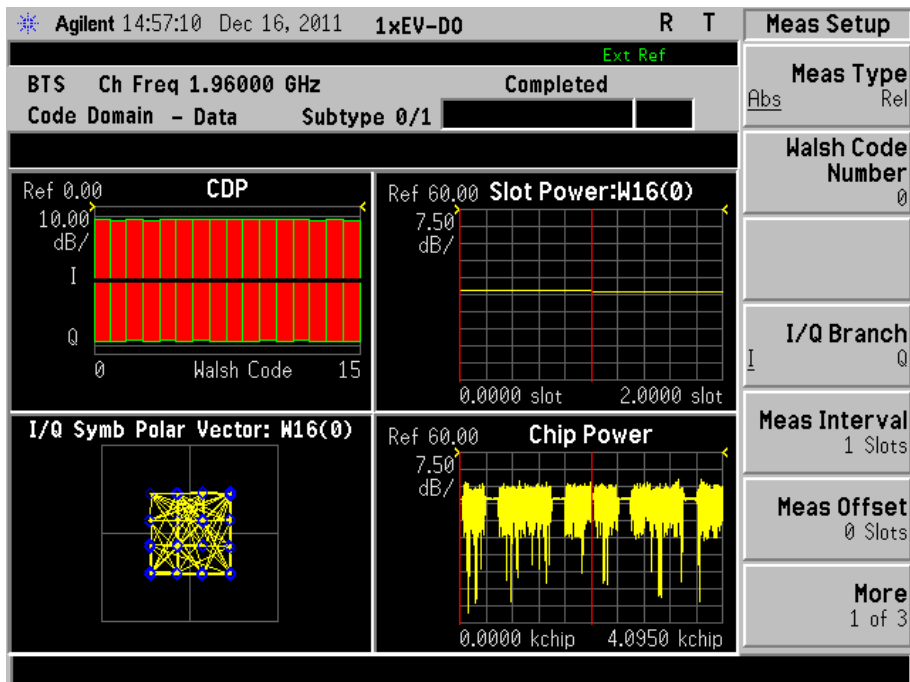
EUT transmitting with 8PSK modulation:





Product Service

EUT transmitting with 16QAM modulation:





## **2.4 OCCUPIED BANDWIDTH**

### **2.4.1 Specification Reference**

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

### **2.4.2 Equipment Under Test**

RRUS 11 B25 / KRC 131 146/1, S/N: CB25472392

### **2.4.3 Date of Test and Modification State**

15 December 2011 – Modification State 0

### **2.4.4 Test Equipment Used**

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

### **2.4.5 Test Method and Operating Modes**

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

The EUT was transmitting at maximum power, modulated using QPSK as the representative test modulation. Using a resolution bandwidth of 20kHz and a video bandwidth of 200kHz. The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

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

Configuration 1 - Mode 1  
                          - Mode 2  
                          - Mode 3

### **2.4.6 Environmental Conditions**

15 December 2011

Ambient Temperature 20.5°C

Relative Humidity 42.3%



Product Service

### 2.4.7 Test Results

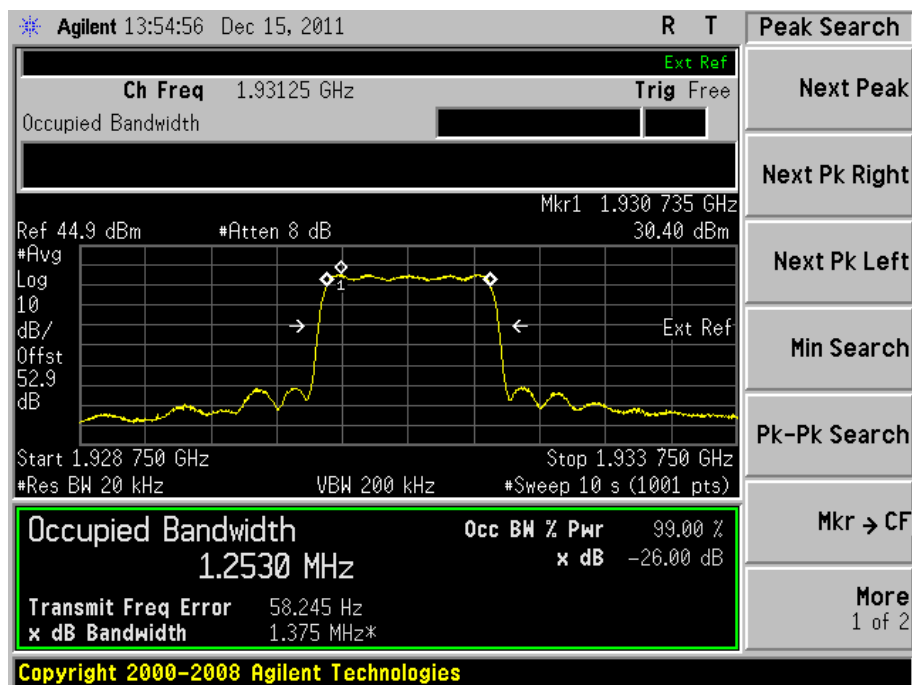
For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-GEN for Occupied Bandwidth.

The test results are shown below

#### Single Carrier

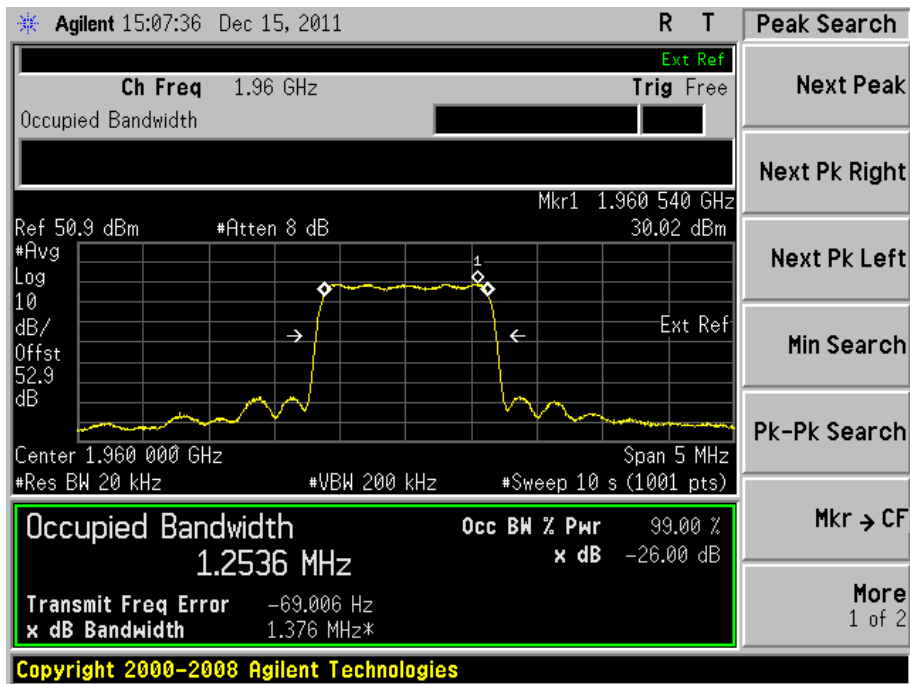
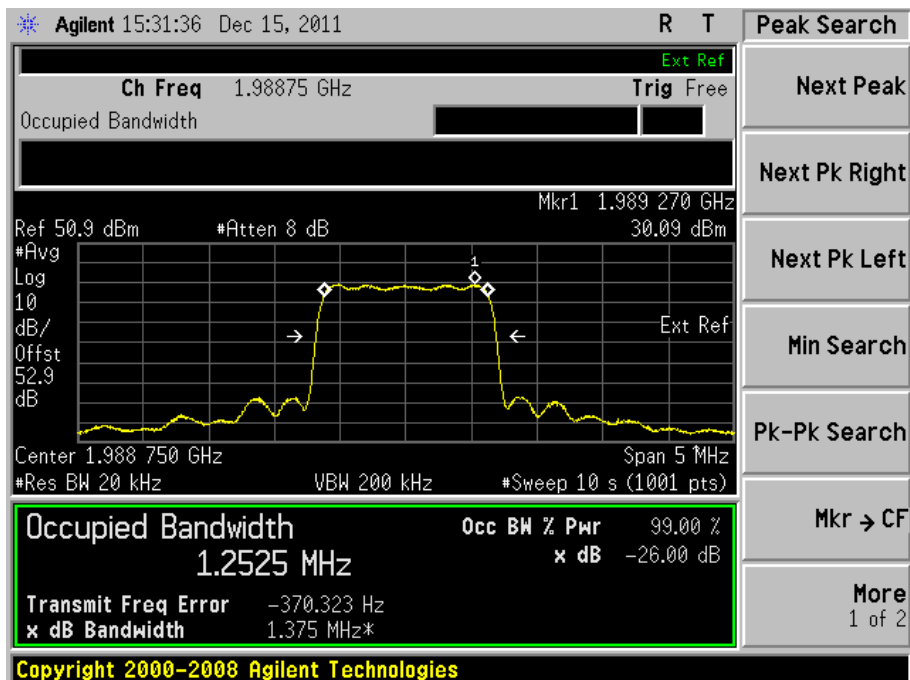
#### QPSK

#### Configuration 1 - Mode 1





Product Service

Configuration 1 - Mode 2Configuration 1 - Mode 3



## **2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS ( $\pm 1$ MHz)**

### **2.5.1 Specification Reference**

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

### **2.5.2 Equipment Under Test**

RRUS 11 B25 / KRC 131 146/1, S/N: CB25472392

### **2.5.3 Date of Test and Modification State**

15, 20 and 21 December 2011 – Modification State 0

### **2.5.4 Test Equipment Used**

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

### **2.5.5 Test Method and Operating Modes**

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

In accordance with 24.238(b), at least 1% of the emission bandwidth shall be used for the resolution bandwidth up to 1MHz away from the block edge. For Single Carrier and Multi Carrier, a resolution bandwidth of 20kHz was used up to 1MHz away from the band edges. A resolution bandwidth of 51kHz was used between 1MHz to 5MHz away from the band edge. As the FCC rules specify a RBW of 1MHz for measurements of emissions > 1MHz away from the band edges, the limit was adjusted with -13dB to -26dBm to compensate for the reduce measurement bandwidth. Spectrum analyser detector was set as RMS.

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

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

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

### **2.5.6 Environmental Conditions**

	15 December 2011	20 December 2011	21 December 2011
Ambient Temperature	20.5°C	20.5°C	21.5°C
Relative Humidity	42.3%	42.5%	43.5%

### 2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Spurious Emissions Antenna Terminals ( $\pm 1$  MHz)

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

#### QPSK

##### Single Carrier

##### Configuration 1 - Mode 1 and 3

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

##### Multi Carrier (1x2)

##### Configuration 1 - Mode 7 and 8

Band Edge Frequency	Edge Test with QPSK modulation Channel No./Frequencies
Bottom 1930 MHz	Channel: 25 & 75 Frequency: 1931.25 & 1933.75 MHz
Top 1990 MHz	Channel: 1125 & 1175 Frequency: 1986.25 & 1988.75 MHz

The channels shown in the table above are the minimum and maximum channels that can be used in the authorised frequency ranges to maintain compliance.



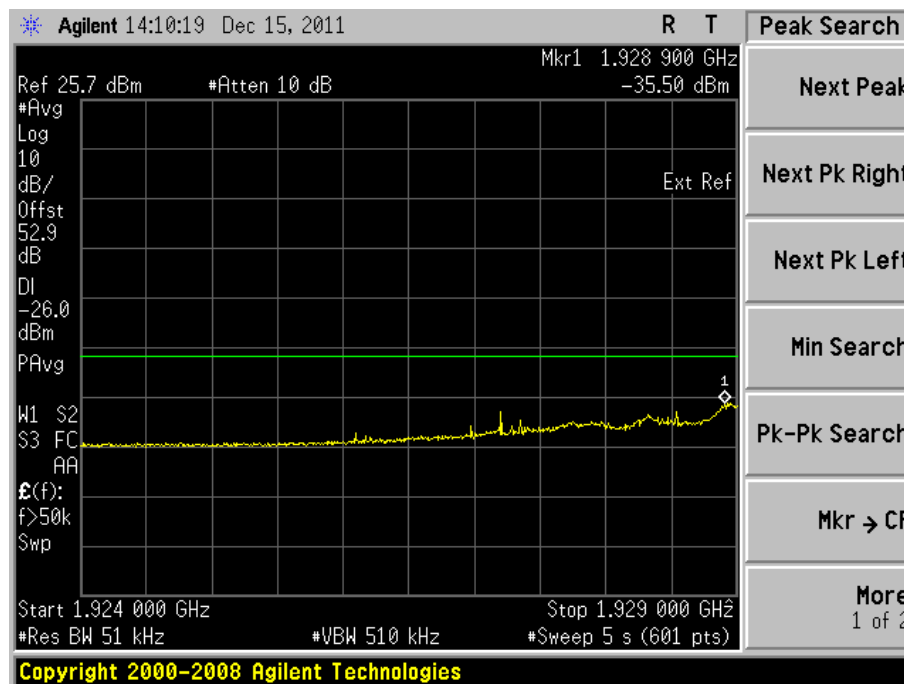
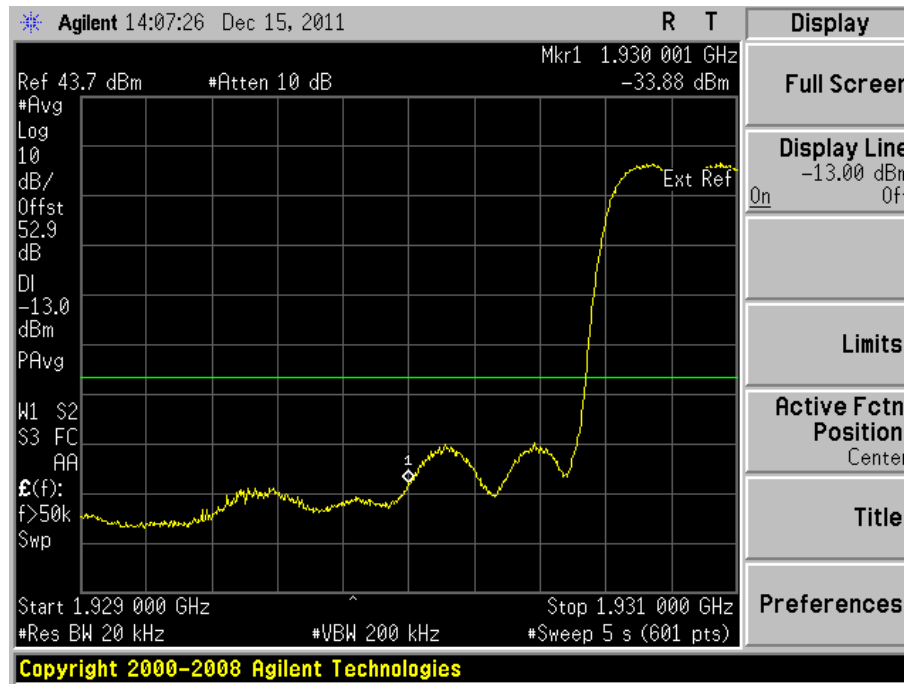
Product Service

The test results are shown below

## QPSK

### Single Carrier

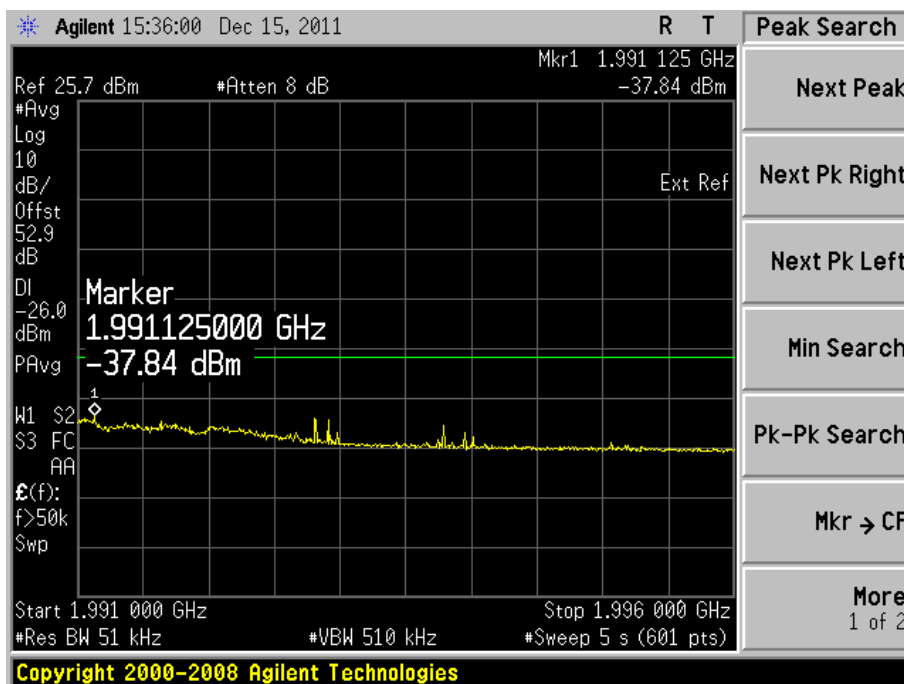
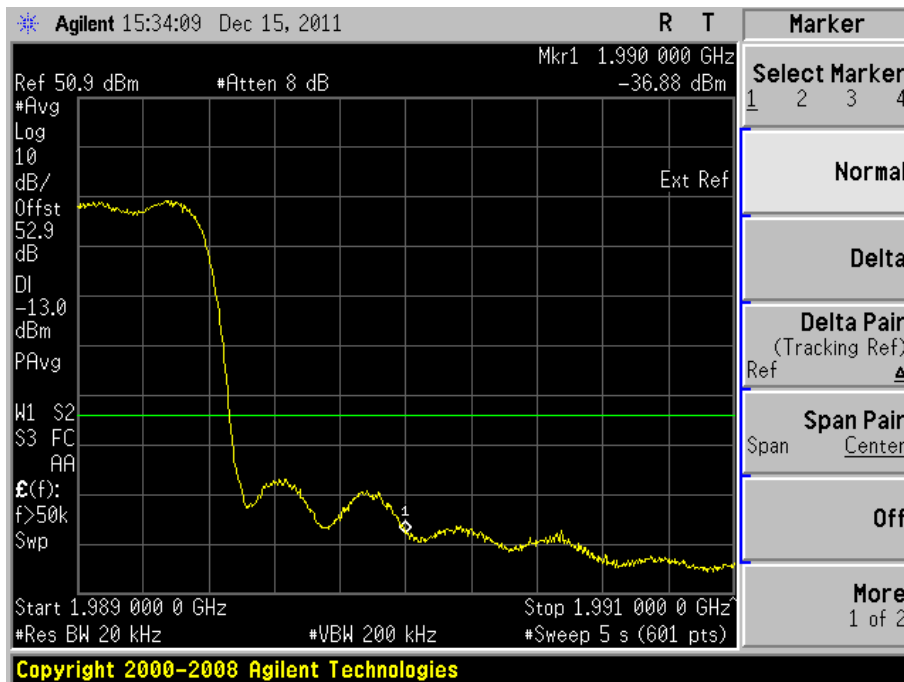
#### Configuration 1 - Mode 1





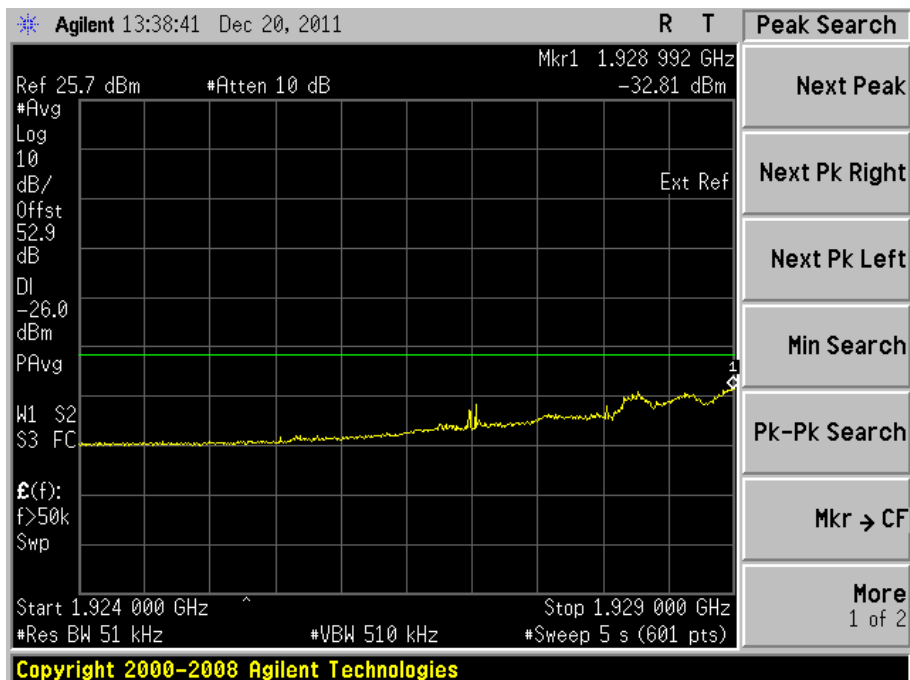
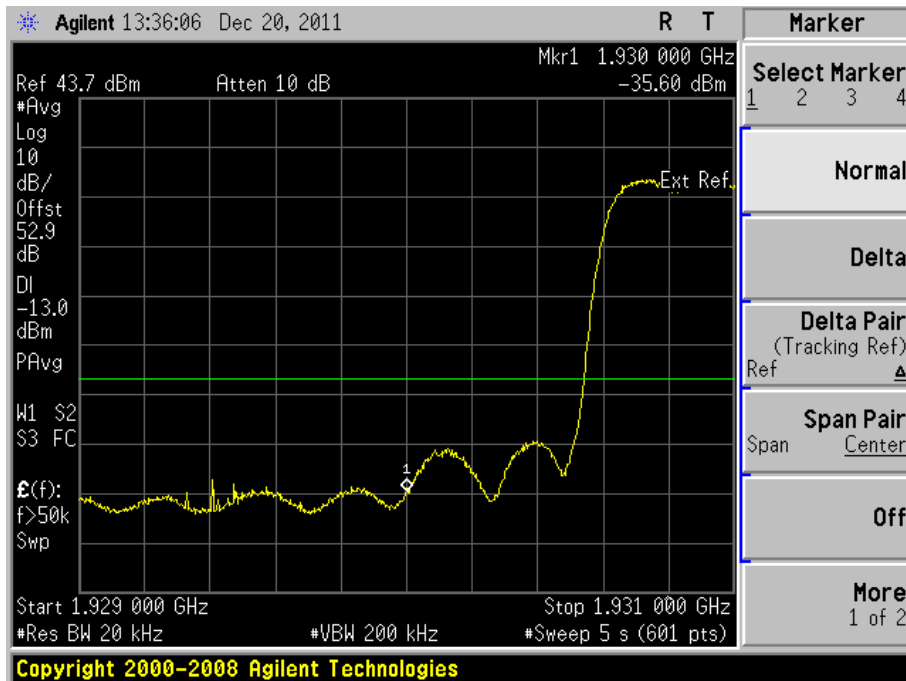
Product Service

## Configuration 1 - Mode 3



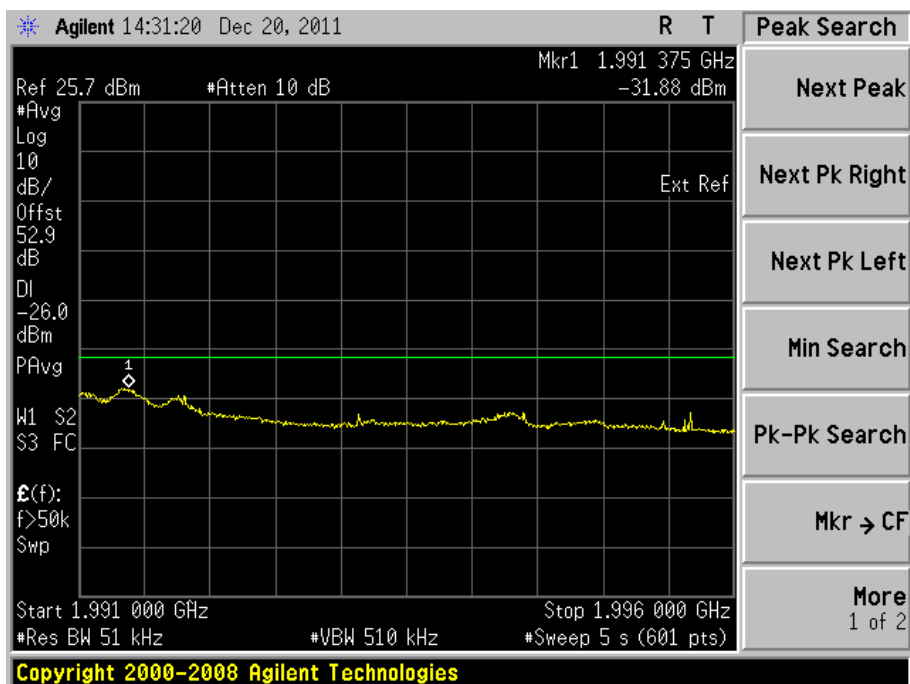
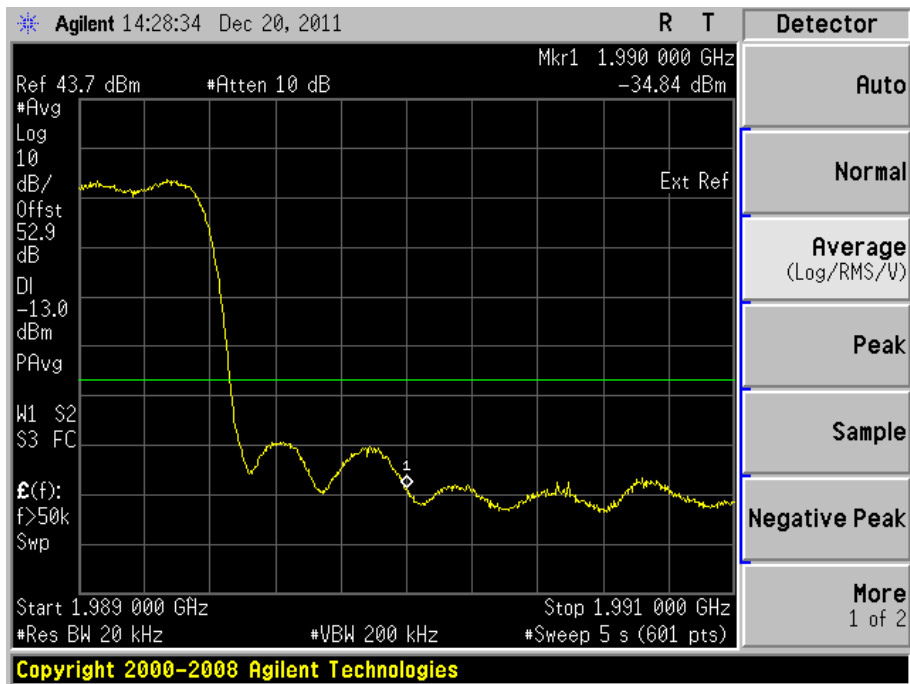


Product Service

**Multi Carrier (1x2)****Configuration 1 - Mode 7**



Product Service

Configuration 1 - Mode 8Limit

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



## **2.6 RADIATED SPURIOUS EMISSIONS**

### **2.6.1 Specification Reference**

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

### **2.6.2 Equipment Under Test**

RRUS 11 B25 / KRC 131 146/1, S/N: CB25537412

### **2.6.3 Date of Test and Modification State**

27 and 28 December 2011 – Modification State 0

### **2.6.4 Test Equipment Used**

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

### **2.6.5 Test Method and Operating Modes**

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

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

Emissions identified within the range 30MHz – 25GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz – 25GHz, the measurement was performed with a resolution bandwidth of 1MHz.

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

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

Field Strength of Carrier -  $(43 + 10\log(P))$  dB

Where:

Field Strength is measured in dB $\mu$ V/m

P is measured Transmitter Power in Watts



### **Determination of Spurious Emission Limit**

As the EUT does not have an integral antenna, the field strength of the carrier has been calculated assuming that the power is to be fed to a half-wave tuned dipoles as per 2.1053 (a).

$$E_{(v/m)} = (30 \times G_i \times P_o)^{0.5} / d$$

Where  $G_i$  is the antenna gain of ideal half-wave dipoles,  
 $P_o$  is the power out of the transceiver in W,  
 $d$  is the measurement distance in meter.

Therefore at 3m measurement distance the field strength using the lowest transceiver output power would be:

$$E_{(v/m)} = (30 \times 1.64 \times 35.32)^{0.5} / 3 = 13.895V/m = 142.9dB\mu V/m$$

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

$$43 + 10\log(35.32) = 58.5dB$$

Therefore the limit at 3m measurement distance is:

$$142.9 - 58.5 = 84.4 \text{ dB}\mu V/m$$

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

The test was performed with the EUT operating on all modes in section 1.4.3 and record the result of the following configurations and modes of operation for worst case:

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

### **2.6.6 Environmental Conditions**

	27 December 2011	28 December 2011
Ambient Temperature	20.5°C	21.3°C
Relative Humidity	32.0%	35.0%



### 2.6.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 & Part 24 and Industry Canada RSS-133 for Radiated Spurious Emissions.

The test results are shown below

Note: Only the worst case results plots have been included as all of the emissions are greater than 20dB below the limit. A set of plots have been included to show the measurement system noise floor

#### **QPSK**

##### **Single Carrier**

###### Configuration 1 - Mode 2

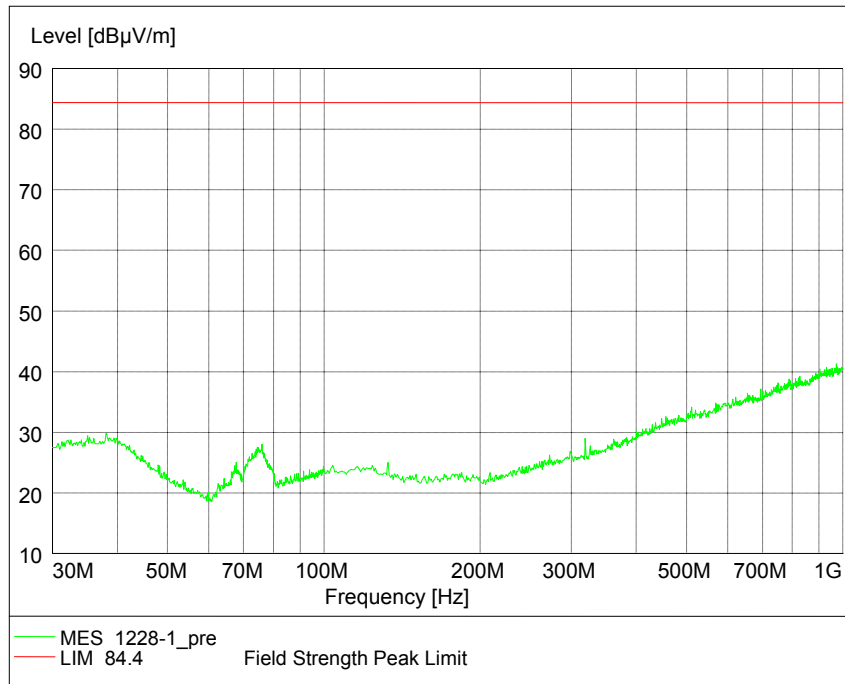
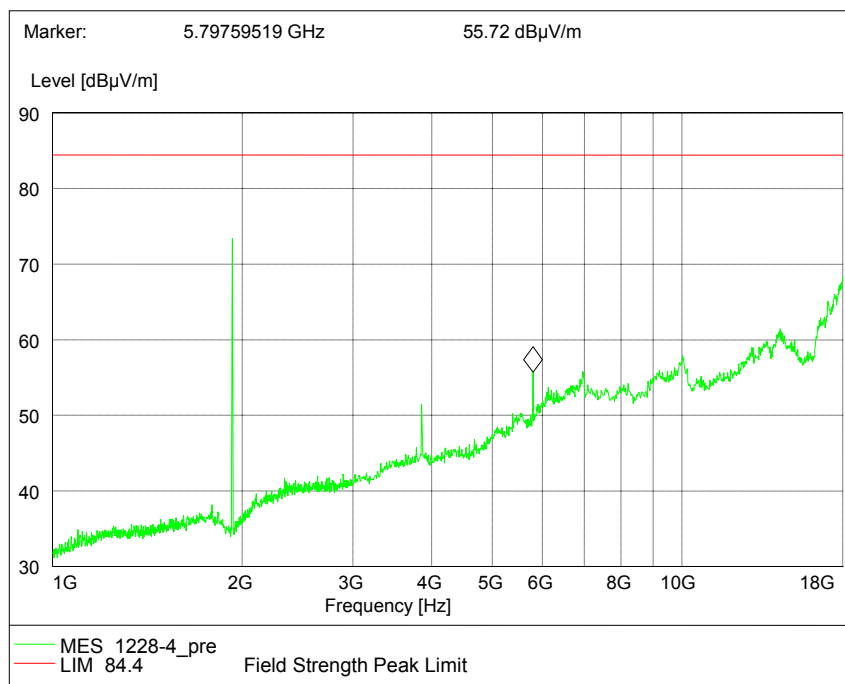
No emissions were detected within 20dB of the limit.

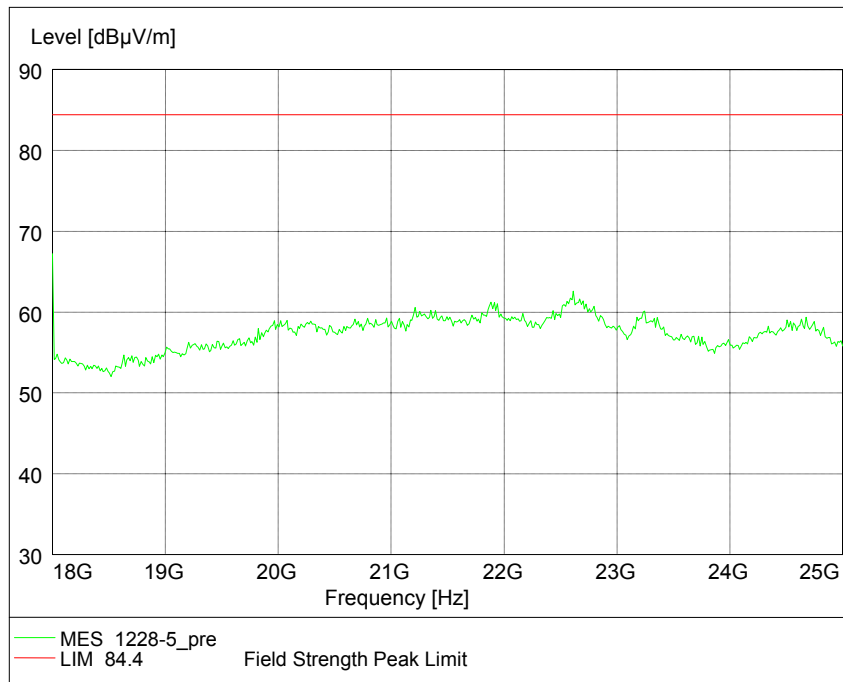
#### **8PSK**

##### **Single Carrier**

###### Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

**16QAM****Single Carrier****Configuration 1 - Mode 1****30MHz to 1GHz****1GHz to 18GHz**

18GHz to 25GHzConfiguration 1 - Mode 2

No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 3**Multi Carrier (1x2)**Configuration 1 - Mode 5

No emissions were detected within 20dB of the limit.

Limit	-13dBm / 84.4dBμV/m
-------	---------------------

Remarks

The EUT does not exceed -13dBm / 84.4dBμV/m at the measured frequencies.



## 2.7 CONDUCTED SPURIOUS EMISSIONS

### 2.7.1 Specification Reference

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

### 2.7.2 Equipment Under Test

RRUS 11 B25 / KRC 131 146/1, S/N: CB25472392

### 2.7.3 Date of Test and Modification State

25, 26 and 27 December 2011 – Modification State 0

### 2.7.4 Test Equipment Used

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

### 2.7.5 Test Method and Operating Modes

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

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 9kHz to 25GHz. The EUT was set to transmit on maximum power. The EUT was tested on Bottom, Middle and Top channels. The resolution was set to 1MHz for 9kHz to 25GHz thus meeting the requirements of Part 24.238(b). The spectrum analyser detector was set to peak and trace was kept on Max Hold.

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

In addition, measurements were made up to the 10<sup>th</sup> harmonic of the highest internal frequency.

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

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

### 2.7.6 Environmental Conditions

	25 December 2011	26 December 2011	27 December 2011
Ambient Temperature	21.2°C	20.5°C	20.7°C
Relative Humidity	42.5%	40.5%	41.8%



Product Service

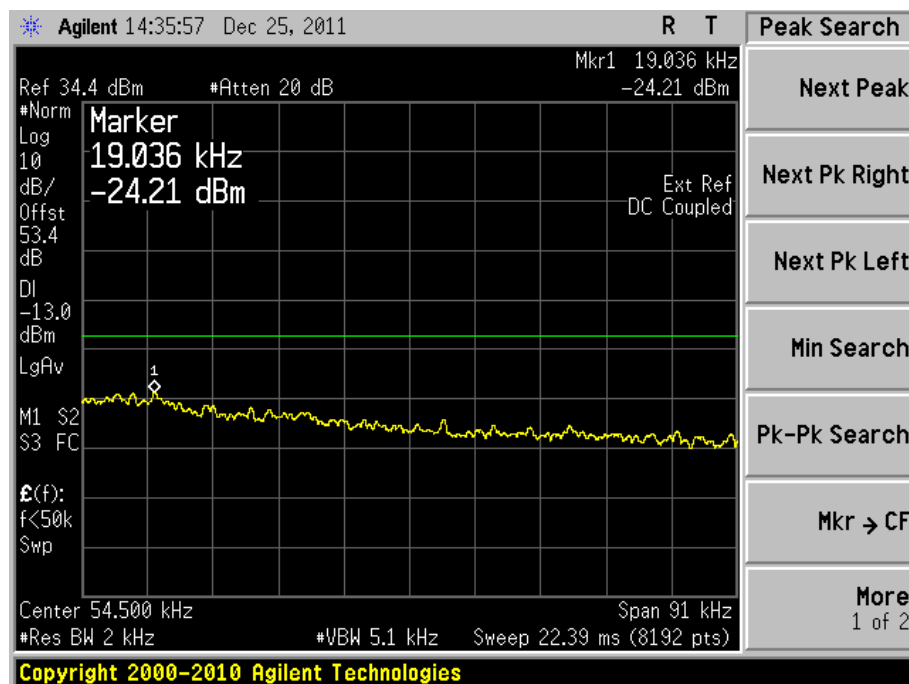
### 2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and Part 24 and Industry Canada RSS-133 for Conducted Spurious Emissions.

The test results are shown below

Remark:

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



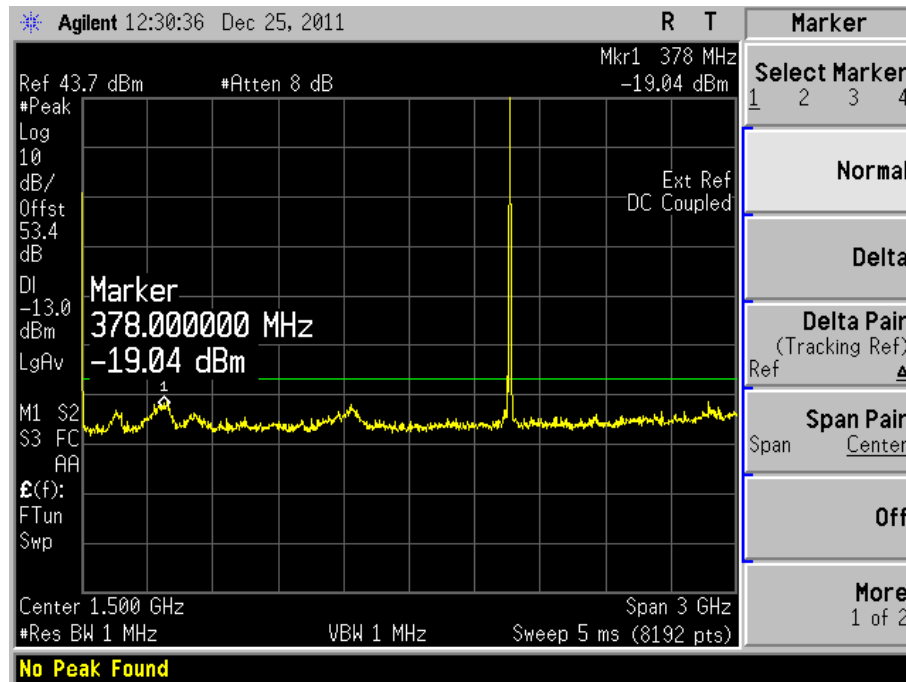


Product Service

**QPSK****Single Carrier**

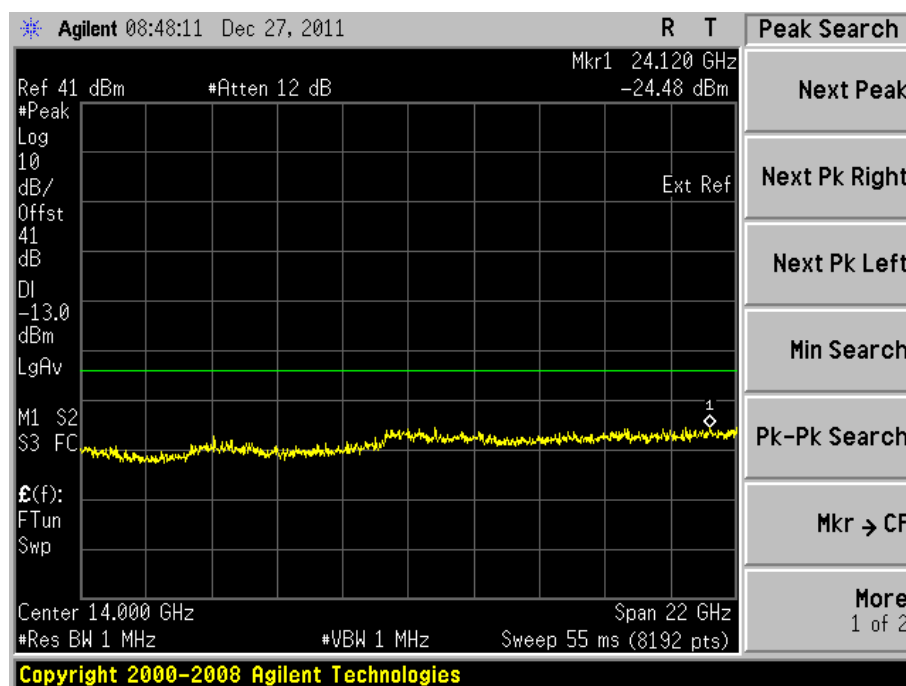
Configuration - Mode 1

9kHz to 3GHz



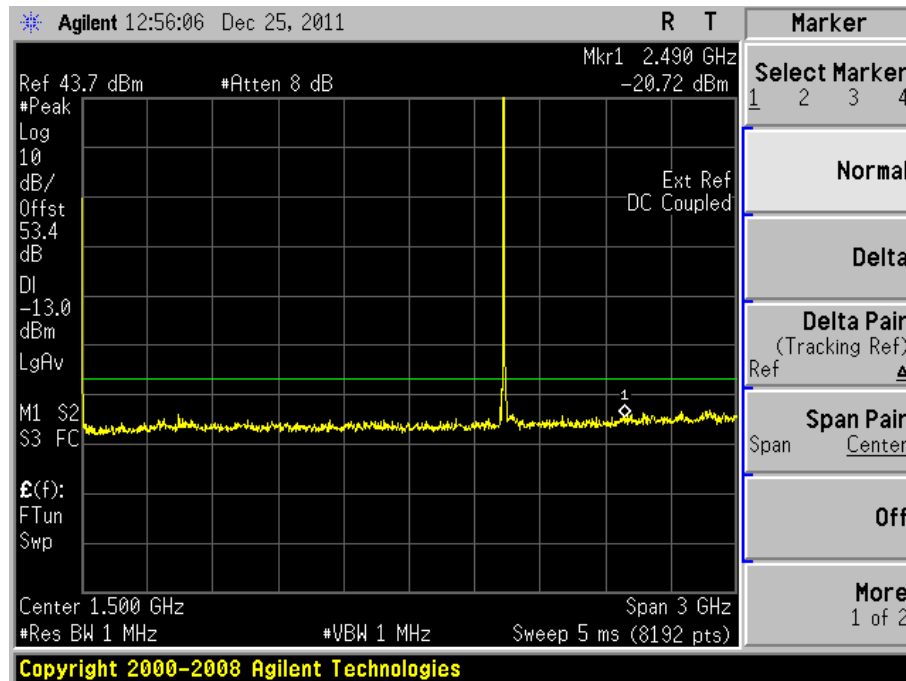
Note: The emission beyond the limit is the operating frequency.

3GHz to 25GHz

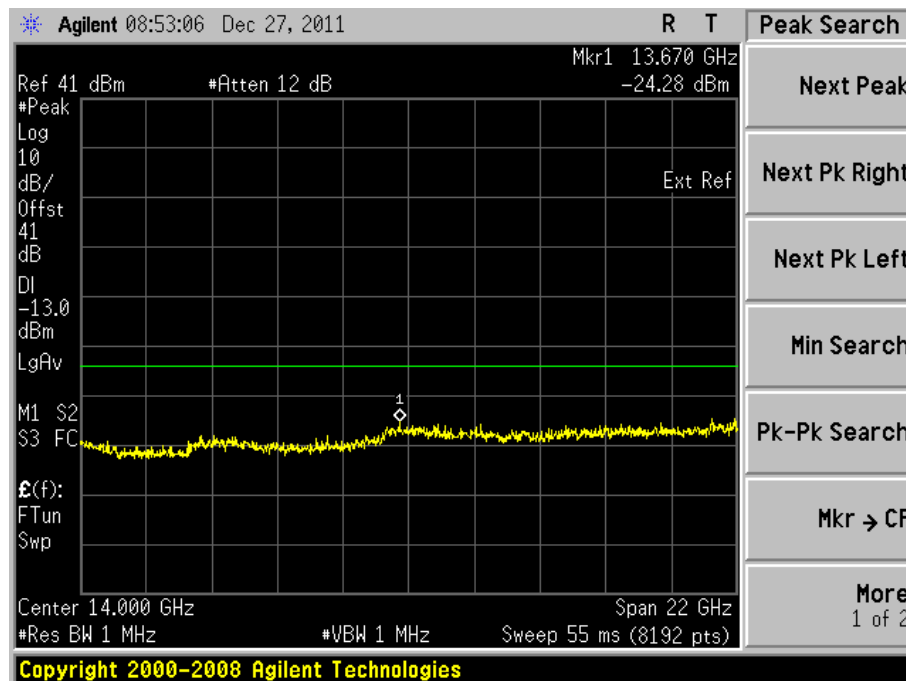




Product Service

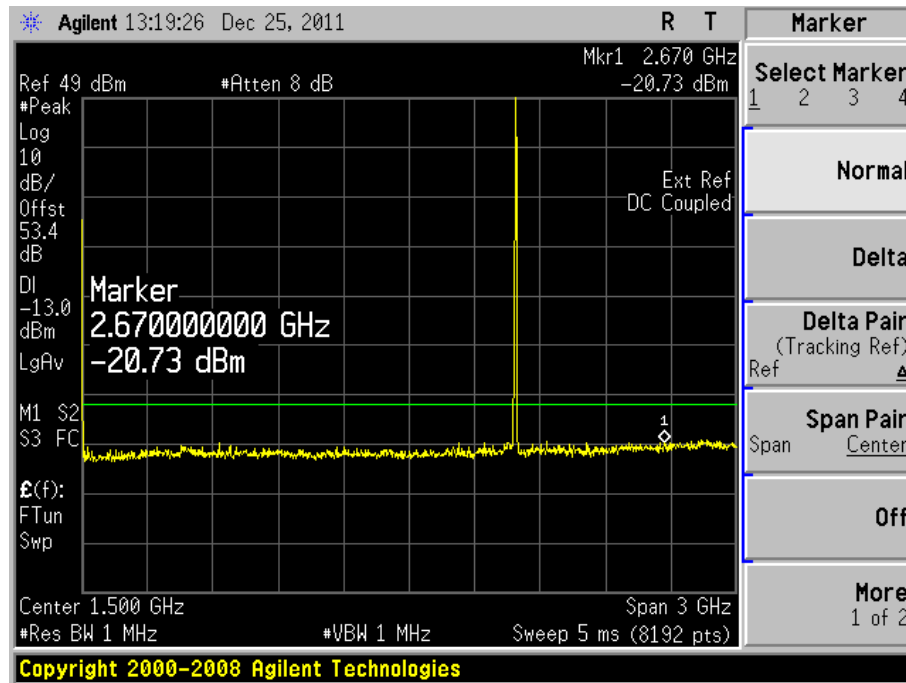
Configuration 1 - Mode 29kHz to 3GHz

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

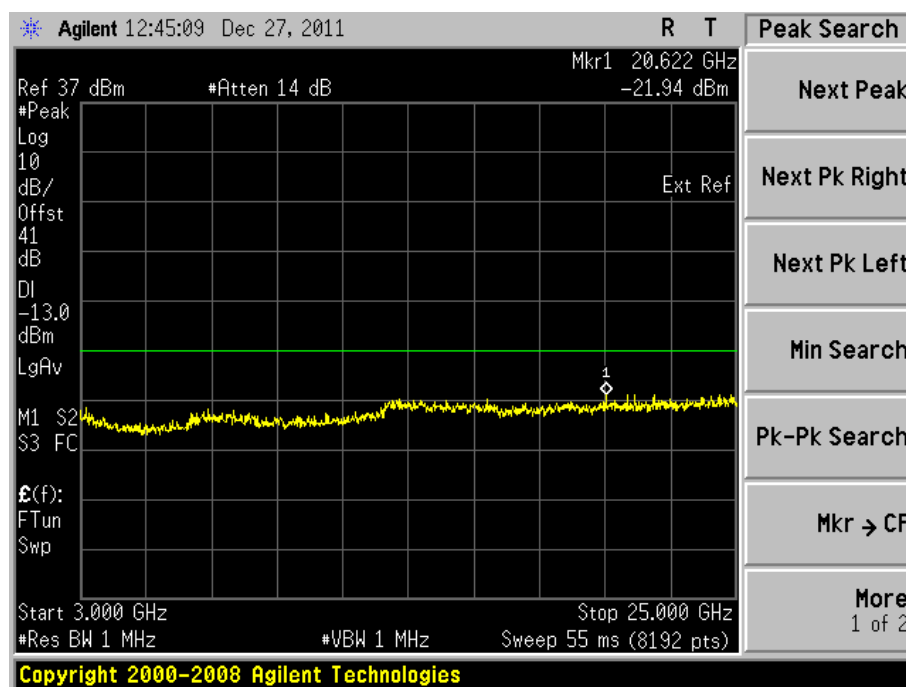
3GHz to 25GHz



Product Service

Configuration 1 - Mode 39kHz to 3GHz

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

3GHz to 25GHz

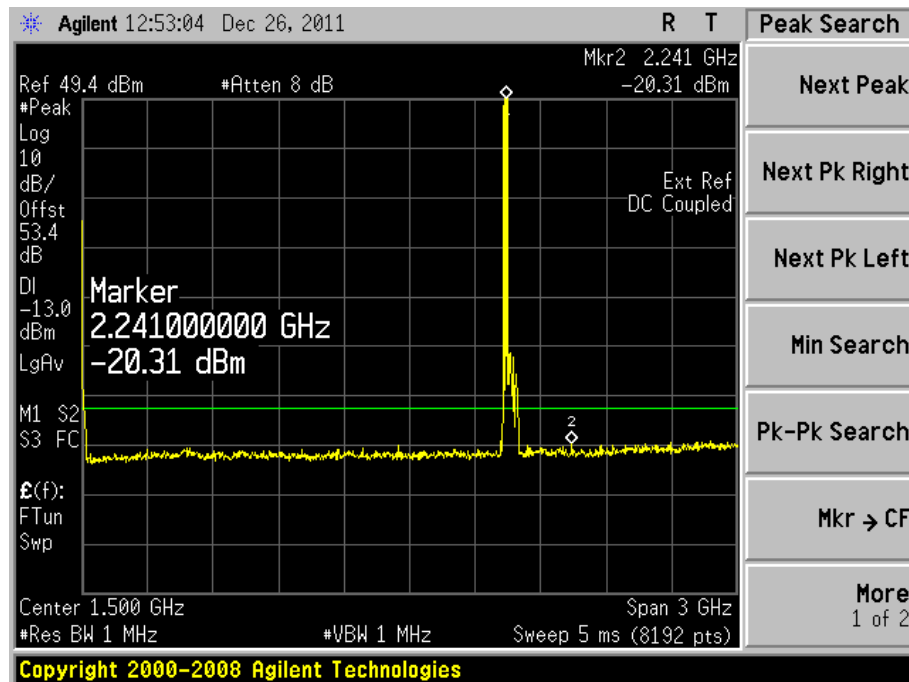


Product Service

**Multi Carrier (1x2)**

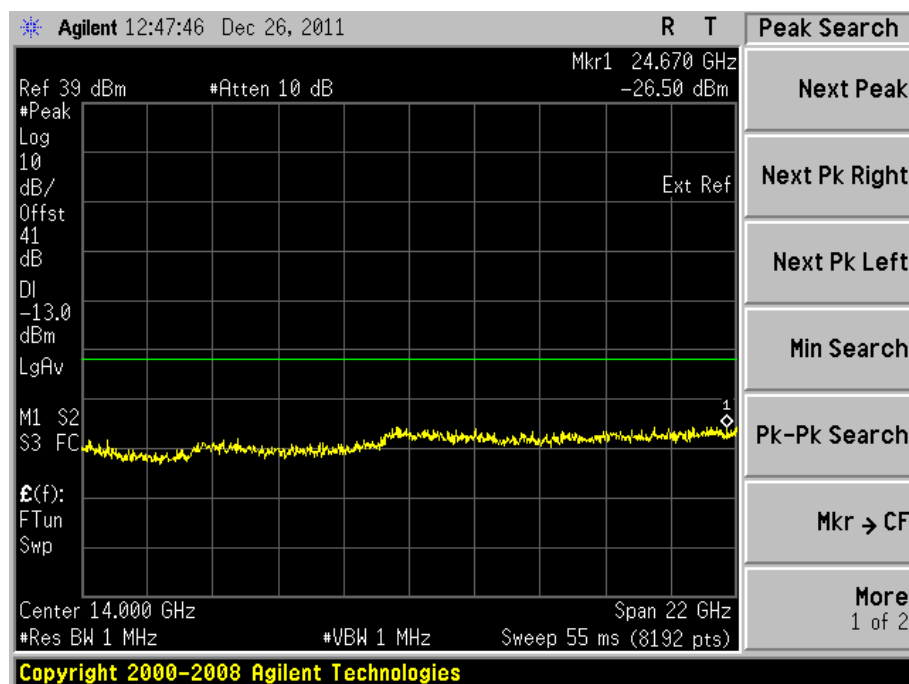
Configuration 1 - Mode 4

9kHz to 3GHz



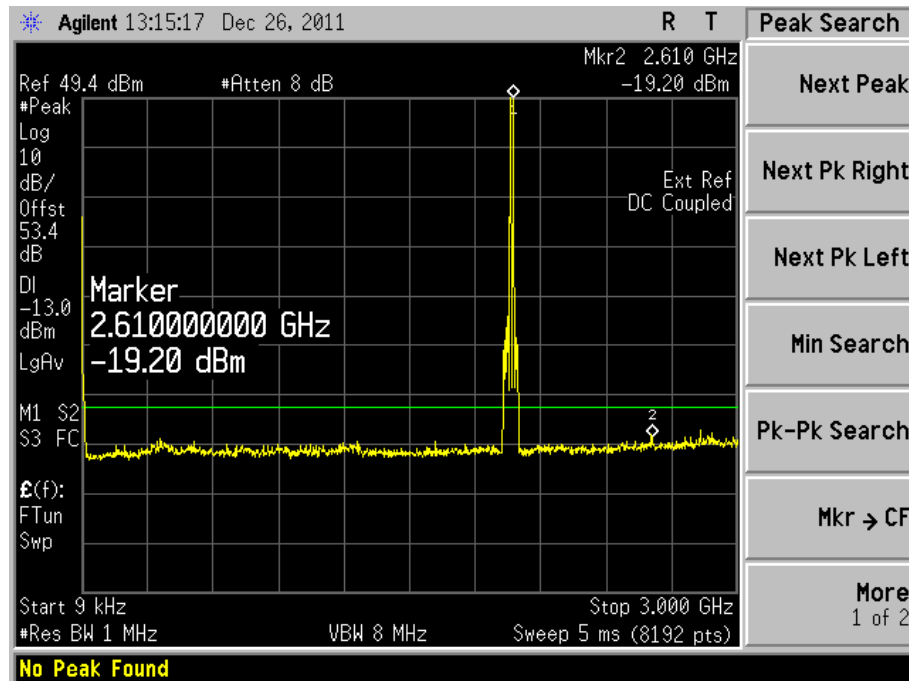
Note: The emissions beyond the limit are the operating frequencies.

3GHz to 25GHz

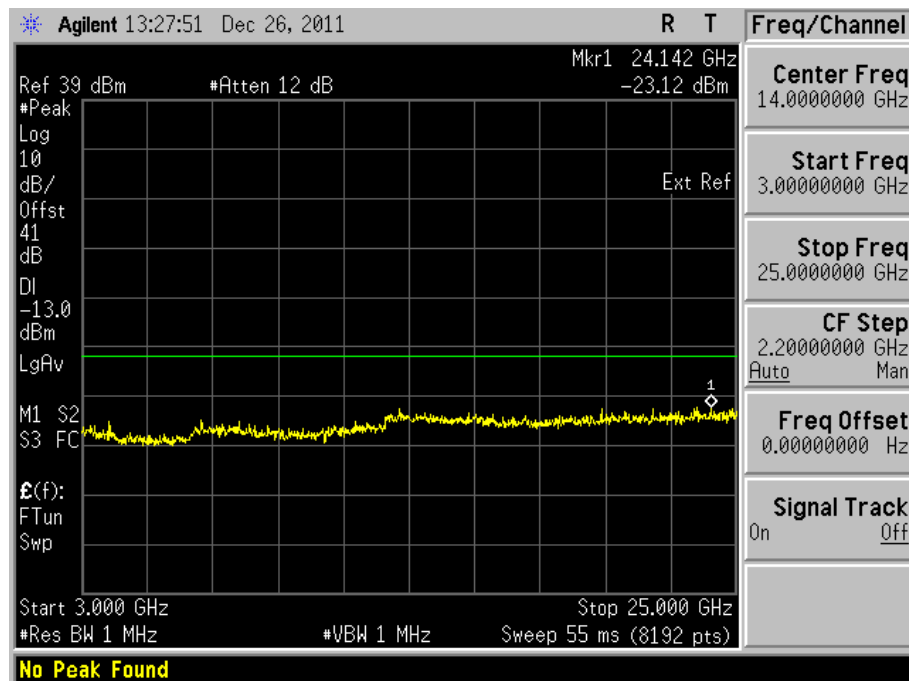




Product Service

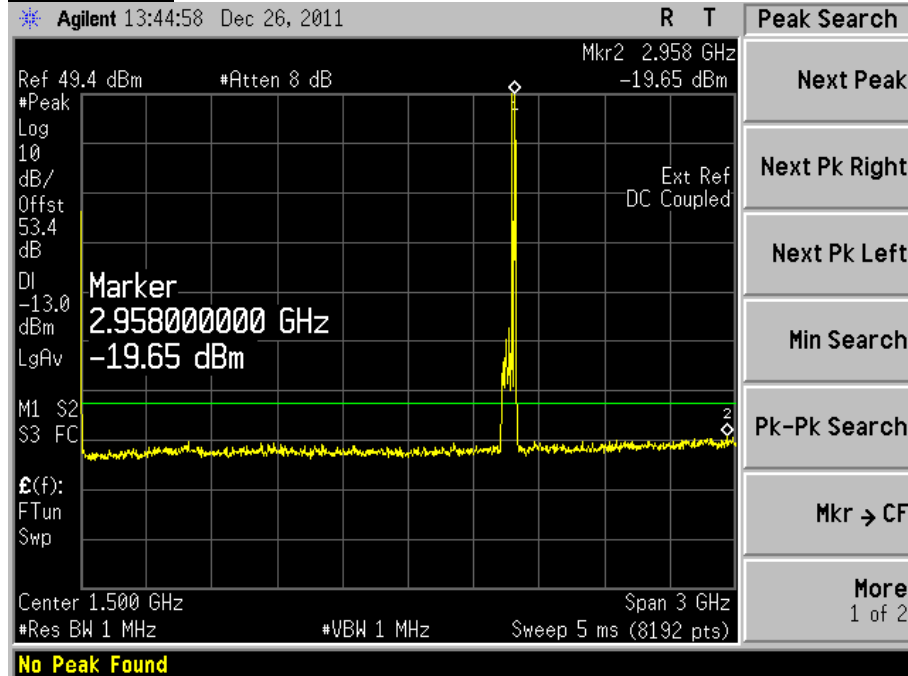
Configuration 1 - Mode 59kHz to 3GHz

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

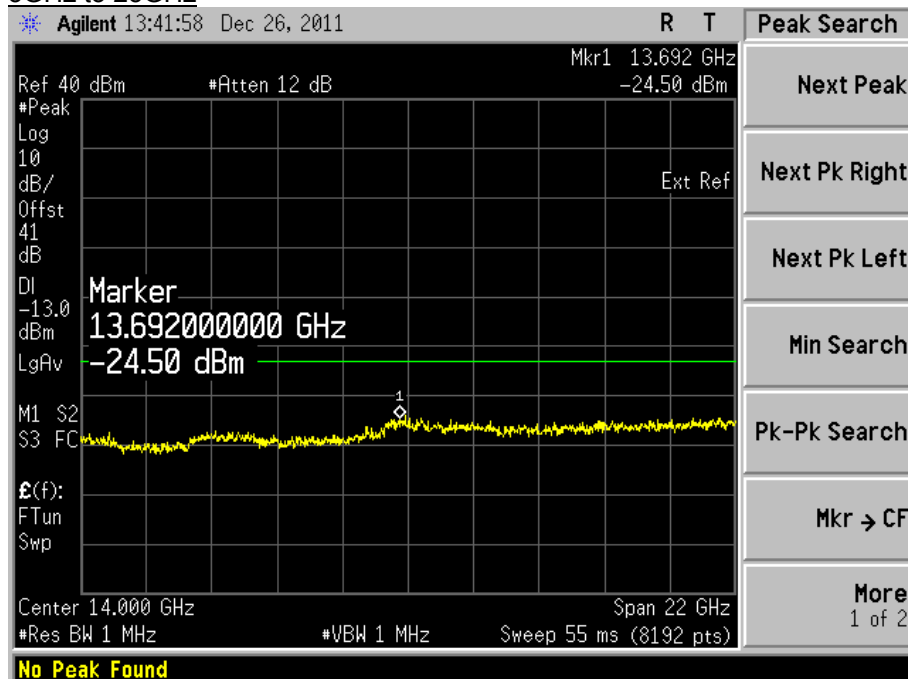
3GHz to 25GHz



Product Service

Configuration 1 - Mode 69kHz to 3GHz

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

3GHz to 25GHz

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

Remarks

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



## **2.8 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS**

### **2.8.1 Specification Reference**

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

### **2.8.2 Equipment Under Test**

RRUS 11 B25 / KRC 131 146/1, S/N: CB25472392

### **2.8.3 Date of Test and Modification State**

22 and 25 December 2011 – Modification State 0

### **2.8.4 Test Equipment Used**

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

### **2.8.5 Test Method and Operating Modes**

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

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

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

Configuration 1 - Mode 2

### **2.8.6 Environmental Conditions**

	22 December 2011	25 December 2011
Ambient Temperature	22.2°C	21.2°C
Relative Humidity	44.2%	42.5%



### 2.8.7 Test Results

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

The test results are shown below

Power Supply: -48V DC

#### Single Carrier

#### QPSK

#### Configuration 1 - Mode 2

Temperature Interval (°C)	Deviation (Hz)
-30	+12.15
-20	-10.22
-10	+9.34
0	+8.89
+10	-11.32
<b>+20</b>	<b>+8.56</b>
+30	+9.49
+40	+18.46
+50	+16.67

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

#### Remarks

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



## **2.9 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS**

### **2.9.1 Specification Reference**

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

### **2.9.2 Equipment Under Test**

RRUS 11 B25 / KRC 131 146/1, S/N: CB25472392

### **2.9.3 Date of Test and Modification State**

25 December 2011 – Modification State 0

### **2.9.4 Test Equipment Used**

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

### **2.9.5 Test Method and Operating Modes**

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

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

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

Configuration 1 - Mode 2

### **2.9.6 Environmental Conditions**

25 December 2011

Ambient Temperature 21.2°C

Relative Humidity 42.5%



### 2.9.7 Test Results

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

The test results are shown below

Temperature: 20°C

#### Single Carrier

#### QPSK

#### Configuration 1 - Mode 2

DC Voltage (V)	Deviation (Hz)
-40.8	+13.48
<b>-48.0</b>	<b>+8.56</b>
-55.2	-5.17

Limit	$\pm 1.0$ ppm or $\pm 1.96$ 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.



## **2.10 RECEIVER SPURIOUS EMISSIONS**

### **2.10.1 Specification Reference**

Industry Canada RSS-133, Clause 6.6

### **2.10.2 Equipment Under Test**

RRUS 11 B25 / KRC 131 146/1, S/N: CB25472392

### **2.10.3 Date of Test and Modification State**

26 and 28 December 2011 – Modification State 0

### **2.10.4 Test Equipment Used**

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

### **2.10.5 Test Method and Operating Modes**

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

In accordance with RSS-Gen Clause 6.2, the receiver spurious emissions from the antenna terminal were measured. Measurements were performed on the receiver antenna connector RF B. The EUT was set to transmitter mode on the TX connector RF A and during the measurement the RF A was terminated with a matched load, (50 Ohm).

The resolution was set to 120kHz in the frequency range 9kHz to 1GHz and 1MHz in the frequency range 1GHz to 13GHz thus meeting the requirements of RSS-Gen Clause 4.10, the spectrum analyser detector was set to peak and trace was kept on Max Hold to give the worst case. The limit line was displayed, showing the -57dBm, 2 nanowatts in band 9kHz to 1GHz and above 1GHz, -53dBm, 5 nanowatts.

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

In addition, measurements were made from 9kHz up to the 5<sup>th</sup> harmonic of the highest internal frequency.

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

Configuration 1 - Mode 1  
                           - Mode 2  
                           - Mode 3

### **2.10.6 Environmental Conditions**

	26 December 2011	28 December 2011
Ambient Temperature	20.5°C	22.5°C
Relative Humidity	40.5%	36.4%



Product Service

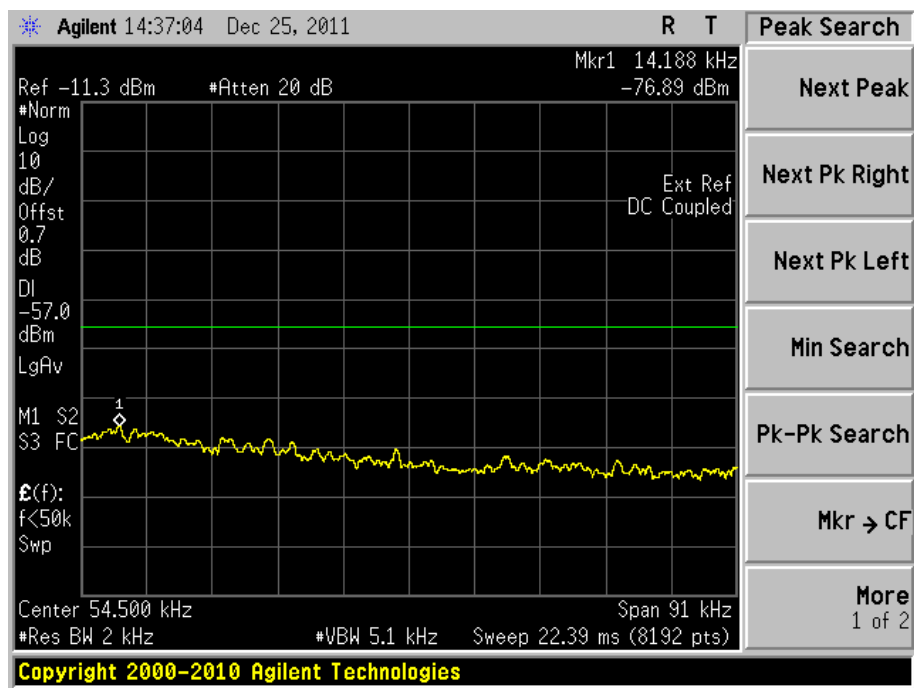
### 2.10.7 Test Results

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

The test results are shown below

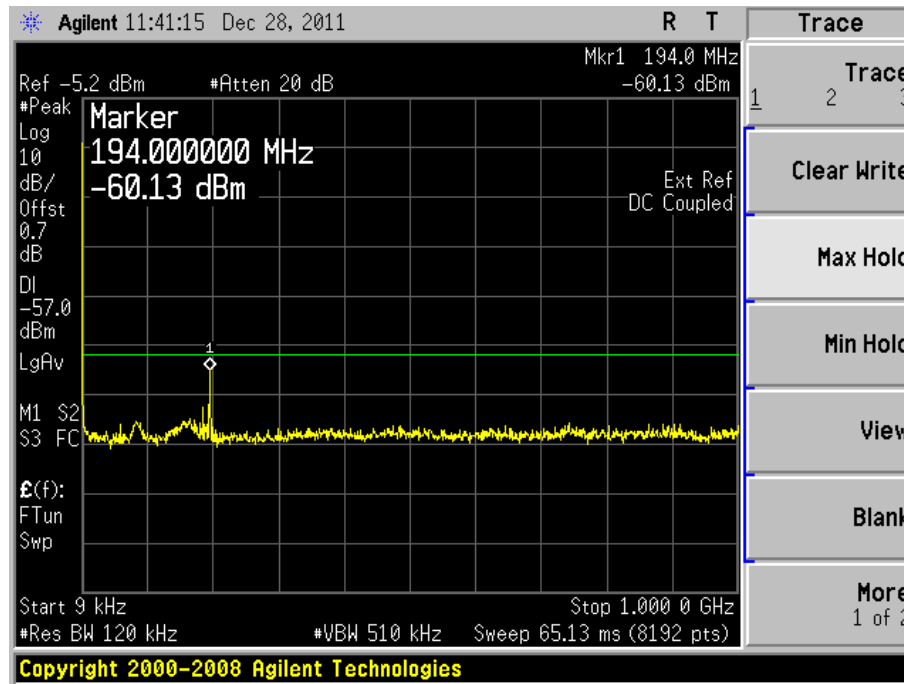
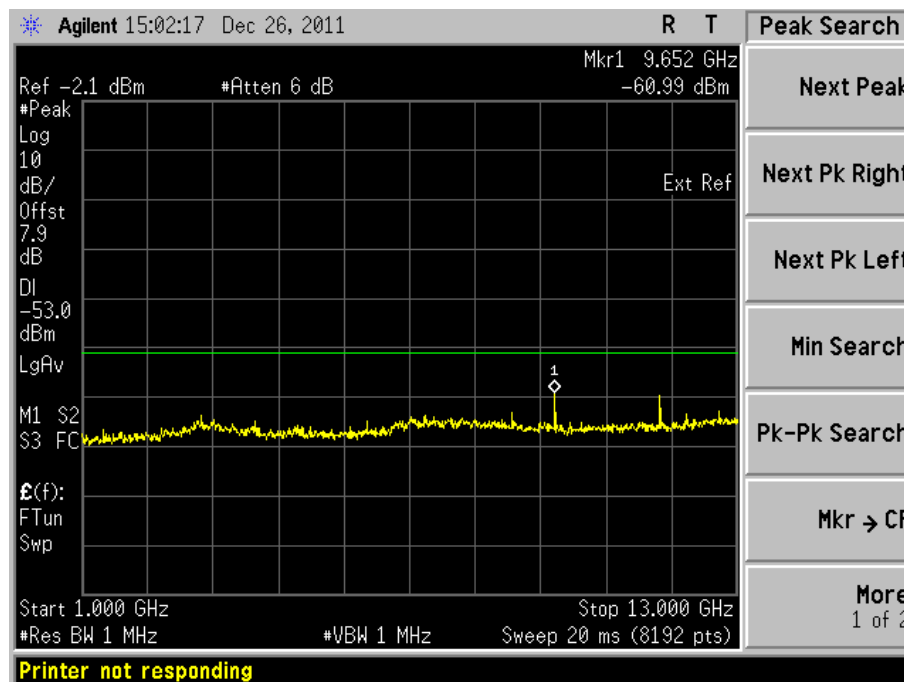
Remark:

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



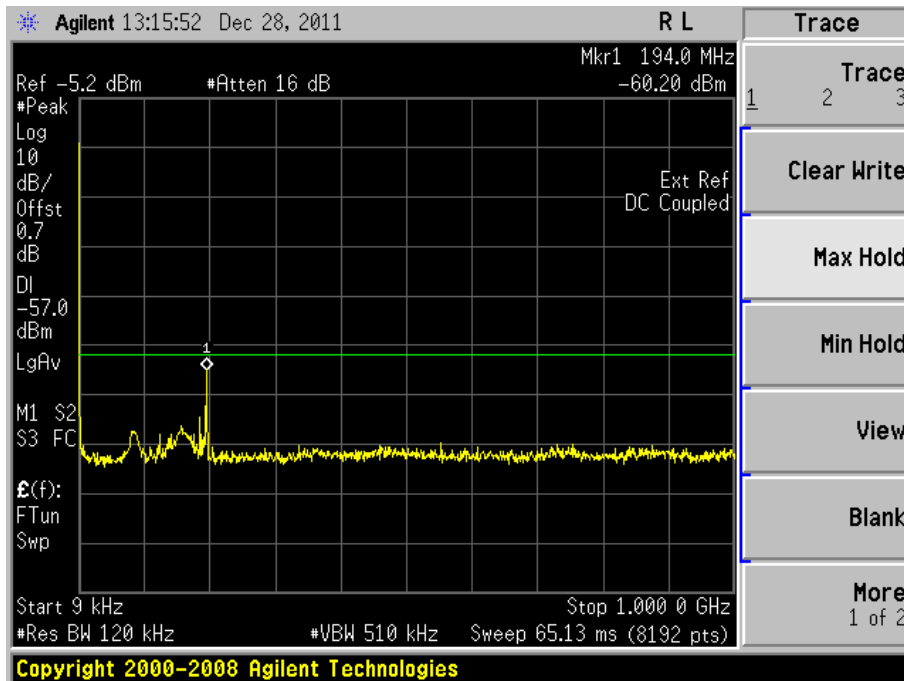
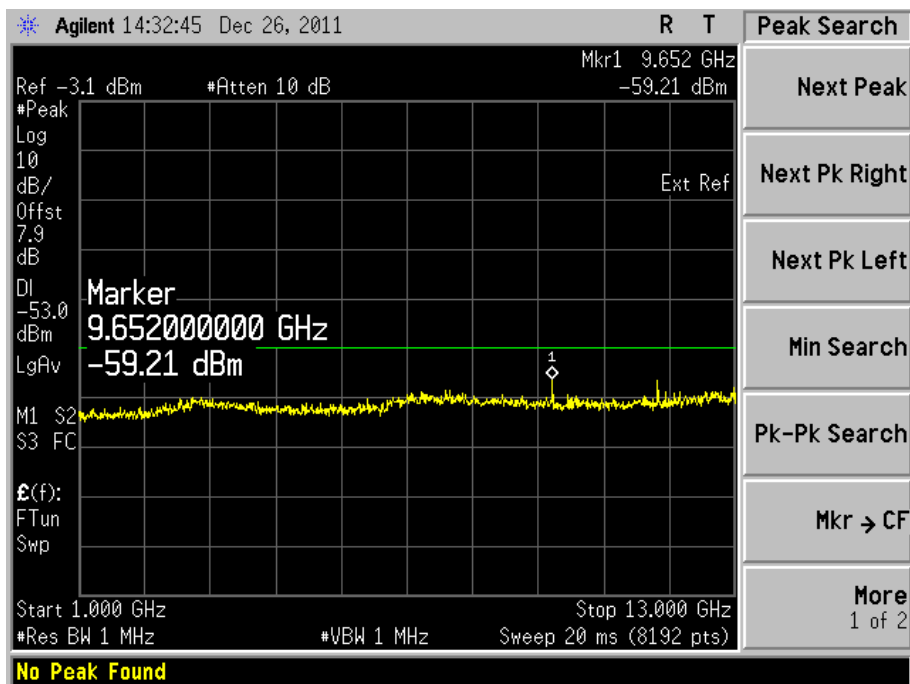


Product Service

**QPSK****Single Carrier****Configuration 1 - Mode 1****9kHz to 1GHz****1GHz to 13GHz**



Product Service

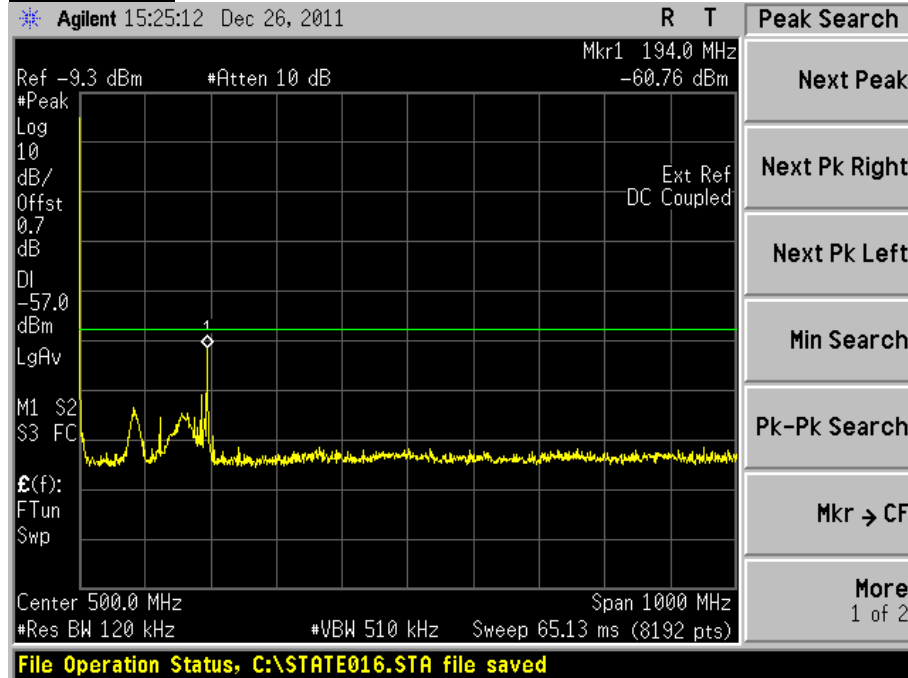
Configuration 1 - Mode 29kHz to 1GHz1GHz to 13GHz



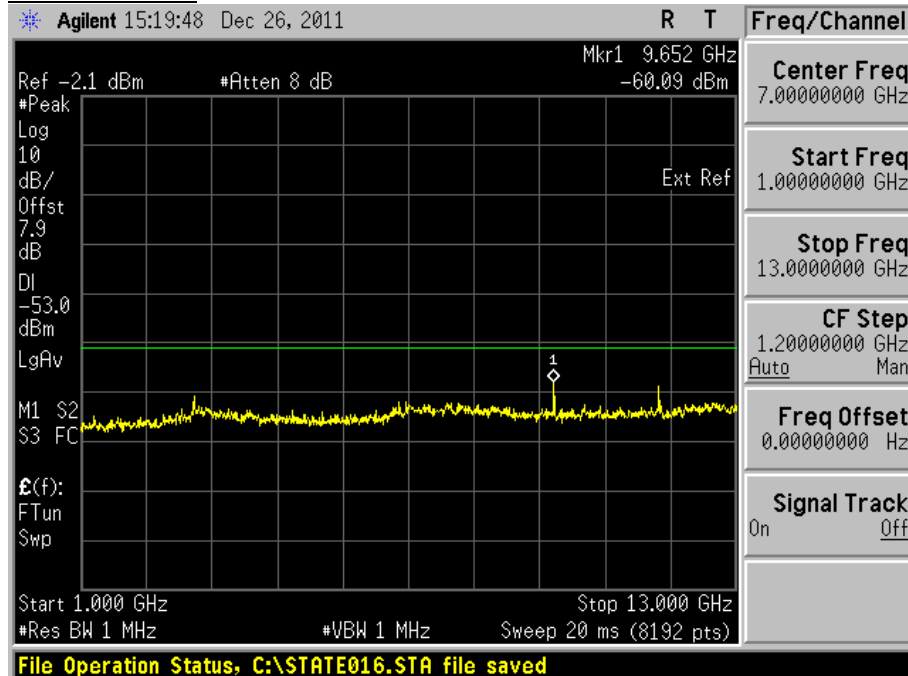
Product Service

Configuration 1 - Mode 3

## 9kHz to 1GHz



## 1GHz to 13GHz



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

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



Product Service

### **SECTION 3**

#### **TEST EQUIPMENT USED**

### 3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
<b>Section 2.1, 2.2, 2.3, 2.4, 2.6, 2.7 and 2.10 – Maximum Conducted Output Power, Peak – Average Ratio, Modulation Characteristics, Occupied Bandwidth, Spurious Emissions at Antenna Terminals (<math>\pm 1</math>MHz), Conducted Spurious Emissions and Receiver Spurious Emissions.</b>					
Spectrum Analyser	Agilent	E4440A	MY48250517	12	18-April-2012
Power Meter	Hewlett Packard	E4418B	US39251254	12	21-April-2012
Thermal Power Sensor	Hewlett Packard	8482A	3318A29942	12	21-April-2012
Network Analyzer	Hewlett Packard	8720D	US36140166	12	09-Sep-2012
30 dB Attenuator	Shanghai Huaxiang	DTS150G	11101004	-	O/P MON
50 dB Attenuator	Shanghai Huaxiang	-	11091429	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121602	-	O/P MON
Power Supply	XANTREX	XFR 60-46	E00103273	-	O/P MON
Digital Multi-meter	FLUKE	179	91820401	12	13-Dec-2012
Thermo-hygrometer	AZ Instruments	8705	9151655	12	19-Dec-2012
<b>Section 2.5 – Radiated Spurious Emissions</b>					
Load	Shanghai Huaxiang	TF100	09121631	-	O/P MON
Load	Shanghai Huaxiang	TF100	09121602	-	O/P MON
EMI Receiver	Rohde & Schwarz	ESI 40	100015	12	19-Aug-2012
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	19-Aug-2012
Double-Ridged Wave-guide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2012
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	12	19-Aug-2012
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18m×16.88m×9.60m	-	12	19-Aug-2012
Power Supply	Dahua	DH1716A-14	20080401	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	13-Dec-2012
Thermo-hygrometer	AZ Instruments	8705	9151655	12	19-Dec-2012



<b>Section 2.8 and 2.9 – Frequency Stability Under Temperature and Voltage Variations</b>					
Spectrum Analyser	Agilent	E4440A	MY48250517	12	18-April-2012
30 dB Attenuator	Shanghai Huaxiang	DTS150G	11101004	-	O/P MON
50 dB Attenuator	Shanghai Huaxiang	-	11091429	-	O/P MON
Temperature Chamber	THERMOTRON	SE-600-6-6	34648	-	O/P MON
Power Supply	XANTREX	XFR 60-46	E00103273	-	O/P MON
Digital Multimeter	FLUKE	179	91820401	12	03-Jan-2012
Thermo-hygrometer	AZ Instruments	8705	9151655	12	16-Dec-2012

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



### 3.2 MEASUREMENT UNCERTAINTY

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

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

\* In accordance with CISPR 16-4



Product Service

## **SECTION 4**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



#### 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

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

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