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Report On

FCC and Industry Canada Testing of the
IP Access Ltd
165H BTS (1900MHz)

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FCC ID : QGGKU02ZZS
IC ID: 4644A-KU02ZZS

Document 75905356 Report 02 Issue 2

April 2009



Product Service

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COMMERCIAL-IN-CONFIDENCE

REPORT ON

FCC and Industry Canada Testing of the
IP Access Ltd
165H BTS (1900MHz)

Document 75905356 Report 02 Issue 2

April 2009

PREPARED FOR

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DATED

05 May 2009

30 April 2009

This report has been up-issued to Issue 2 to include the EUT's Industry Canada ID and references to the RSS-133 specification.

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

Test Engineer(s);

J Holcombe

A Guy



S Bennett



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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
IP Access Ltd
165H BTS (1900MHz)



Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the IP Access Ltd 165H BTS (1900MHz) to the requirements of FCC CFR 47 Part 24 and RSS-133.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	IP Access Ltd
Model Number	165H BTS
Serial Number(s)	75129
Software Version	168a357v142b30d0
Hardware Version	A
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 24: 2008 RSS-133: 2008
Incoming Release Date	Declaration of Build Status 10 March 2009
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	PO20821 15 December 2008
Start of Test	19 March 2009
Finish of Test	26 March 2009
Name of Engineer(s)	A Guy J Holcombe S Bennett
Related Document(s)	ANSI 63.4: 2001



1.2 BRIEF SUMMARY OF RESULTS

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

Configuration 1 - AC Mains Powered (via PSU)							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Base Standard
	FCC	IC					
2.1	24.238	-	Emissions for Broadband PCS Equipment	1930.2MHz Transmit (Bottom Channel)	0	Pass	ANSI 63.4
				1960.0MHz Transmit (Middle Channel)	0	Pass	
				1989.8MHz Transmit (Top Channel)	0	Pass	
2.2	24.232 (c)	6.4	EIRP Peak Power	1930.2MHz Transmit (Bottom Channel)	0	Pass	ANSI 63.4
				1960.0MHz Transmit (Middle Channel)	0	Pass	
				1989.8MHz Transmit (Top Channel)	0	Pass	
2.3	2.1051, 24.229	6.5.1	Spurious Emissions at Band Edge	1930.2MHz Transmit (Bottom Channel)	0	Pass	-
				1989.8MHz Transmit (Top Channel)	0	Pass	
2.4	2.1046, 24.232	6.4	Maximum Peak Output Power – Conducted	1930.2MHz Transmit (Bottom Channel)	0	Pass	-
				1960.0MHz Transmit (Middle Channel)	0	Pass	
				1989.8MHz Transmit (Top Channel)	0	Pass	
2.5	2.1047(d)	6.2	Modulation Characteristics	1989.8MHz Transmit (Top Channel)	0	Pass	-
2.6	2.1049, 24.238(b)	6.3	Occupied Bandwidth	1960.0MHz Transmit (Middle Channel)	0	Pass	-
2.7	2.1051, 24.238(a)	6.5.2	Conducted Spurious Emissions	1930.2MHz Transmit (Bottom Channel)	0	Pass	-
				1960.0MHz Transmit (Middle Channel)	0	Pass	
				1989.8MHz Transmit (Top Channel)	0	Pass	
2.8	2.1055, 24.135(a)	6.3	Frequency Stability Under Temperature Variations	1960.0MHz Transmit (Middle Channel)	0	Pass	-
2.9	2.1055, 24.135(a)	6.3	Frequency Stability Under Voltage Variations	1989.8MHz Transmit (Top Channel)	0	Pass	-



Product Service

1.3 DECLARATION OF BUILD STATUS

Manufacturer	IP Access Ltd
Country of origin	UK
UK Agent	N/A
Technical Description	2G Edge Picocell Base Station
Model No	nanoBTS
Part No	165G (1800MHz) 165H (1900MHz)
Serial No	165G: 00075122 165H: 00075129
Drawing Number	165#006_PRT Individual Pack Assembly 165#012_PRT nanoBTS Assembly 165#017_PRT nanoBTS Sub-Assembly
Build Status	165G: 71 165H: 72
Software Issue	165G & 165H: 168a357v142b30d0
Hardware Issue	165G & 165H: A
FCC ID	QGGKU02ZZS
Industry Canada ID	4644A-KU02ZZS
Signature	Held on File
Date	30/03/2009
D of B S Serial No	165G: 75905353 165H: 75905356

Note: This document has been prepared to enable manufacturers with no mechanism for producing their own Declaration of Build Status, to declare the build state of the equipment submitted for test.

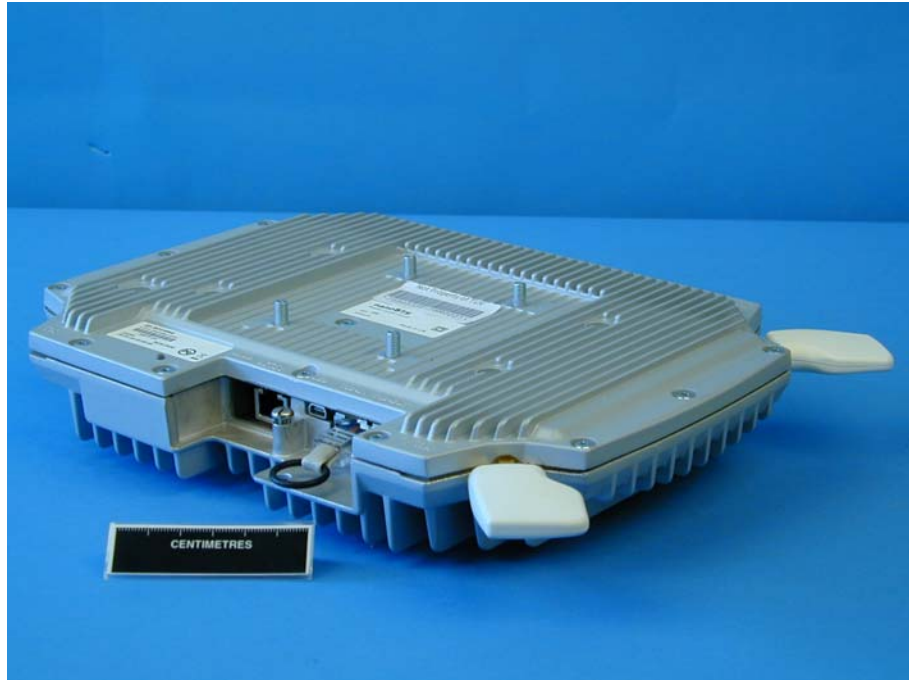
No responsibility will be accepted by TÜV Product Service as to the accuracy of the information declared in this document by the manufacturer.



1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a IP Access Ltd 165H BTS (1900MHz) as 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: AC Mains Powered (via PSU)

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

1.4.3 EUT Cable / Port Identification

Port	Max Cable Length specified	Usage	Type	Screened
DC Power	1.5m or <3m	Power /Signal Lead	Multicore	No
AC Power	1.0m	Power	3 Core	No

1.4.4 Modes of Operation

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

Mode 1 – 1930.2MHz Transmit (Bottom Channel)

Mode 2 – 1960.0MHz Transmit (Middle Channel)

Mode 3 – 1989.8MHz Transmit (Top 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 an open test area as appropriate.

The EUT was powered from a 110V, 60Hz supply.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

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.



Product Service

SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
IP Access Ltd
165H BTS (1900MHz)



Product Service

2.1 EMISSIONS FOR BROADBAND PCS EQUIPMENT

2.1.1 Specification Reference

FCC CFR 47 Part 24, Clause 24.238

2.1.2 Equipment Under Test

165H BTS (1900MHz), S/N: 75129

2.1.3 Date of Test and Modification State

19 March 2009 - 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 ANSI 63.4

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

Configuration 1 - Mode 1
 - Mode 2
 - Mode 3

2.1.6 Environmental Conditions

	19 March 2009
Ambient Temperature	24.4°C
Relative Humidity	24%
Atmospheric Pressure	1026mbar



2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24 for Emissions for Broadband PCS Equipment.

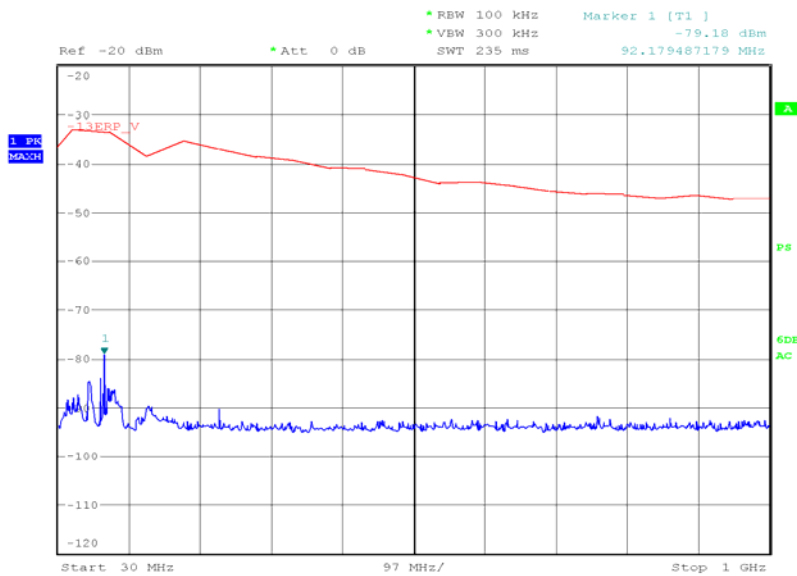
The test results are shown below.

Configuration 1 - Mode 1

Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
5967	Vertical	100	287	-49.15	-13.0	-36.15	Pass

30MHz to 1GHz

Vertical Polarity

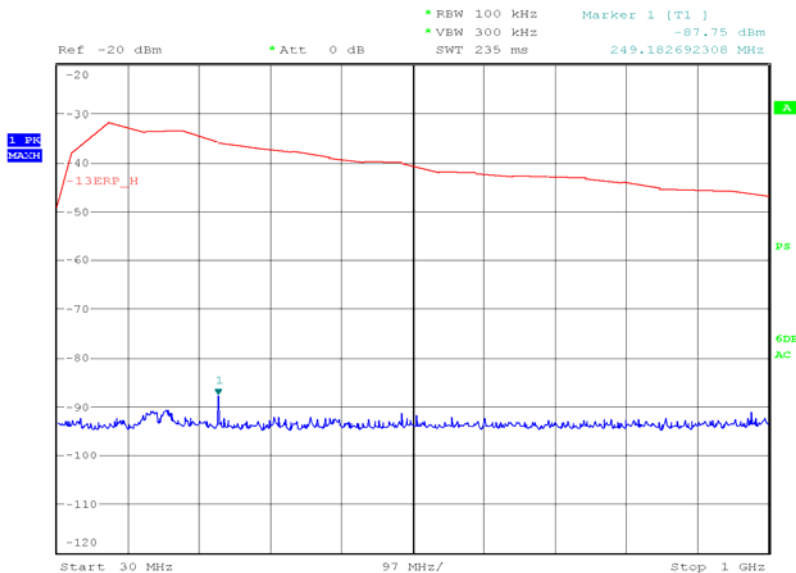


Date: 19.MAR.2009 22:00:36



Product Service

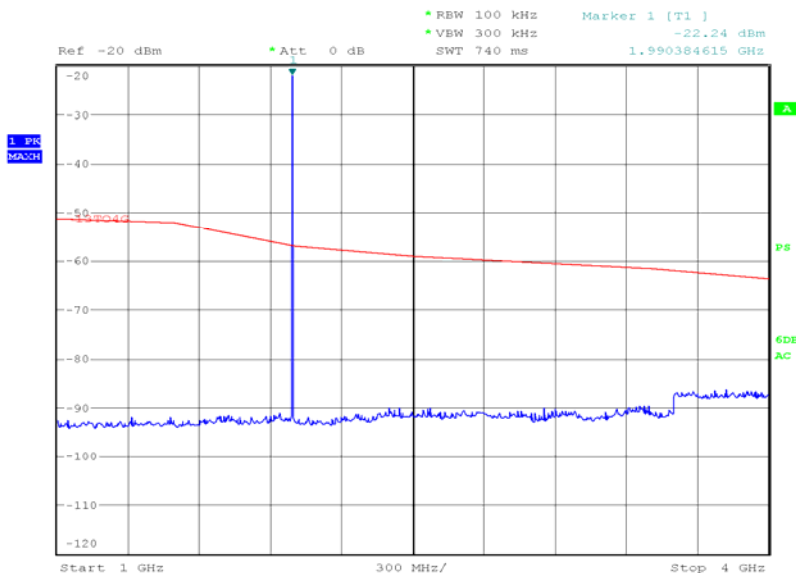
Horizontal Polarity



Date: 19.MAR.2009 21:58:38

1GHz to 4GHz

Vertical Polarity

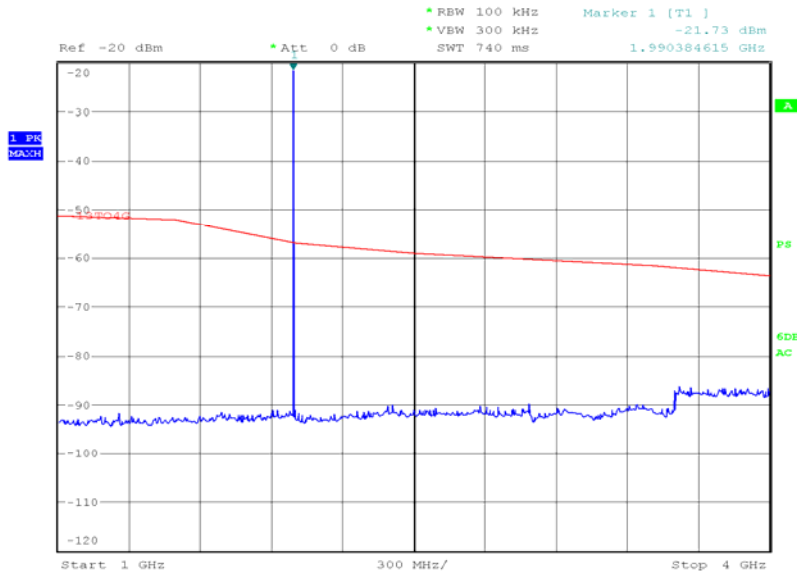


Date: 19.MAR.2009 23:28:47

Note: The Spurious Emission spike shown on the graph above is located within the transmission exclusion band and would be exempt from further measurement.



Horizontal Polarity

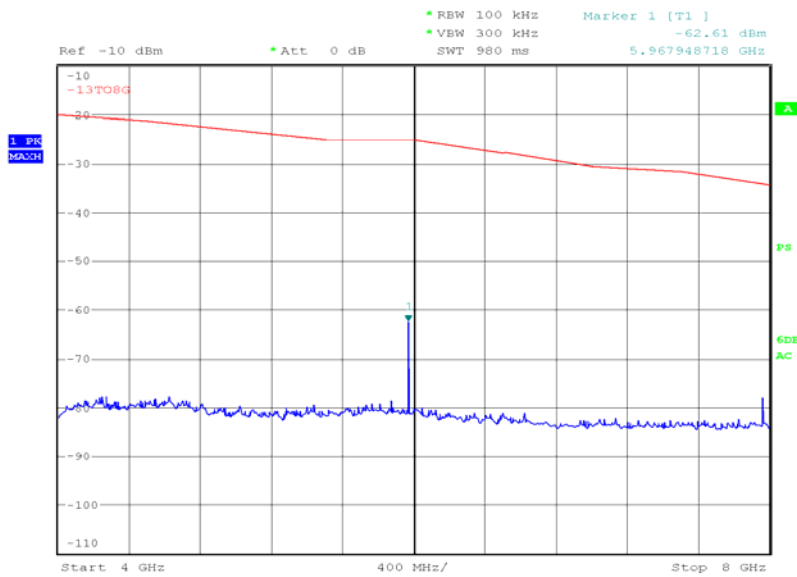


Date: 19.MAR.2009 23:32:06

Note: The Spurious Emission spike shown on the graph above is located within the transmission exclusion band and would be exempt from further measurement.

4GHz to 8GHz

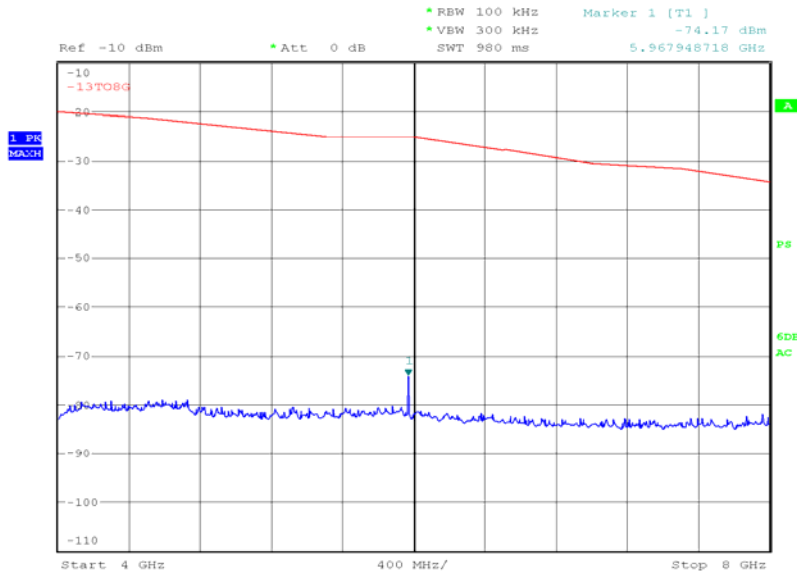
Vertical Polarity



Date: 20.MAR.2009 00:10:31



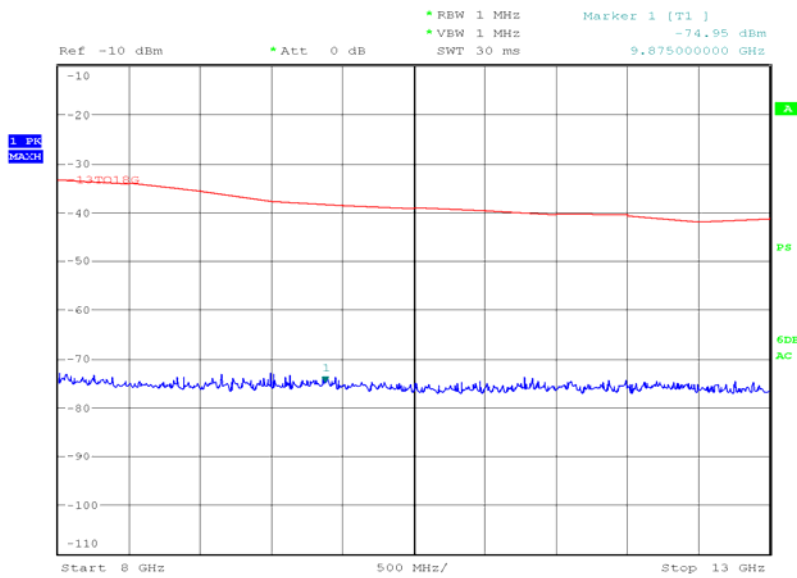
Horizontal Polarity



Date: 20.MAR.2009 00:07:39

8GHz to 13GHz

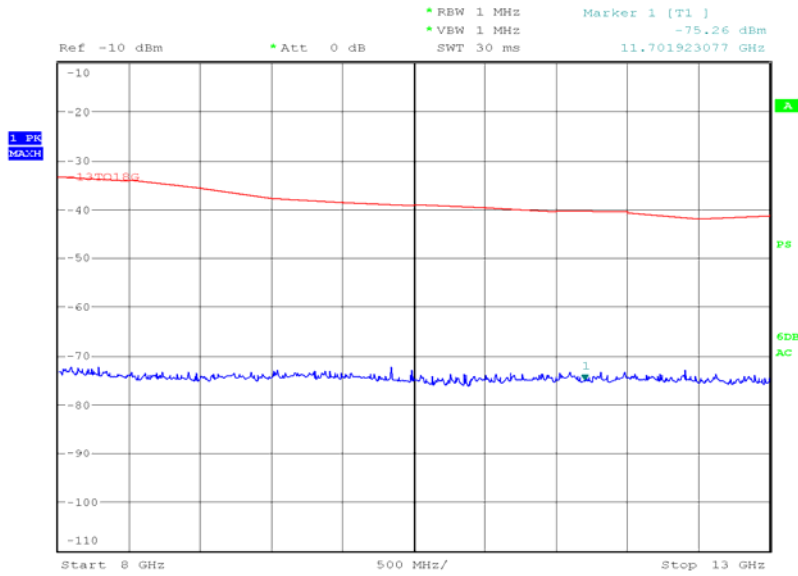
Vertical Polarity



Date: 20.MAR.2009 02:25:01



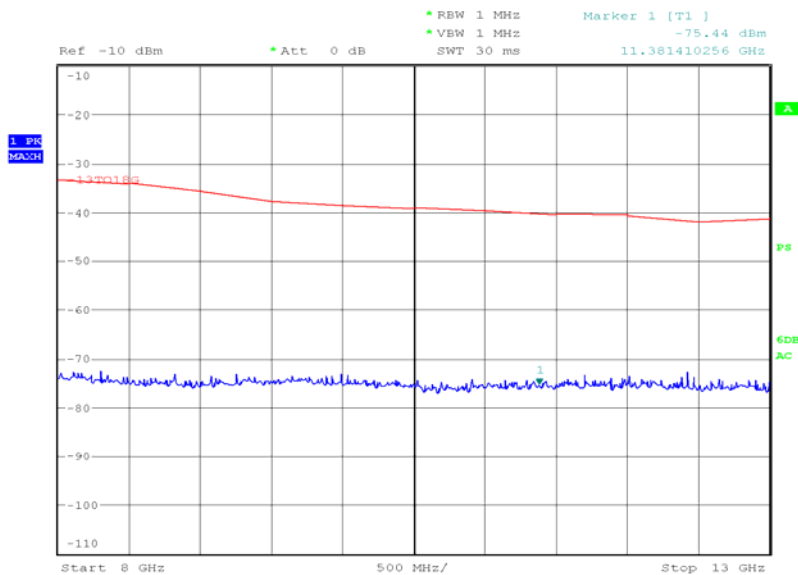
Horizontal Polarity



Date: 20.MAR.2009 02:03:11

13GHz to 18GHz

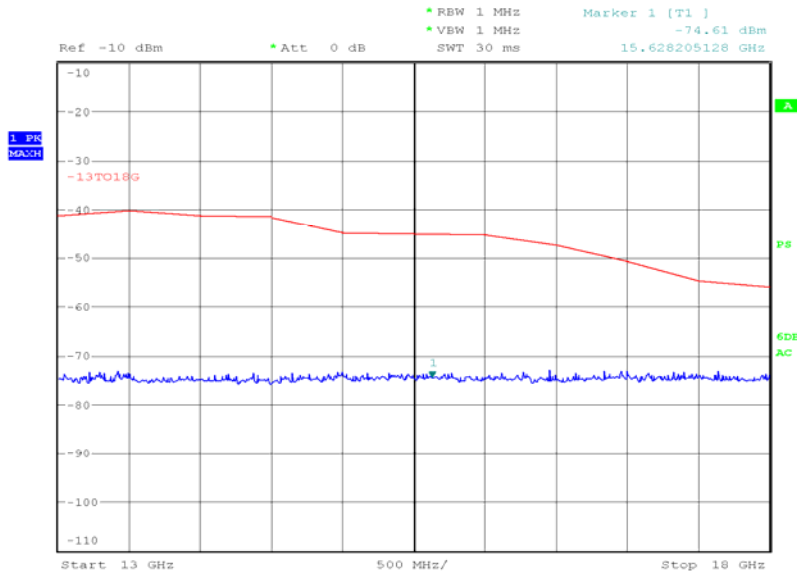
Vertical Polarity



Date: 20.MAR.2009 02:24:45



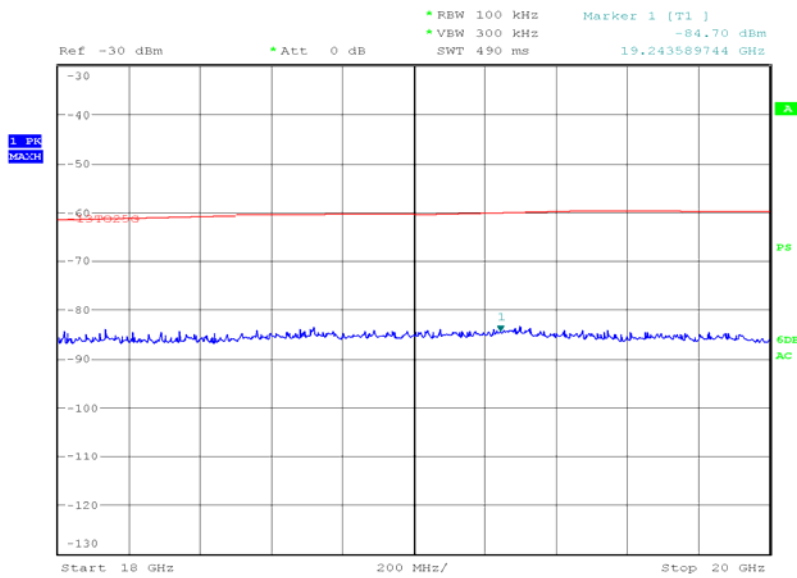
Horizontal Polarity



Date: 20.MAR.2009 02:06:58

18GHz to 20GHz

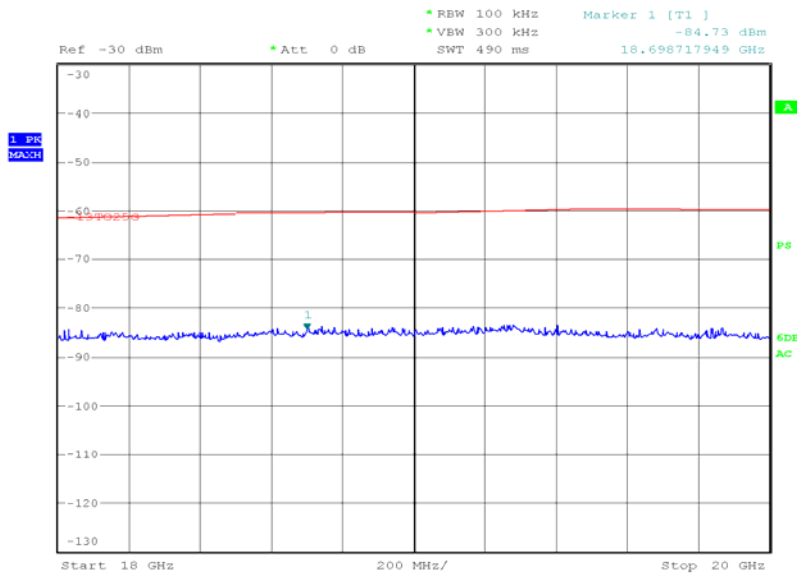
Vertical Polarity



Date: 20.MAR.2009 03:35:04



Horizontal Polarity



Date: 20.MAR.2009 03:50:34

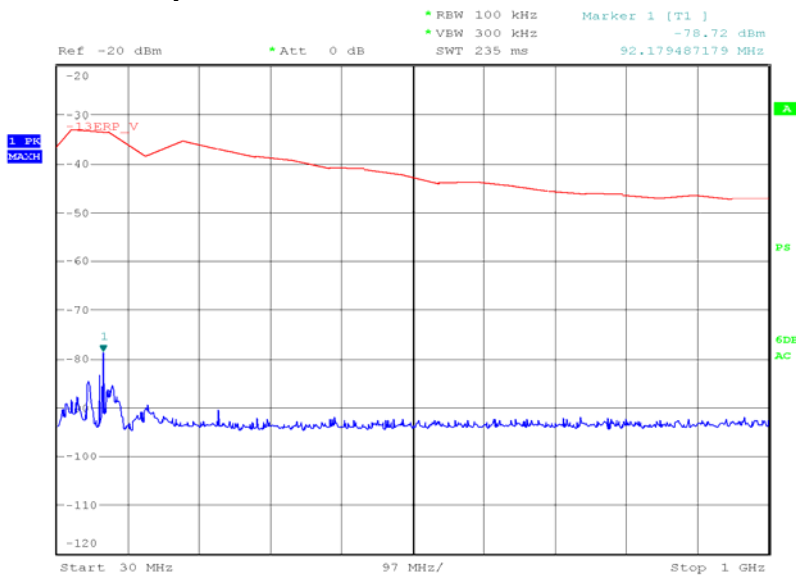


Configuration 1 - Mode 2

Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
5880	Vertical	100	280	-47.3	-13.0	-34.3	Pass

30MHz to 1GHz

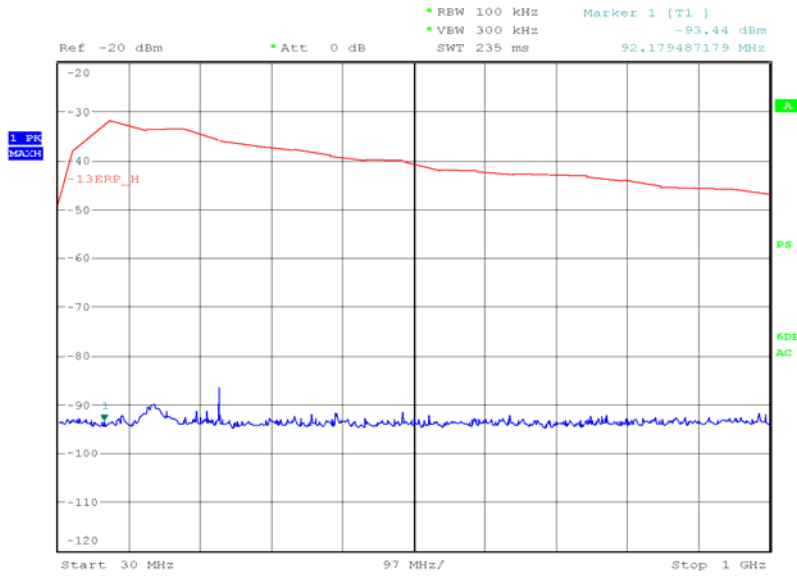
Vertical Polarity



Date: 19.MAR.2009 22:05:48



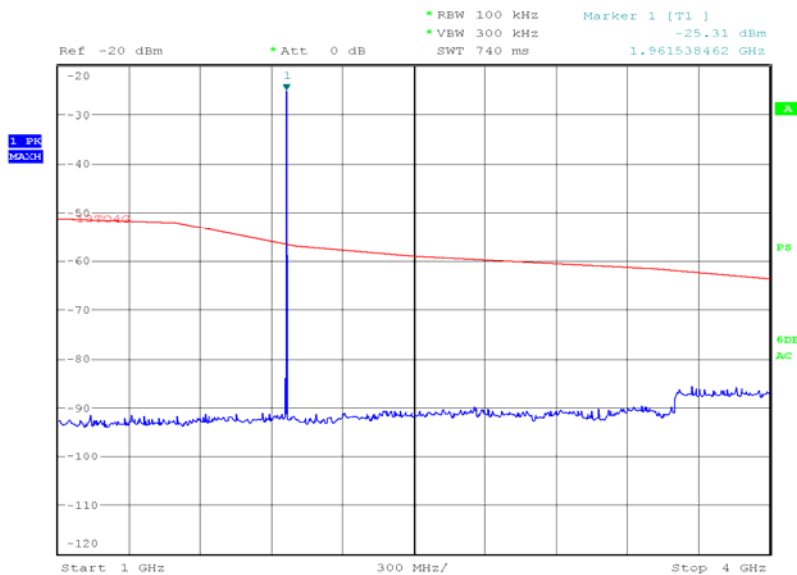
Horizontal Polarity



Date: 19.MAR.2009 22:09:13

1GHz to 4GHz

Vertical Polarity

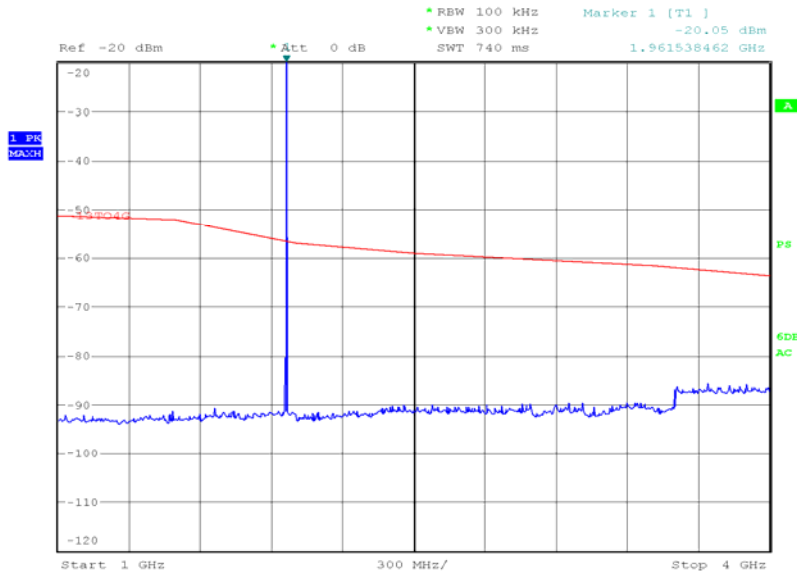


Date: 19.MAR.2009 22:55:48

Note: The Spurious Emission spike shown on the graph above is located within the transmission exclusion band and would be exempt from further measurement.



Horizontal Polarity

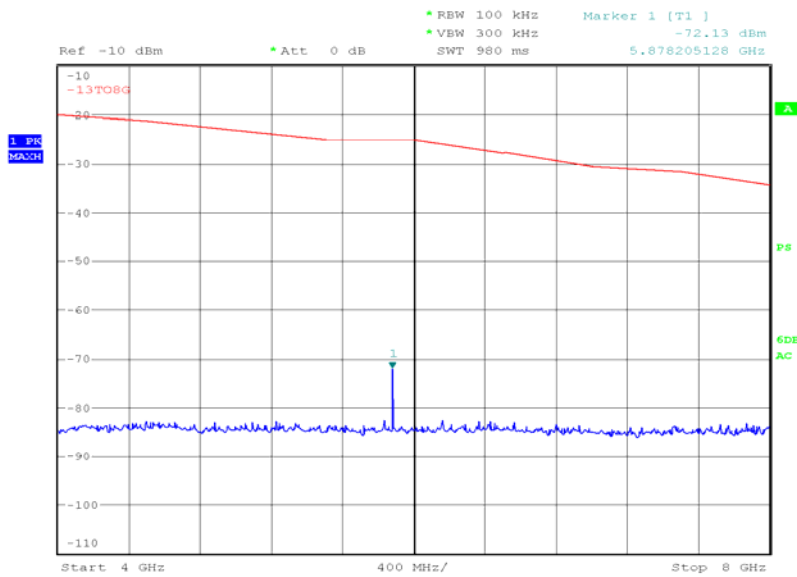


Date: 19.MAR.2009 23:09:48

Note: The Spurious Emission spike shown on the graph above is located within the transmission exclusion band and would be exempt from further measurement.

4GHz to 8GHz

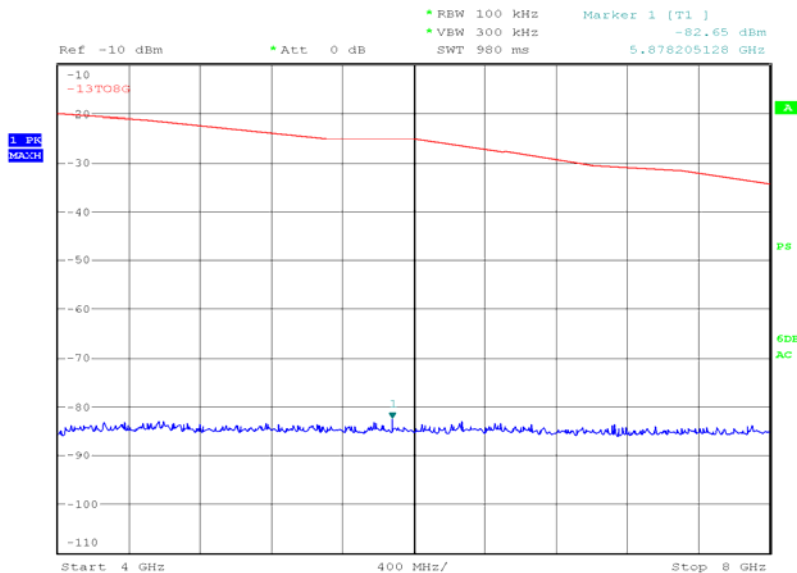
Vertical Polarity



Date: 20.MAR.2009 00:21:52



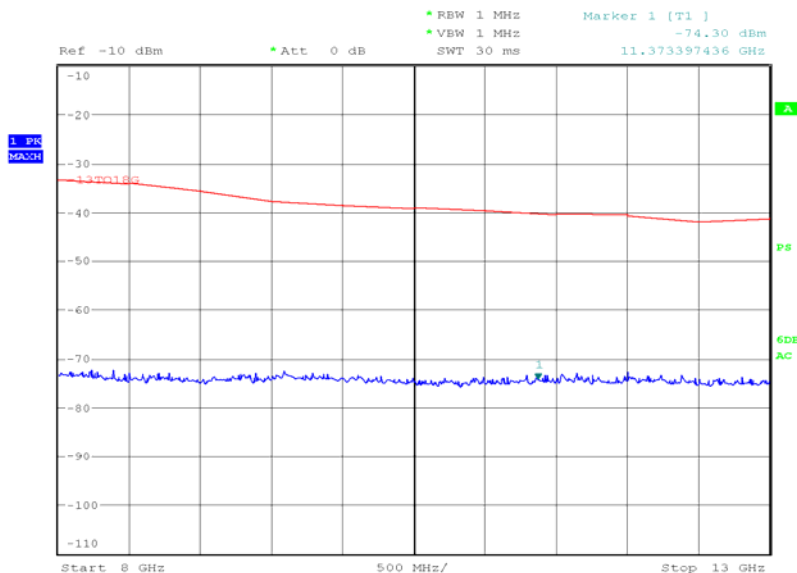
Horizontal Polarity



Date: 20.MAR.2009 00:26:48

8GHz to 13GHz

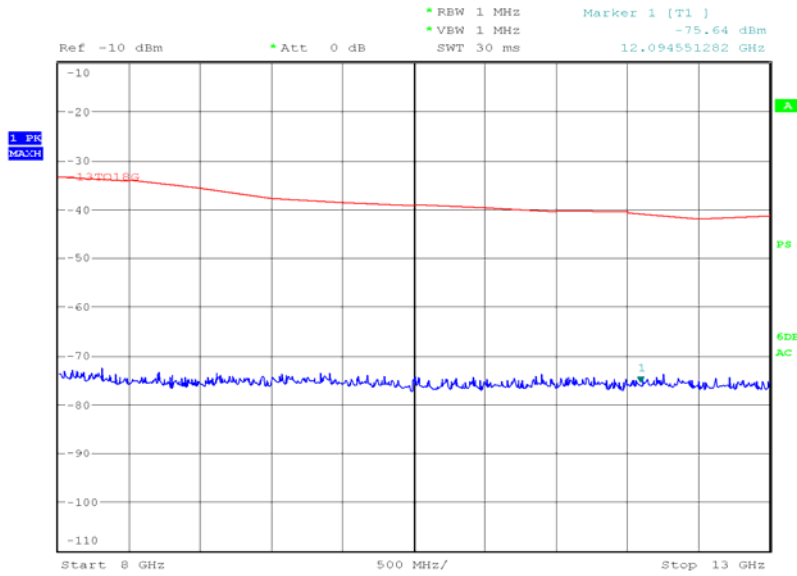
Vertical Polarity



Date: 20.MAR.2009 01:30:08



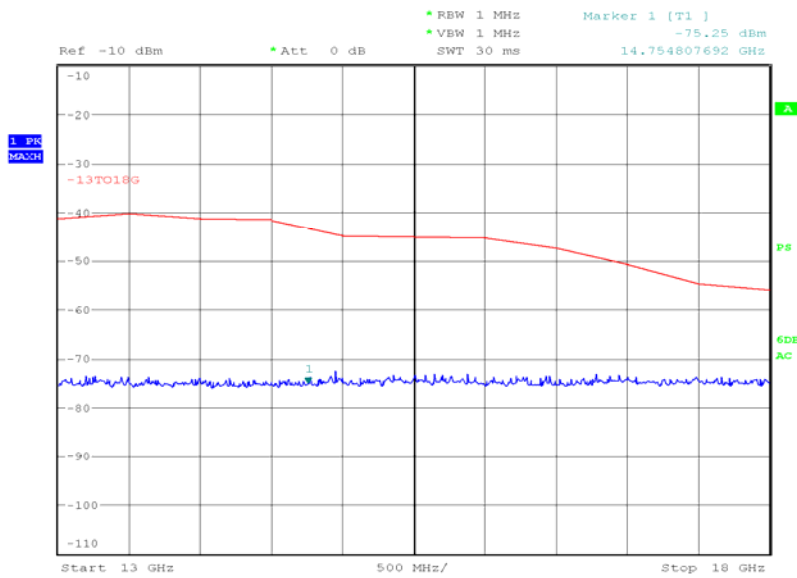
Horizontal Polarity



Date: 20.MAR.2009 02:00:44

13GHz to 18GHz

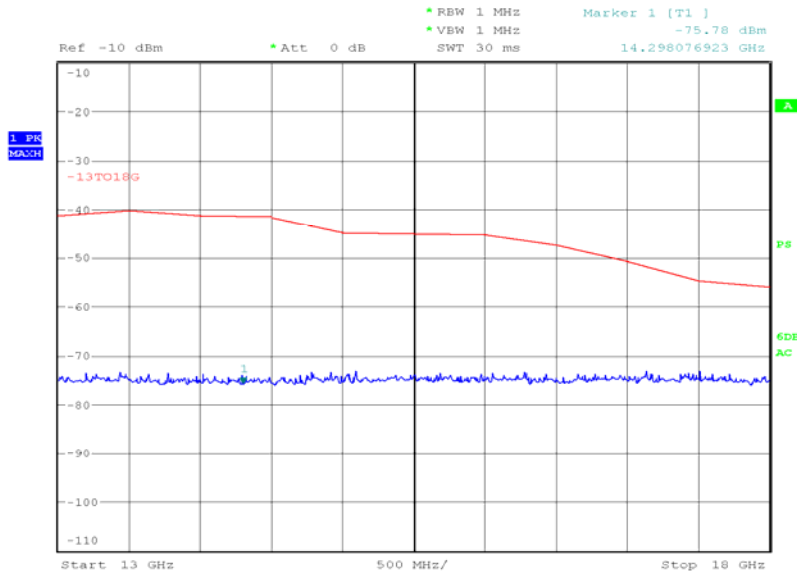
Vertical Polarity



Date: 20.MAR.2009 01:32:55



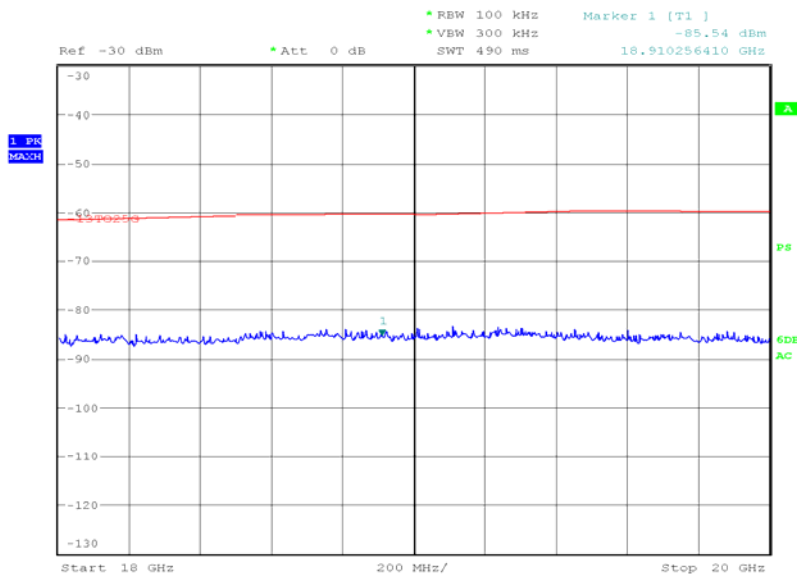
Horizontal Polarity



Date: 20.MAR.2009 01:58:16

18GHz to 20GHz

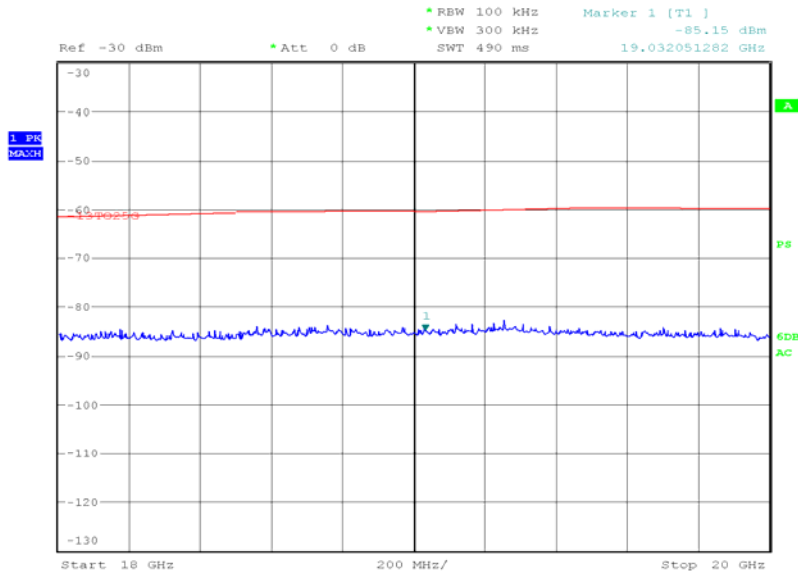
Vertical Polarity



Date: 20.MAR.2009 03:30:28



Horizontal Polarity



Date: 20.MAR.2009 03:45:58

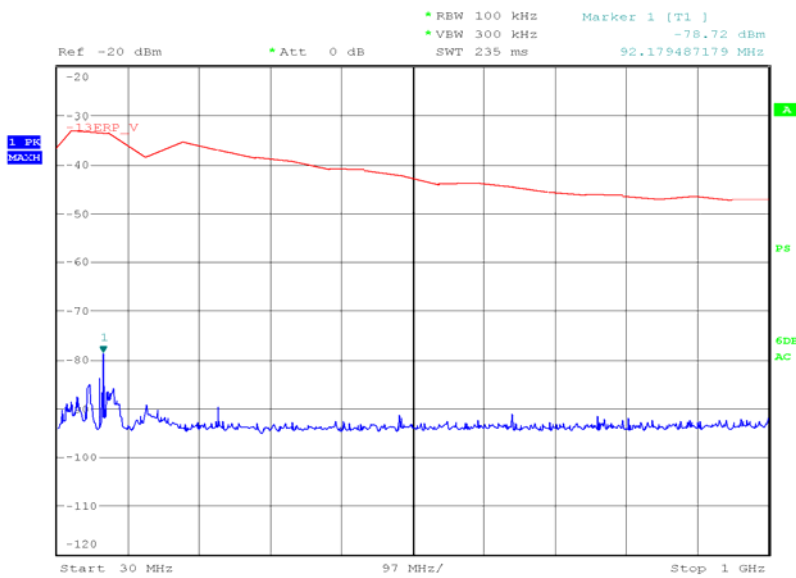


Configuration 1 - Mode 3

Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
5790	Vertical	100	289	-46.03	-13.0	-33.03	Pass

30MHz to 1GHz

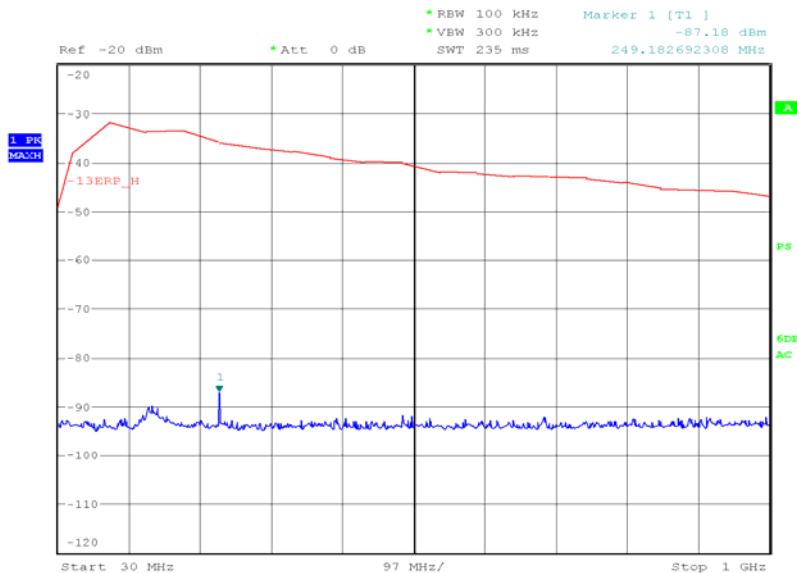
Vertical Polarity



Date: 19.MAR.2009 22:16:33



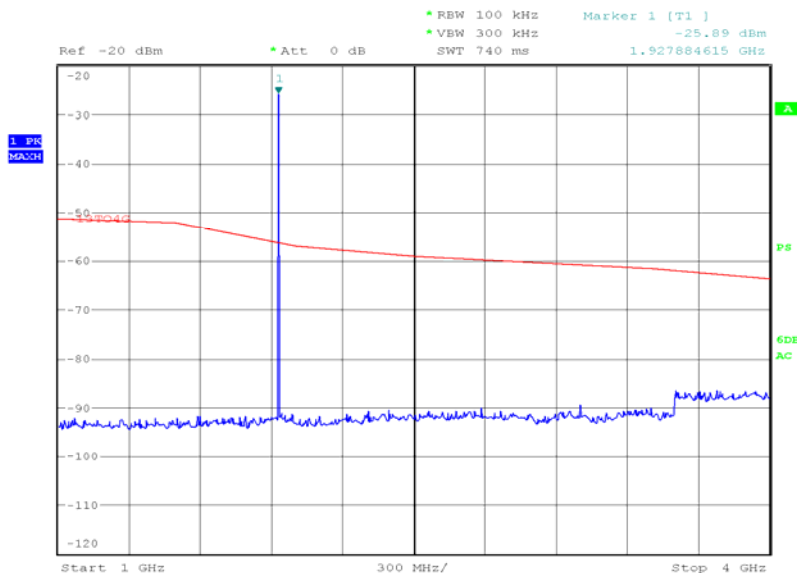
Horizontal Polarity



Date: 19.MAR.2009 22:13:30

1GHz to 4GHz

Vertical Polarity



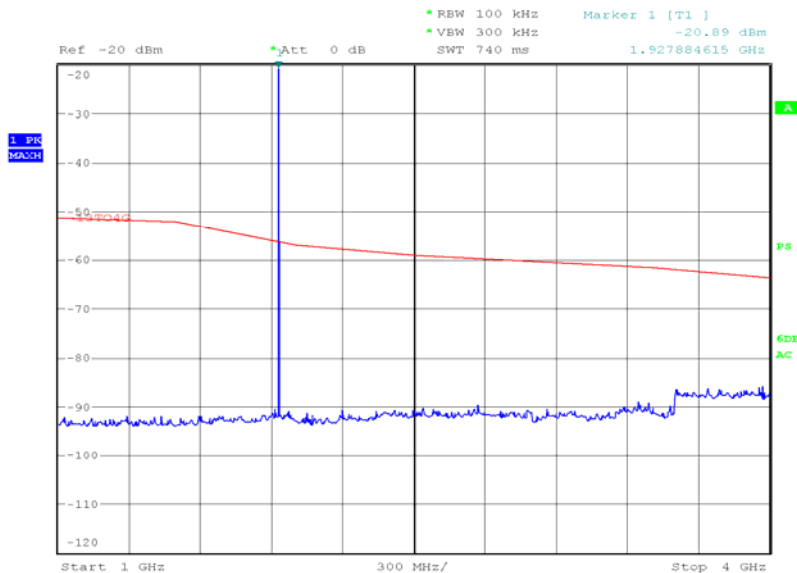
Date: 19.MAR.2009 22:48:05

Note: The Spurious Emission spike shown on the graph above is located within the transmission exclusion band and would be exempt from further measurement.



Product Service

Horizontal Polarity

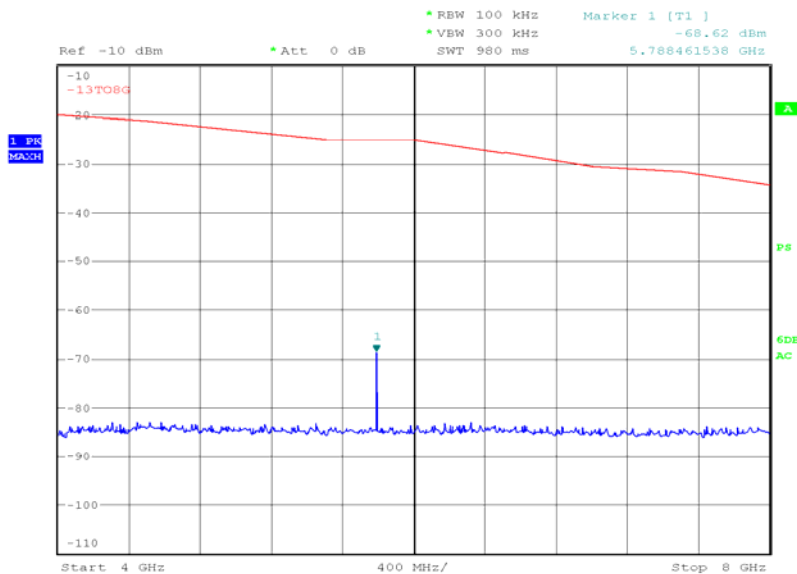


Date: 19.MAR.2009 22:45:29

Note: The Spurious Emission spike shown on the graph above is located within the transmission exclusion band and would be exempt from further measurement.

4GHz to 8GHz

Vertical Polarity

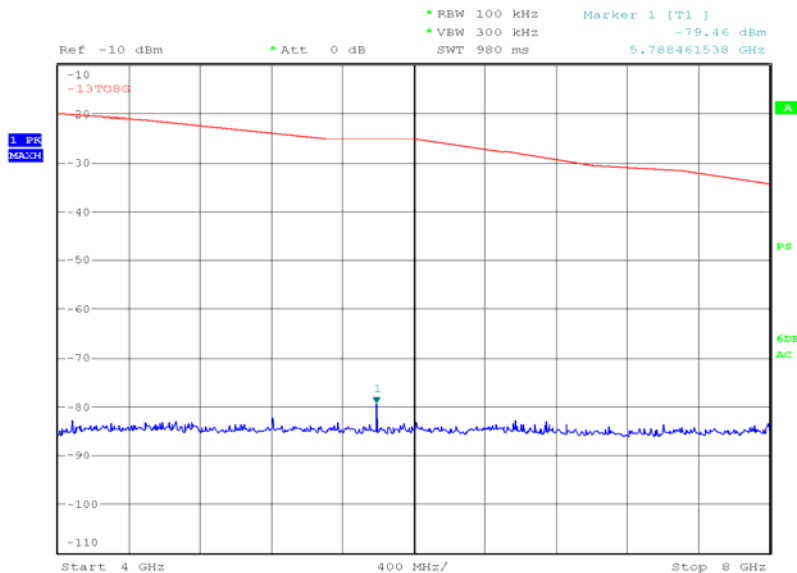


Date: 20.MAR.2009 00:32:25



Product Service

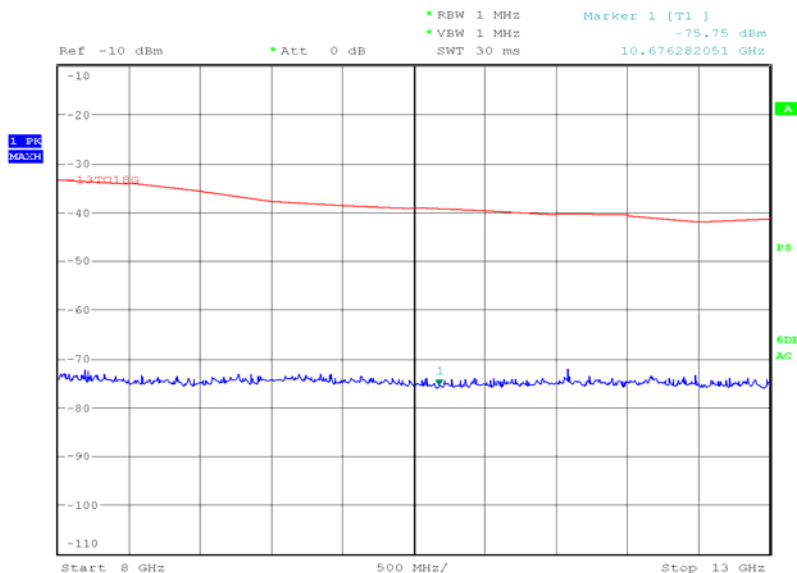
Horizontal Polarity



Date: 20.MAR.2009 00:29:09

8GHz to 13GHz

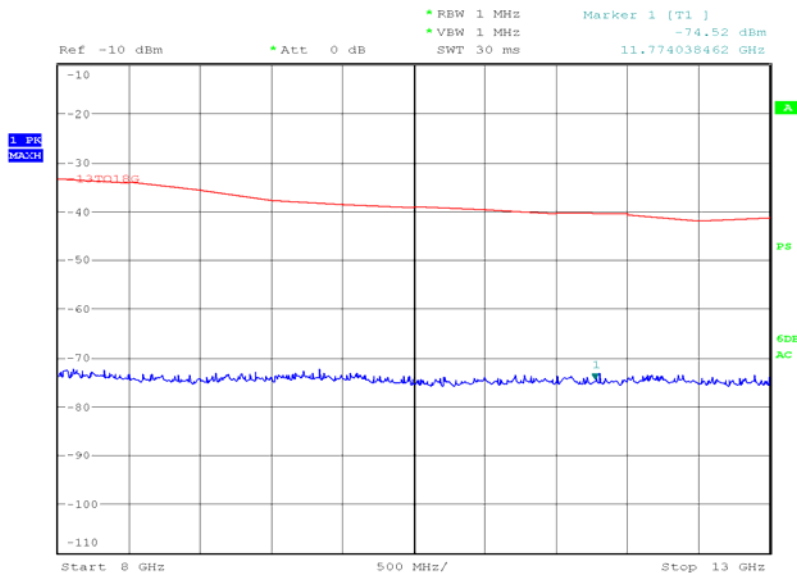
Vertical Polarity



Date: 20.MAR.2009 01:16:37



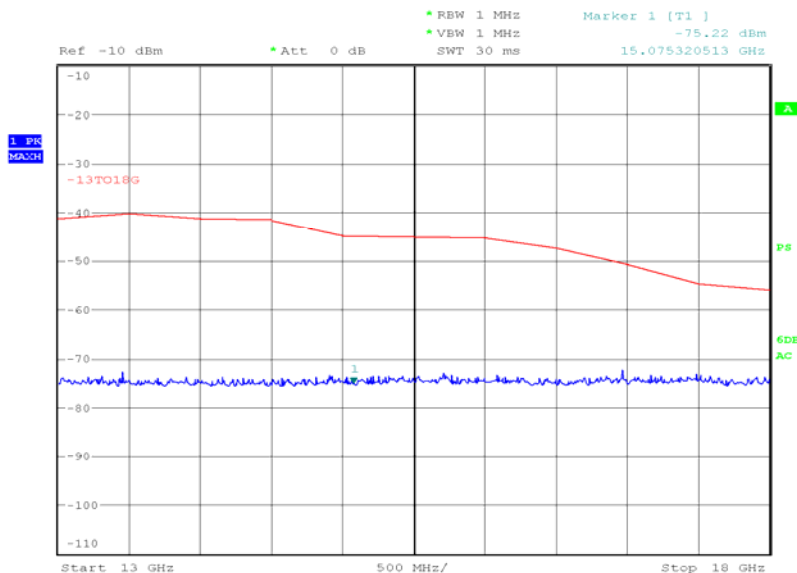
Horizontal Polarity



Date: 20.MAR.2009 01:53:53

13GHz to 18GHz

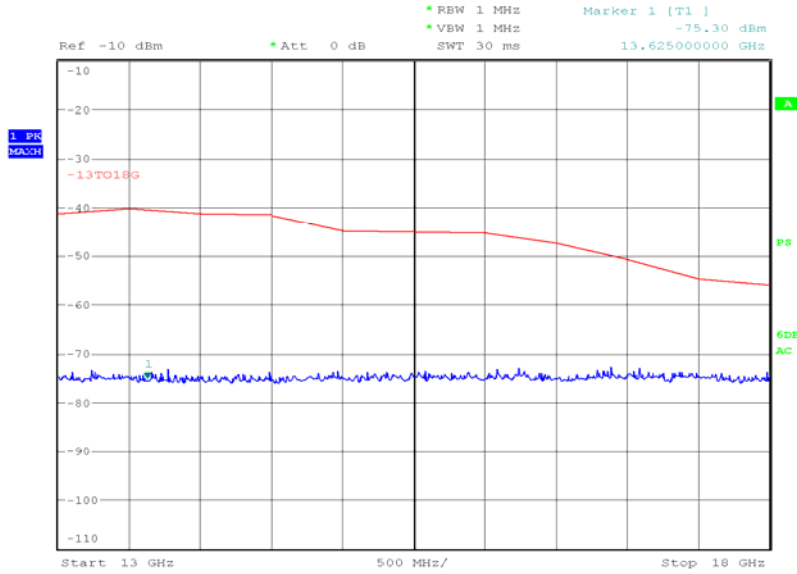
Vertical Polarity



Date: 20.MAR.2009 01:21:14



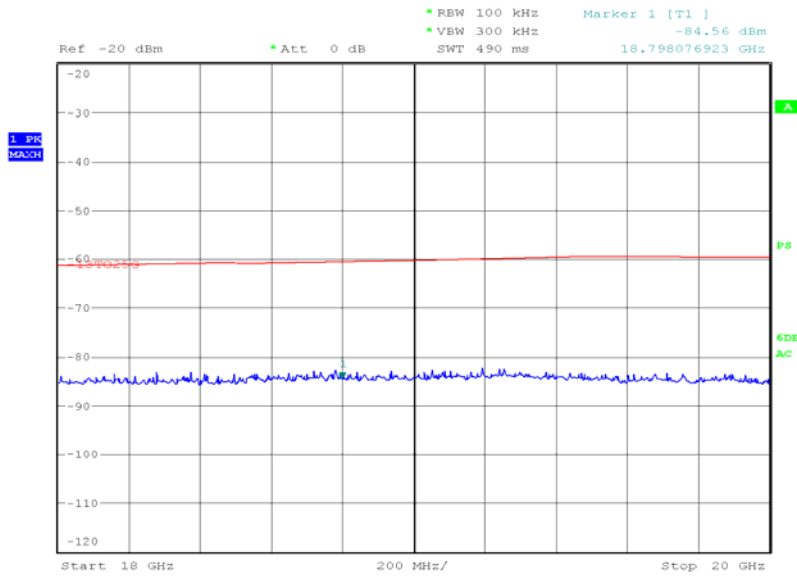
Horizontal Polarity



Date: 20.MAR.2009 01:55:45

18GHz to 20GHz

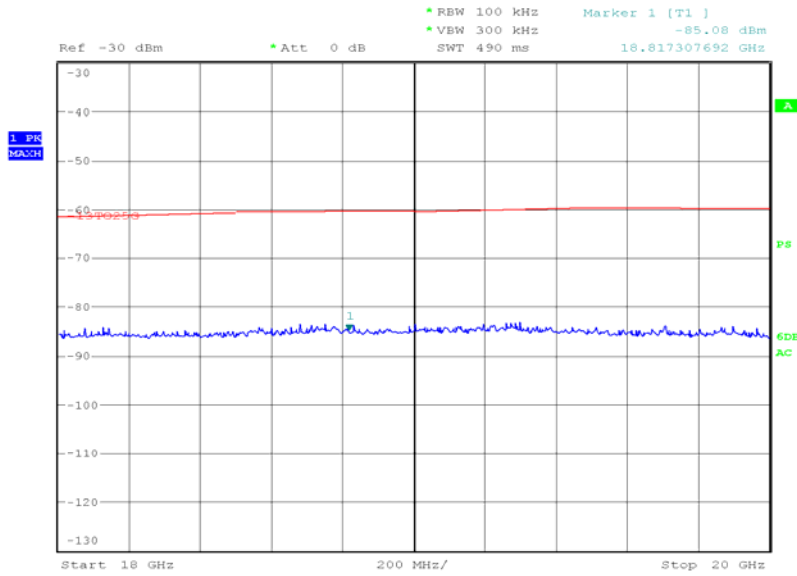
Vertical Polarity



Date: 20.MAR.2009 03:27:23



Horizontal Polarity



Date: 20.MAR.2009 03:42:43



Product Service

2.2 EIRP PEAK POWER

2.2.1 Specification Reference

FCC CFR 47 Part 24, Clause 24.232(c)
RSS-133, Clause 6.4

2.2.2 Equipment Under Test

165H BTS (1900MHz), S/N: 75129

2.2.3 Date of Test and Modification State

19 March 2009 - 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 ANSI 63.4.

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

Configuration 1 - Mode 1
 - Mode 2
 - Mode 3

2.2.6 Environmental Conditions

	19 March 2009
Ambient Temperature	21°C
Relative Humidity	39%
Atmospheric Pressure	1002mbar



Product Service

2.2.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24 for EIRP Peak Power.

The test results are shown below.

Configuration 1 - Mode 1

Frequency	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
1.989	32.6	33.0	1.819	2

Configuration 1 - Mode 2

Frequency	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
1.960	32.9	33.0	1.949	2

Configuration 1 - Mode 3

Frequency	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
1.93	32.8	33.0	1.905	2



Product Service

2.3 SPURIOUS EMISSIONS AT BAND EDGE

2.3.1 Specification Reference

FCC CFR 47 Part 24: 2008, Part 24.229(a)(b), 24.238(a)(b)
RSS-133, Clause 6.5.1

2.3.2 Equipment Under Test

165H BTS (1900MHz), S/N: 75129

2.3.3 Date of Test and Modification State

26 March 2009 - Modification State 0

2.3.4 Test Equipment Used

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

2.3.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 24.

In accordance with 24.238, at least 1% of the 26dB bandwidth 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 reference power and path losses of all channels used for testing in each frequency block were measured. Having entered the reference level offset, the limit line was displayed, showing the $-13 \text{ dBm}, (43 + 10 \log (P))$, limit.

The EUT was tested on GMSK and 8PSK modulation schemes on maximum power.

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

Configuration 1 - Mode 1
- Mode 3

2.3.6 Environmental Conditions

26 March 2009

Ambient Temperature 20°C

Relative Humidity 44%



Product Service

2.3.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24 for Band Edge Measurements.

The test results are shown below.

-48V DC Supply

Configuration 1 - Mode 1 and 3

Maximum Power – GMSK

Frequency Block	Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
A	Channel : 512 Frequency : 1930.2 MHz	-
C	-	Channel : 810 Frequency : 1989.8 MHz

Maximum Power – 8PSK

Frequency Block	Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
A	Channel : 512 Frequency : 1930.2 MHz	-
C	-	Channel : 810 Frequency : 1989.8 MHz

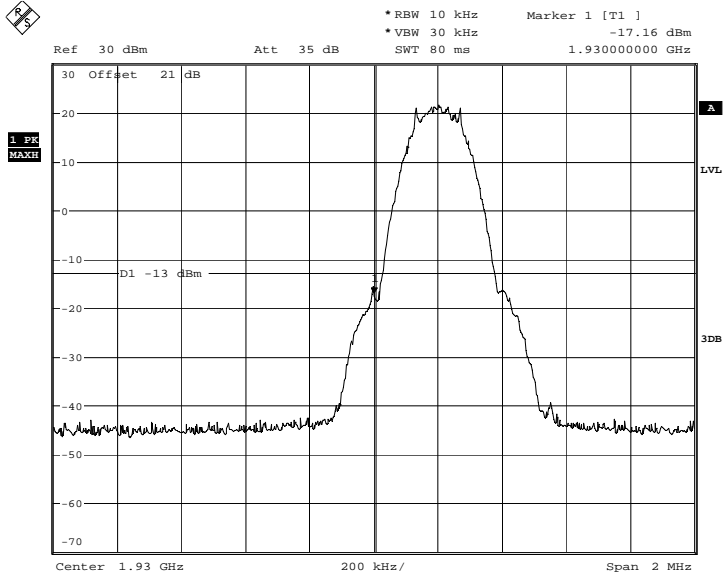
Limit	≤-13dBm at Block Edge
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Product Service

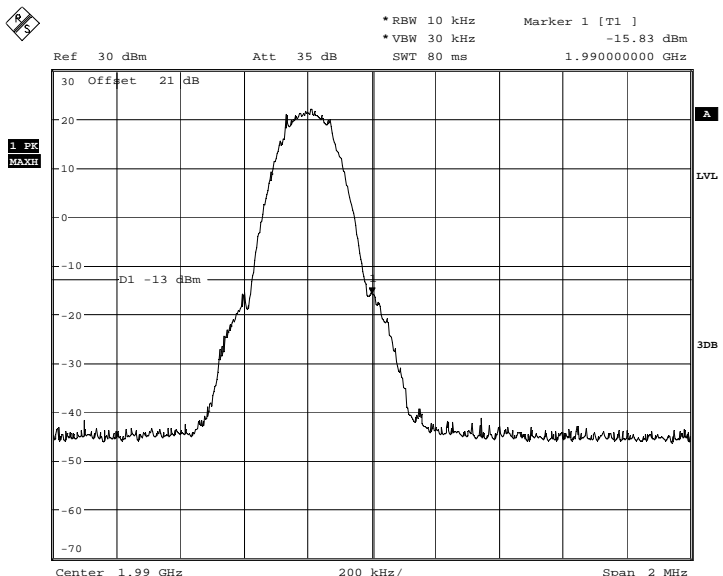
Maximum Power - GMSK

Frequency Block A



Date: 26.MAR.2009 09:11:24

Frequency Block C



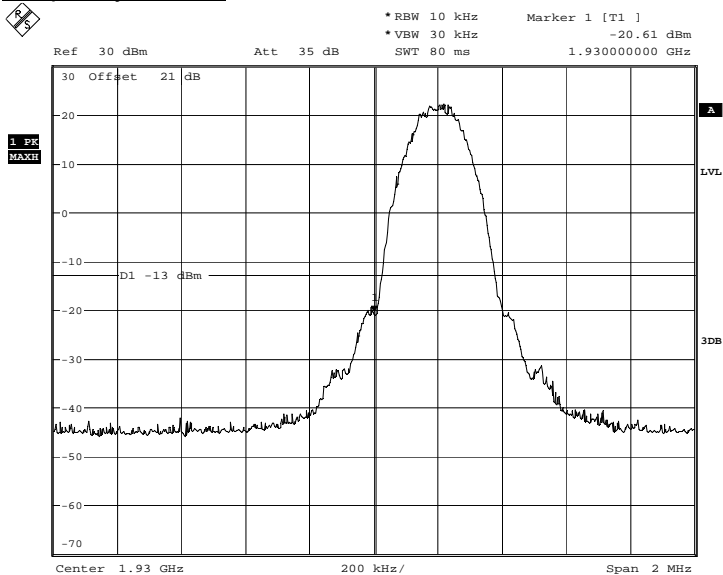
Date: 26.MAR.2009 09:06:54



Product Service

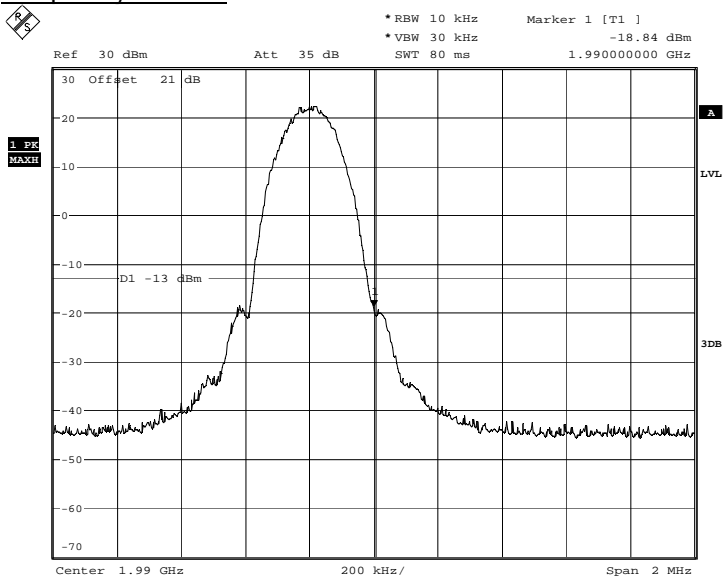
Maximum Power – 8PSK

Frequency Block A



Date: 26.MAR.2009 09:10:10

Frequency Block C



Date: 26.MAR.2009 09:08:44



Product Service

2.4 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.4.1 Specification Reference

FCC CFR 47 Part 24, Part 24.232(b)(d), 2.1046
RSS-133, Clause 6.4

2.4.2 Equipment Under Test

165H BTS (1900MHz), S/N: 75129

2.4.3 Date of Test and Modification State

25 March 2009 - 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 24.

FCC Part 24.232(b) and 2.1046

Using a spectrum analyser and a 20dB attenuator, the output power of the EUT was measured at the antenna terminal.

The EUT supports GSM and GPRS.

The EUT was tested on both GMSK and 8PSK modulation schemes, on maximum power with all timeslots active.

The spectrum analyser RBW and VBW were set to 1MHz and 3MHz respectively and the path loss measured and entered as a reference level offset. An rms detector was selected with the result being recorded

FCC Part 24.232(d)

The EUT was connected to the measuring equipment via a 10dB attenuator. The path loss was entered as a reference level offset. Using the CCDF function on the Spectrum Analyser. The peak to average ratio was measured and recorded for GMSK and 8PSK modulation schemes on maximum power with all timeslots active.

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 March 2009

Ambient Temperature 21°C

Relative Humidity 31%

2.4.7 Test Results

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

The test results are shown below.

-48V DC Supply

Configuration 1 – Modes 1, 2 and 3

FCC Part 24.232(b) and 2.1046

Maximum Power – GMSK

Frequency (MHz)	Peak		Average	
	Result (dBm)	Result (mW)	Result (dBm)	Result (mW)
1930.2	23.86	243.22	23.31	214.29
1960.0	24.35	272.27	23.75	237.14
1989.8	24.39	274.78	23.86	243.22

Maximum Power – 8PSK

Frequency (MHz)	Peak		Average	
	Result (dBm)	Result (mW)	Result (dBm)	Result (mW)
1930.2	26.55	451.86	23.50	223.87
1960.0	27.10	512.86	23.85	242.66
1989.8	27.43	553.35	24.02	252.35



Product Service

FCC Part 24.232(d)

Maximum Power – GMSK

Frequency (MHz)	Peak to Average Ratio (dB)
1930.2	0.63
1960.0	0.65
1989.8	0.68

Maximum Power – 8PSK

Frequency (MHz)	Peak to Average Ratio (dB)
1930.2	3.27
1960.0	3.39
1989.8	3.44

Limit	<100W
-------	-------



Product Service

2.5 MODULATION CHARACTERISTICS

2.5.1 Specification Reference

FCC CFR 47 Part 24, Clause 2.1047(d)
RSS-133, Clause 6.2

2.5.2 Equipment Under Test

165H BTS (1900MHz), S/N: 75129

2.5.3 Date of Test and Modification State

25 March 2009 - 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 24.

Two plots are shown on the following pages showing the EUT transmitting with the display in the time domain.

Plot 1: EUT transmitting with GMSK with all timeslots active, with all timeslots shown.
Plot 2: EUT transmitting with GMSK with all timeslots active, with one timeslots shown.
Plot 3: EUT transmitting with 8PSK with all timeslots active, with all timeslots shown.
Plot 4: EUT transmitting with 8PSK with all timeslots active, with one timeslots shown.

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

Configuration 1 - Mode 3

2.5.6 Environmental Conditions

	25 March 2009
Ambient Temperature	21°C
Relative Humidity	29%



Product Service

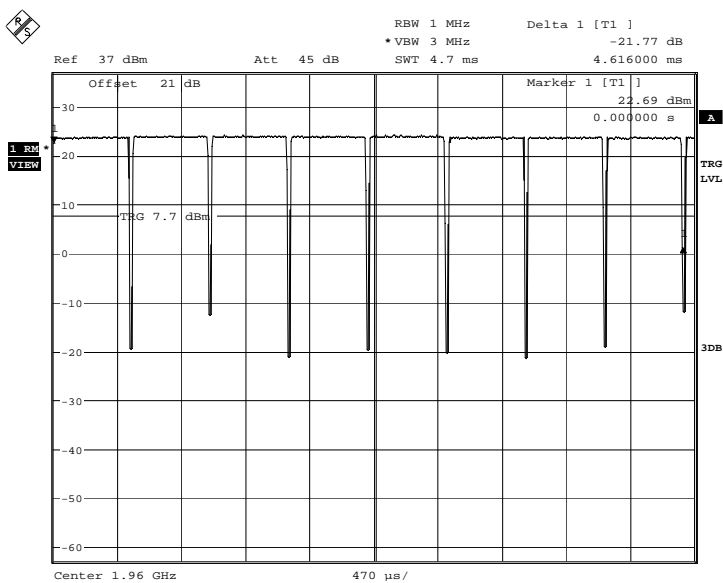
2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24 and RSS-133 for Modulation Characteristics.

The test results are shown below.

Configuration 1 - Mode 3

EUT Transmitting with GMSK with all timeslots active, with all timeslots shown

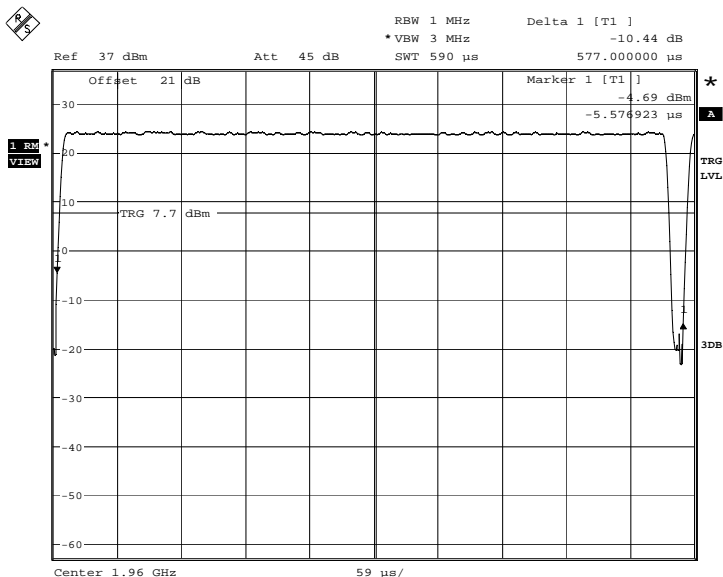


Date: 25.MAR.2009 15:46:07



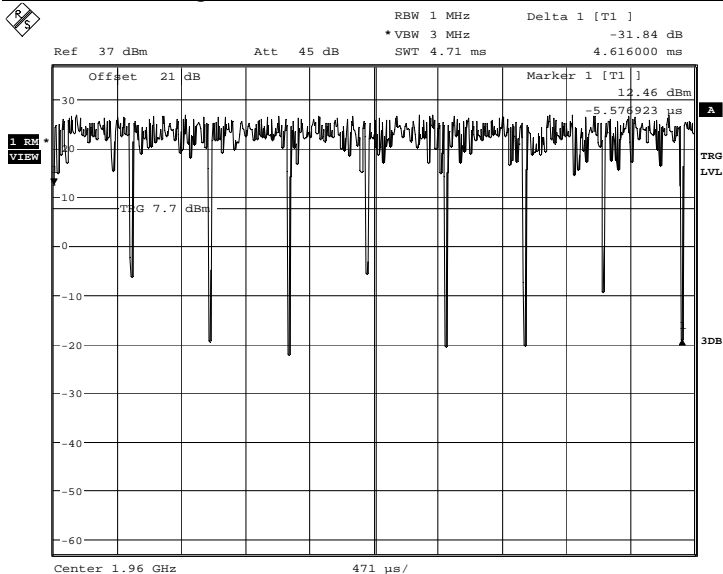
Product Service

EUT Transmitting with GMSK with all timeslots active, with one timeslots shown



Date: 25.MAR.2009 15:51:13

EUT Transmitting with 8PSK with all timeslots active, with all timeslots shown

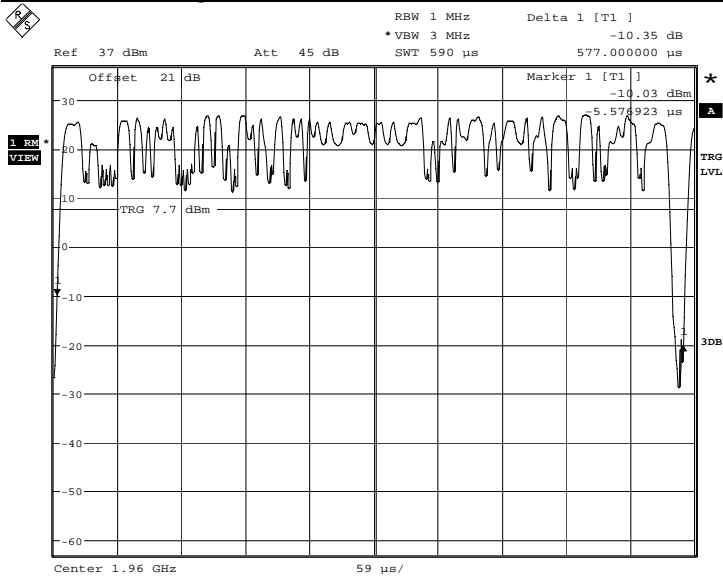


Date: 25.MAR.2009 15:54:18



Product Service

EUT Transmitting with 8PSK with all timeslots active, with one timeslots shown.



Date: 25.MAR.2009 15:53:24



Product Service

2.6 OCCUPIED BANDWIDTH

2.6.1 Specification Reference

FCC CFR 47 Part 24, Clause 24.238(b), 2.1049
RSS-133, Clause 6.3

2.6.2 Equipment Under Test

165H BTS (1900MHz), S/N: 75129

2.6.3 Date of Test and Modification State

25 March 2009 - 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 24.

The EUT was transmitting at maximum power, modulated with all timeslots active. Using a resolution bandwidth of 10 kHz and a video bandwidth of 30 kHz, the -26 dBc points were established and the emission bandwidth determined. The EUT was tested with GMSK and 8PSK modulation schemes.

The plot of the following page shows the resultant display from the Spectrum Analyser.

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

Configuration 1 - Mode 2

2.6.6 Environmental Conditions

25 March 2009

Ambient Temperature 21°C

Relative Humidity 28%



Product Service

2.6.7 Test Results

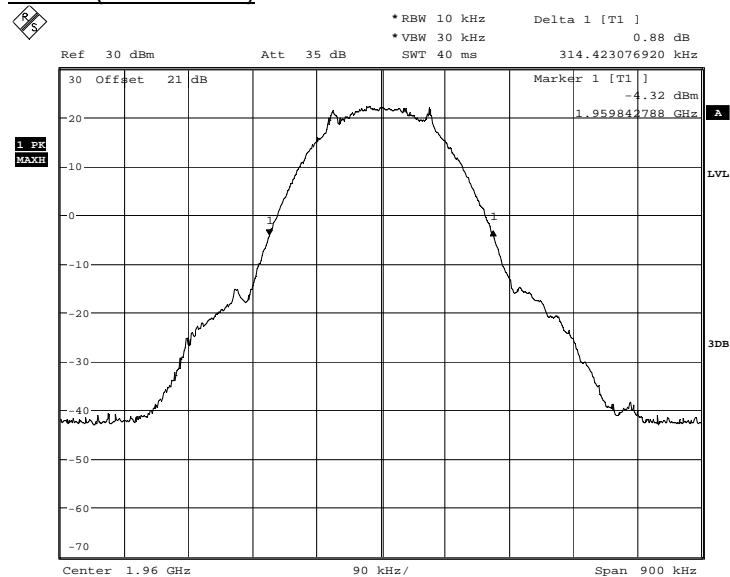
For the period of test the EUT met the requirements of FCC CFR 47 Part 24 and RSS-133 for Occupied Bandwidth.

The test results are shown below.

Configuration 1 - Mode 3

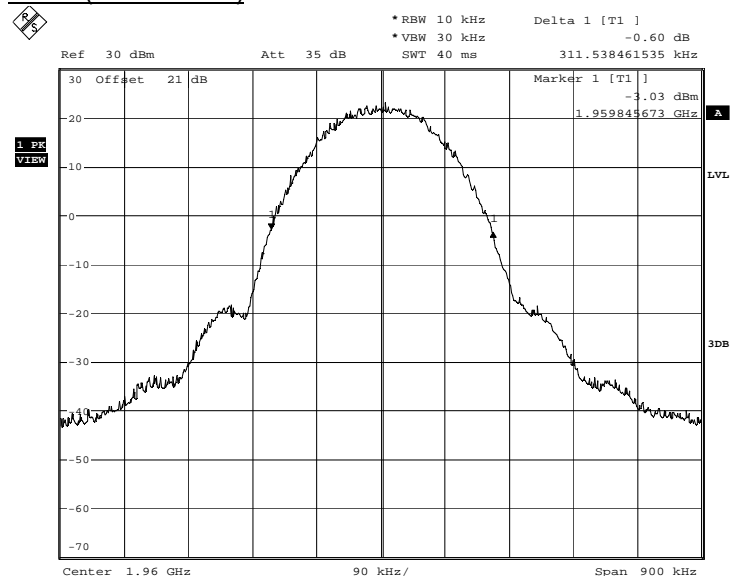
FCC Part 24 Bandwidth Requirements (Occupied Bandwidth As Defined By The -26dBc Points)

GMSK (314.423kHz)



Date: 26.MAR.2009 08:49:47

8PSK (311.538kHz)

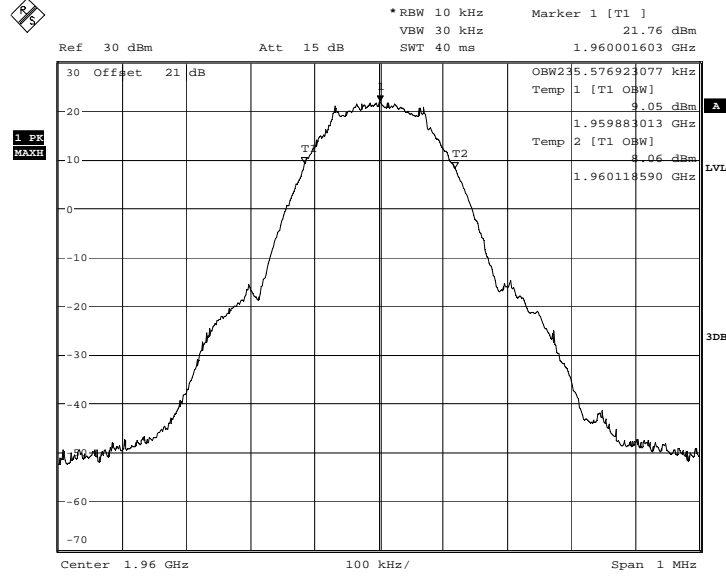


Date: 26.MAR.2009 08:52:08



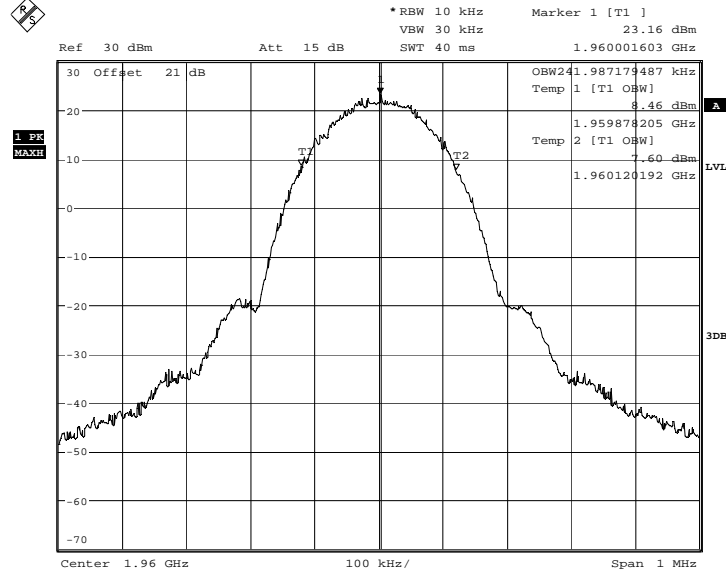
Industry Canada Occupied Bandwidth (99% of Bandwidth)

GMSK (235.577kHz)



Date: 26.MAR.2009 16:41:22

8PSK (241.987kHz)



Date: 26.MAR.2009 16:43:28



Product Service

2.7 CONDUCTED SPURIOUS EMISSIONS

2.7.1 Specification Reference

FCC CFR 47 Part 24, Part 24.238(a), 2.1051
RSS-133, Clause 6.5.2

2.7.2 Equipment Under Test

165H BTS (1900MHz), S/N: 75129

2.7.3 Date of Test and Modification State

26 March 2009 - 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 24.

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 filters and attenuators and the frequency spectrum investigated from 9 kHz to 20 GHz. The EUT was set to transmit on full power on all timeslots. The EUT was tested on Bottom, Middle and Top channels for maximum power. The resolution bandwidths was set to 1 MHz in accordance with Part 24.238. The spectrum analyser detector was set to max hold.

For measuring the range 9 kHz to 4 GHz, on maximum power, a 20dB attenuator was used. From 4 GHz to 20GHz, a 10 dB attenuator and a high pass filters were used.

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 1 - Mode 1
 - Mode 2
 - Mode 3

2.7.6 Environmental Conditions

	26 March 2009
Ambient Temperature	20°C
Relative Humidity	43%



Product Service

2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24 for Conducted Spurious Emissions.

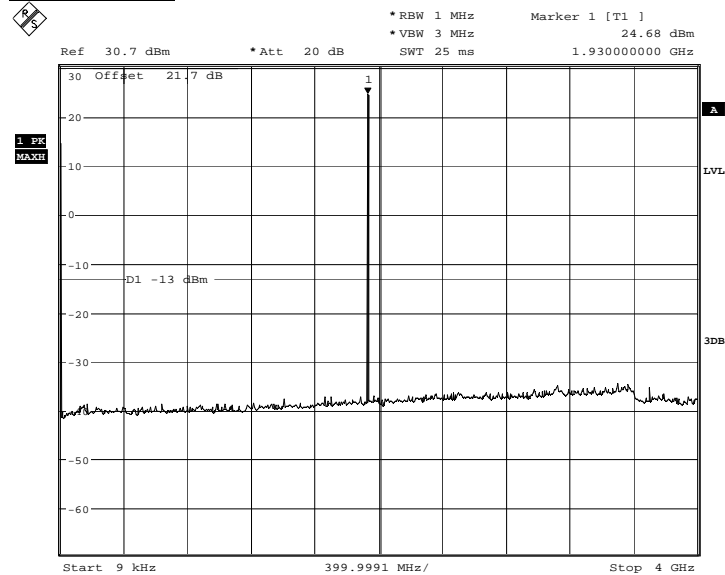
The test results are shown below.

-48V DC Supply

Configuration 1 – Mode 1

GMSK

9kHz to 4GHz

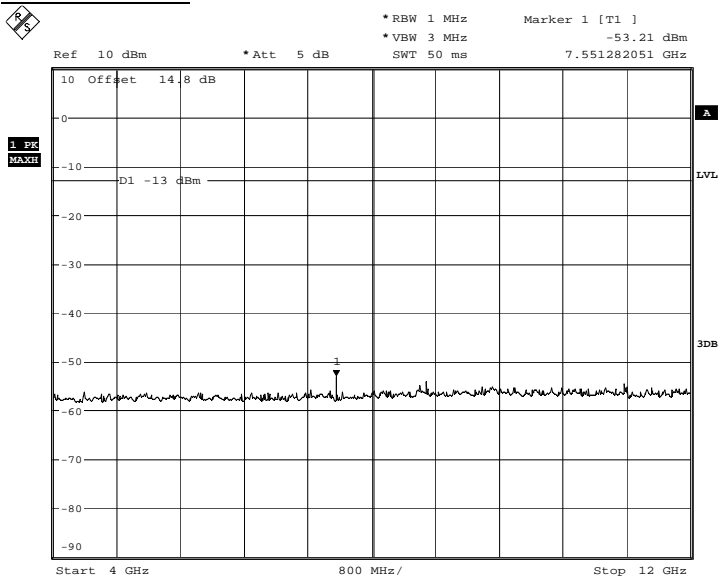


Date: 26.MAR.2009 09:19:25



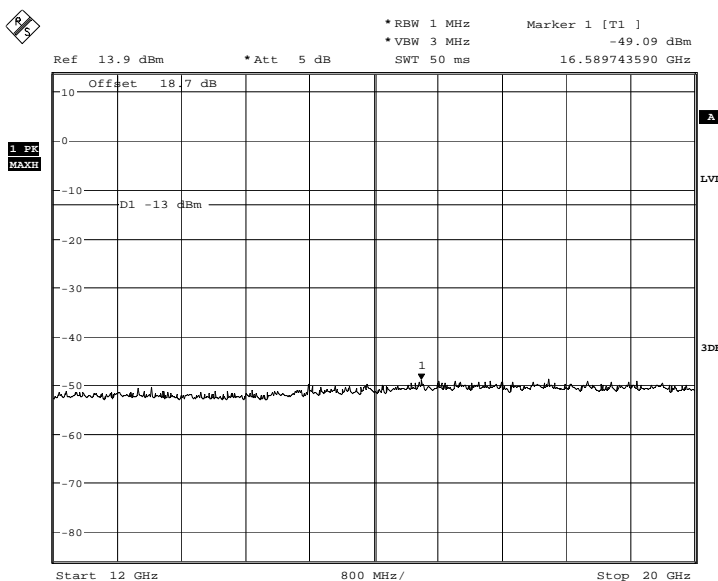
Product Service

4GHz to 12GHz



Date: 26.MAR.2009 09:55:11

12GHz to 20GHz

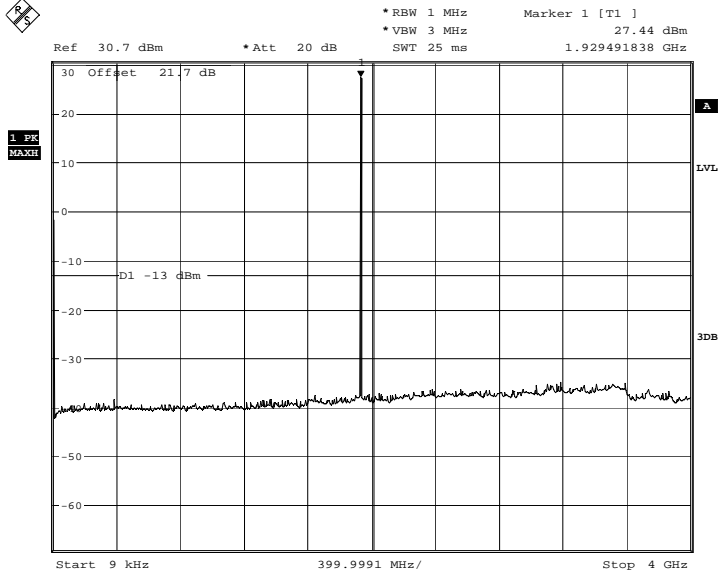


Date: 26.MAR.2009 10:12:24



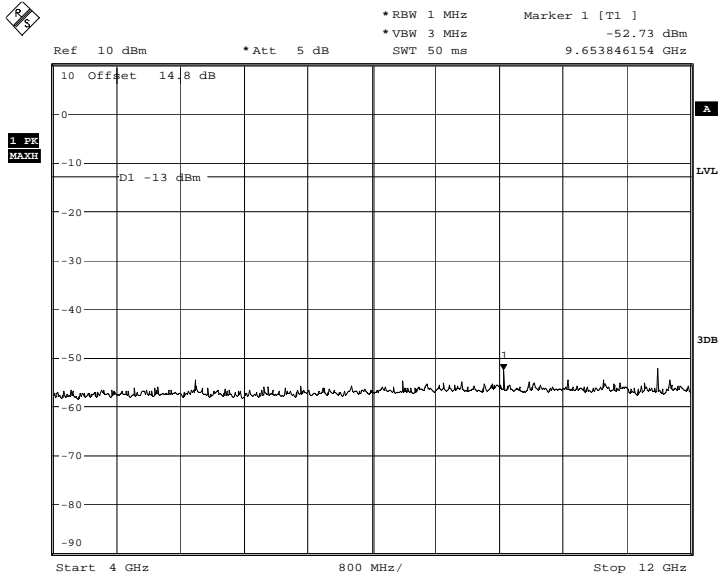
8PSK

9kHz to 4GHz



Date: 26.MAR.2009 09:36:23

4GHz to 12GHz

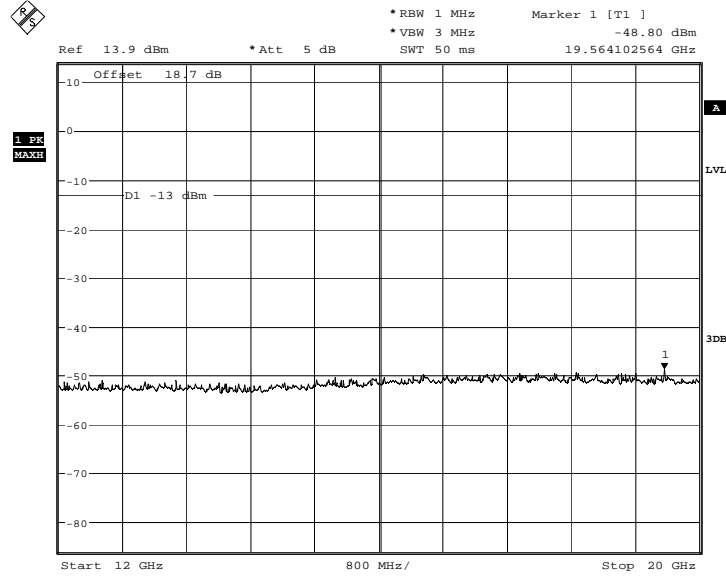


Date: 26.MAR.2009 10:03:18



Product Service

12GHz to 20GHz

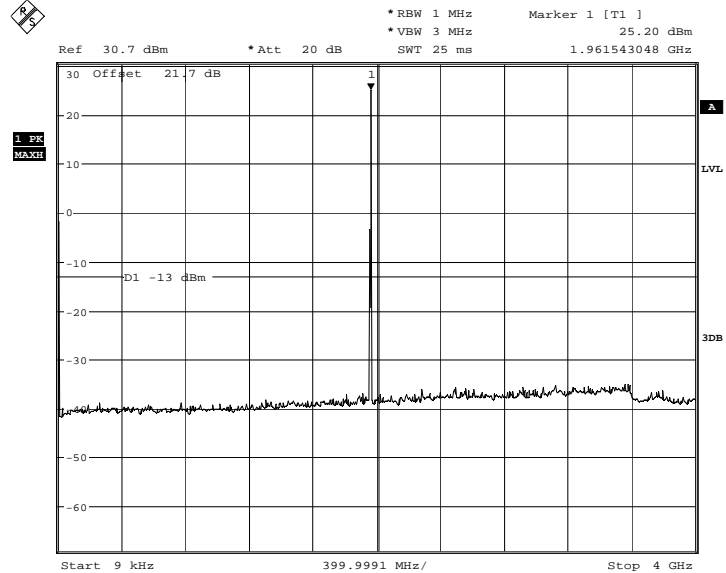


Date: 26.MAR.2009 10:29:23

Configuration 1 – Mode 2

GMSK

9kHz to 4GHz

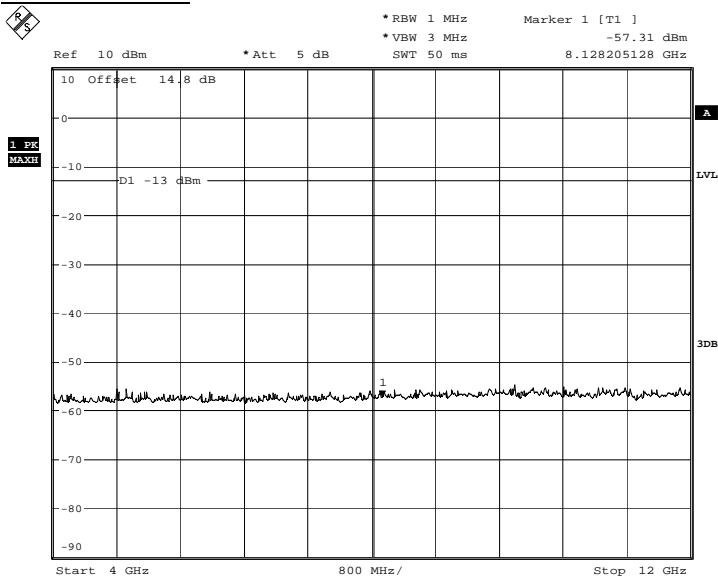


Date: 26.MAR.2009 09:32:34



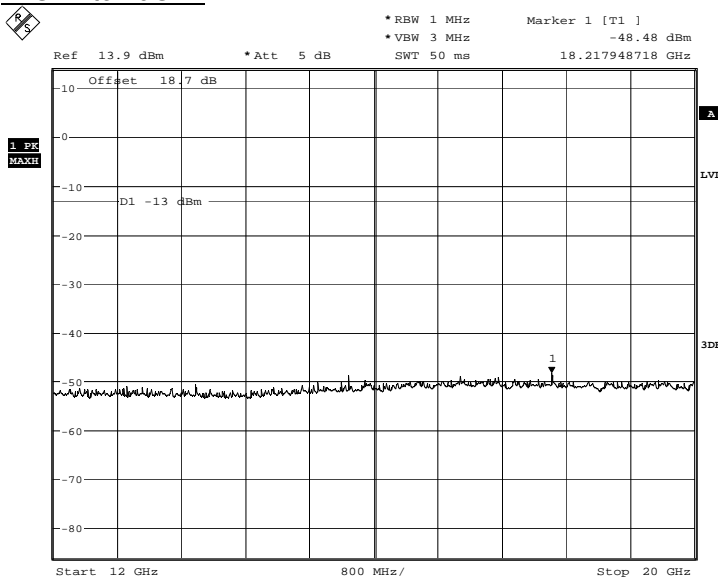
Product Service

4GHz to 12GHz



Date: 26.MAR.2009 09:58:21

12GHz to 20GHz



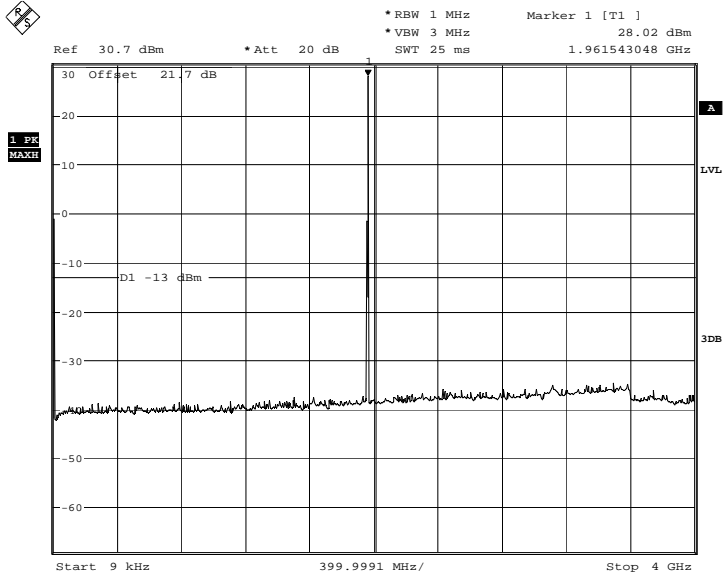
Date: 26.MAR.2009 10:25:02



Product Service

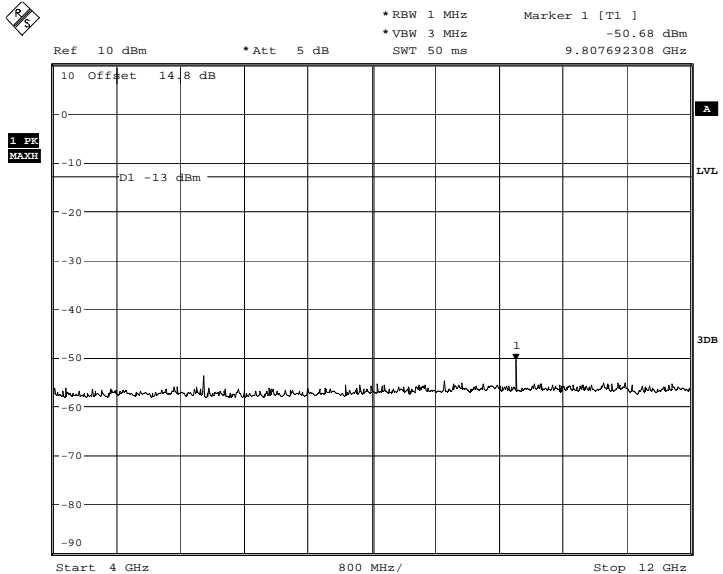
8PSK

9kHz to 4GHz



Date: 26.MAR.2009 09:37:43

4GHz to 12GHz

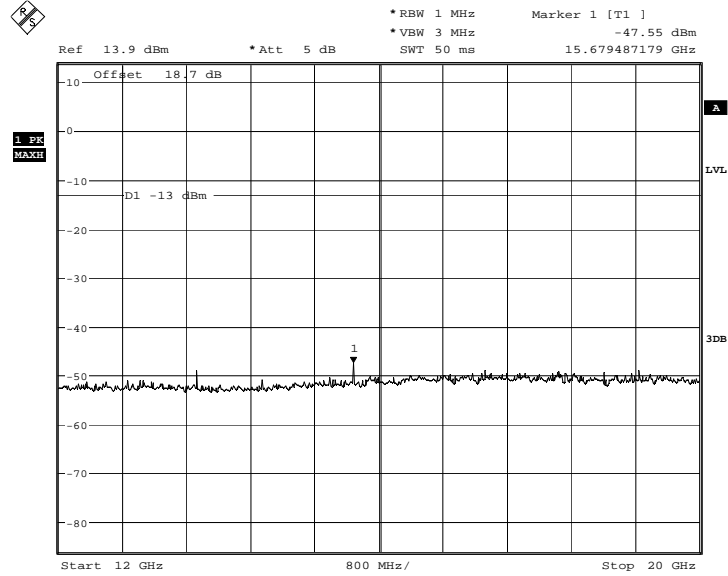


Date: 26.MAR.2009 10:05:28



Product Service

12GHz to 20GHz

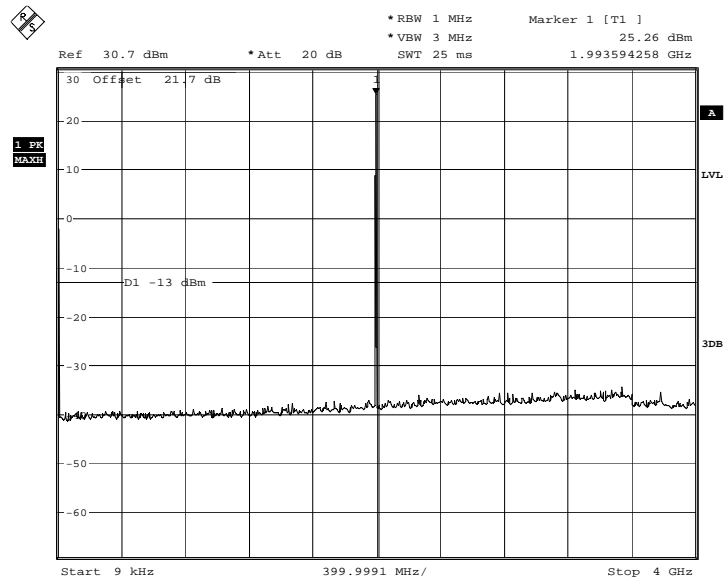


Date: 26.MAR.2009 10:31:00

Configuration 1 – Mode 3

GMSK

9kHz to 4GHz

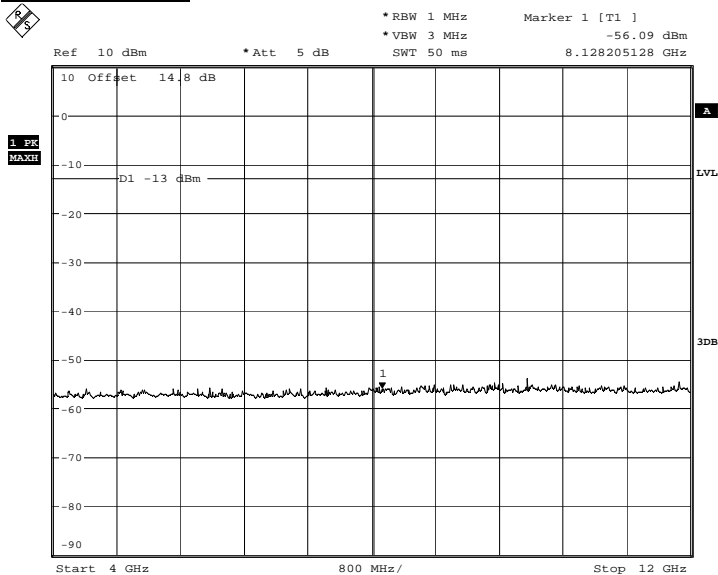


Date: 26.MAR.2009 09:34:03



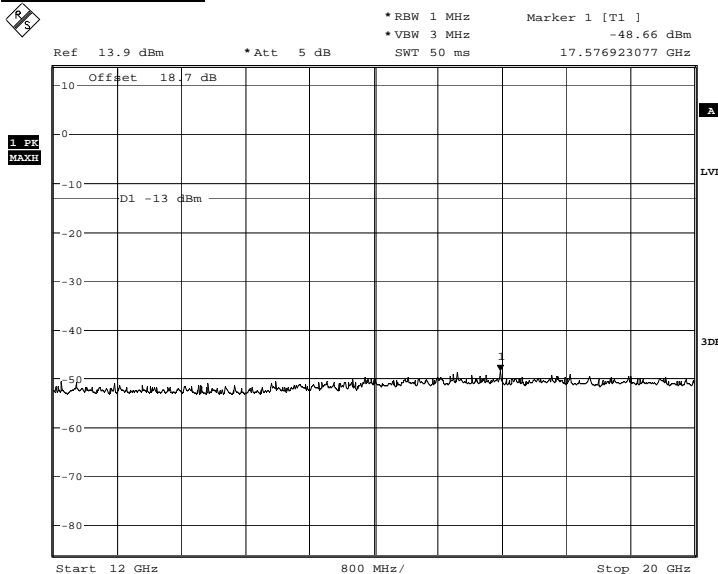
Product Service

4GHz to 12GHz



Date: 26.MAR.2009 10:00:41

12GHz to 20GHz

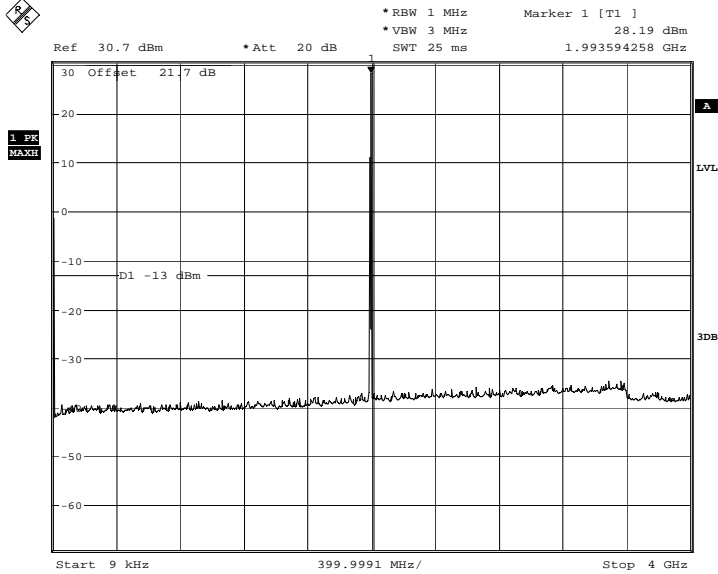


Date: 26.MAR.2009 10:27:37



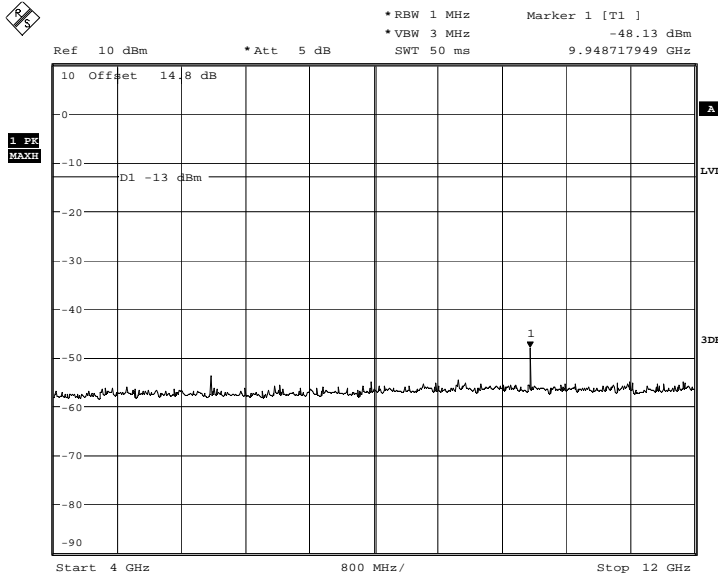
8PSK

9kHz to 4GHz



Date: 26.MAR.2009 09:38:55

4GHz to 12GHz

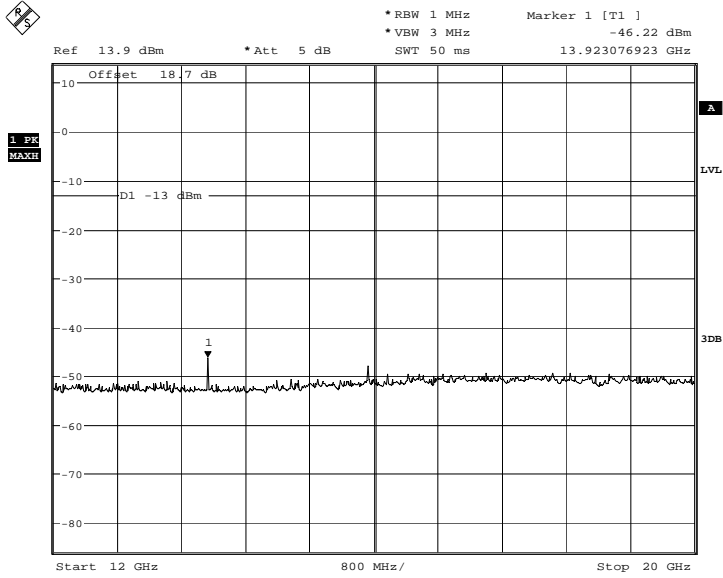


Date: 26.MAR.2009 10:07:31



Product Service

12GHz to 20GHz



Date: 26.MAR.2009 10:32:39



Product Service

2.8 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.8.1 Specification Reference

FCC CFR 47 Part 24, Clause 24.135(a), 2.1055
RSS-133, Clause 6.3

2.8.2 Equipment Under Test

165H BTS (1900MHz), S/N: 75129

2.8.3 Date of Test and Modification State

26 March 2009 - 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 24

The EUT was set to transmit on maximum power. A digital communication analyser (CMU200), was used to measure the frequency error. The maximum result was taken over 200 bursts. The temperature was varied over the range -30°C to +50°C.

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

Configuration 1 - Mode 2

2.8.6 Environmental Conditions

26 March 2009

Ambient Temperature 21°C

Relative Humidity 44%



Product Service

2.8.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24 for Frequency Stability Under Temperature Variations.

The test results are shown below.

Configuration 1 - Mode 2

-48V DC Supply

GMSK

Temperature Interval (°C)	Test Frequency (GHz)	Deviation (Hz)	Limit (kHz)	PPM
-30	1960.0	+16	±1.96	0.0082
-20	1960.0	+14	±1.96	0.0087
-10	1960.0	+17	±1.96	0.0087
0	1960.0	+17	±1.96	0.0087
+10	1960.0	+14	±1.96	0.0071
+20	1960.0	+16	±1.96	0.0082
+30	1960.0	+21	±1.96	0.0107
+40	1960.0	+25	±1.96	0.0128
+50	1960.0	+32	±1.96	0.0163

8PSK

Temperature Interval (°C)	Test Frequency (GHz)	Deviation (Hz)	Limit (kHz)	PPM
-30	1960.0	+21	±1.96	0.0107
-20	1960.0	+21	±1.96	0.0107
-10	1960.0	+19	±1.96	0.0096
0	1960.0	+19	±1.96	0.0096
+10	1960.0	+19	±1.96	0.0096
+20	1960.0	+20	±1.96	0.0102
+30	1960.0	+24	±1.96	0.0122
+40	1960.0	+29	±1.96	0.0148
+50	1960.0	+35	±1.96	0.0179

Limit	±0.0001% or 1ppm
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Product Service

2.9 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.9.1 Specification Reference

FCC CFR 47 Part 24, Clause 24.135(a), 2.1055
RSS-133, Clause 6.3

2.9.2 Equipment Under Test

165H BTS (1900MHz), S/N: 75129

2.9.3 Date of Test and Modification State

26 March 2009 - 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 24.

The EUT was set to transmit on maximum power. A digital communication analyser (CMU200), was used to measure the frequency error. The maximum result was taken over 200 bursts. The voltage was varied by $\pm 15\%$ as defined in 2.1055(d)(1).

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

Configuration 1 - Mode 3

2.9.6 Environmental Conditions

26 March 2009

Ambient Temperature 21°C

Relative Humidity 42%



Product Service

2.9.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24 for Frequency Stability Under Voltage Variations.

The test results are shown below.

Configuration 1 - Mode 3

-48V DC Supply

GMSK

DC Voltage (V)	Test Frequency (GHz)	Deviation (Hz)	Deviation Limit (kHz)
40.8	1960.0	+15	±1.96
48.0	1960.0	+16	±1.96
55.2	1960.0	+14	±1.96

8PSK

DC Voltage (V)	Test Frequency (GHz)	Deviation (Hz)	Deviation Limit (kHz)
40.8	1960.0	+19	±1.96
48.0	1960.0	+20	±1.96
55.2	1960.0	+20	±1.96

Limit	±0.0001% or 1ppm
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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.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 & 2.2 EMC - Radiated Emissions					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	6-Sep-2009
Pre-Amplifier	Phase One	PS04-0086	1533	12	15-Sep-2009
Pre-Amplifier	Phase One	PSO4-0087	1534	12	30-Jul-2009
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1607	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	28-Nov-2009
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	25-Jul-2009
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	20-Aug-2009
Section 2.3 Radio – Spurious Emissions at Band Edge					
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Hygromer	Rotronic	A1	2138	12	13-May-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	30-May-2009
Cable (2m, SMA Type)	Reynolds	262-0248-2000	3222	12	14-Oct-2009
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	21-May-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
Section 2.4 Radio - Maximum Peak Output Power - Conducted					
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Hygromer	Rotronic	A1	2138	12	13-May-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	30-May-2009
Cable (2m, SMA Type)	Reynolds	262-0248-2000	3222	12	14-Oct-2009
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	21-May-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
Section 2.5 Radio - Modulation Characteristics					
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Hygromer	Rotronic	A1	2138	12	13-May-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	30-May-2009
Cable (2m, SMA Type)	Reynolds	262-0248-2000	3222	12	14-Oct-2009
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	21-May-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
Section 2.6 Radio - Occupied Bandwidth					
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Hygromer	Rotronic	A1	2138	12	13-May-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	30-May-2009
Cable (2m, SMA Type)	Reynolds	262-0248-2000	3222	12	14-Oct-2009
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	21-May-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.7 Radio - Conducted Spurious Emissions					
Filter (High Pass)	Lorch	SHP7-7000-SR	566	12	25-Jun-2009
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Hygromer	Rotronic	A1	2138	12	13-May-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	5-Sep-2009
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	30-May-2009
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	30-May-2009
Cable (2m, SMA Type)	Reynolds	262-0248-2000	3222	12	14-Oct-2009
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	21-May-2009
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
Section 2.8 and 2.9 Radio - Frequency Stability Under Temperature and Voltage Variations					
Radiocommunications Tester	Rohde & Schwarz	CMU 200	39	12	3-Nov-2009
Climatic Chamber	Heraeus Votsch	VM 04/100	85	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	3-Sep-2009
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Hygromer	Rotronic	A1	2138	12	13-May-2009
Multimeter	Iso-tech	IDM101	2424	12	3-Sep-2009
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	30-May-2009
Thermocouple Thermometer	Fluke	51	3173	12	3-Jul-2009
Cable (2m, SMA Type)	Reynolds	262-0248-2000	3222	12	14-Oct-2009

TU – Traceability Unscheduled



3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Conducted Emissions, LISN	150kHz to 30MHz Amplitude	3.2dB*
Conducted Emissions, ISN	150kHz to 30MHz Amplitude	2.1dB
Substitution Antenna, Radiated Field	30MHz to 18GHz Amplitude	2.6dB
Discontinuous Interference	150kHz to 30MHz Amplitude	3.0dB*
Interference Power	30MHz to 300MHz Amplitude	3.0dB*
Radiated E-Field Susceptibility	26MHz to 2.5GHz Test Amplitude	1.4dB†
Conducted Susceptibility	100kHz to 250MHz Amplitude	1.8dB†
DC Input Ripple Immunity	Current Voltage	0.45% 0.91%
Power Frequency Magnetic Field	50Hz/60Hz Amplitude	0.45%
Magnetic Emissions	9kHz to 30MHz Amplitude	3.4dB*
Magnetic Field/Flux iaw EN 50366	10Hz to 400kHz	2.64%
Harmonics and Flicker	The test was applied using proprietary equipment that meets the requirements of EN 61000-3-2 and EN 61000-3-3	—
Mains Voltage Variations and Interrupts	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-11	—
Fast Transient Burst	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-4	—
Electrostatic Discharge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-2	—
Surge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-5	—
Vehicle Transients	The test was applied using proprietary equipment that meets the requirements of ISO 7637-1 and 2	—
Compass Safe Distance	Azimuth Accuracy	0.10°

Worst case error for both Time and Frequency measurement 12 parts in 10⁶.

* In accordance with CISPR 16-4

† In accordance with UKAS Lab 34



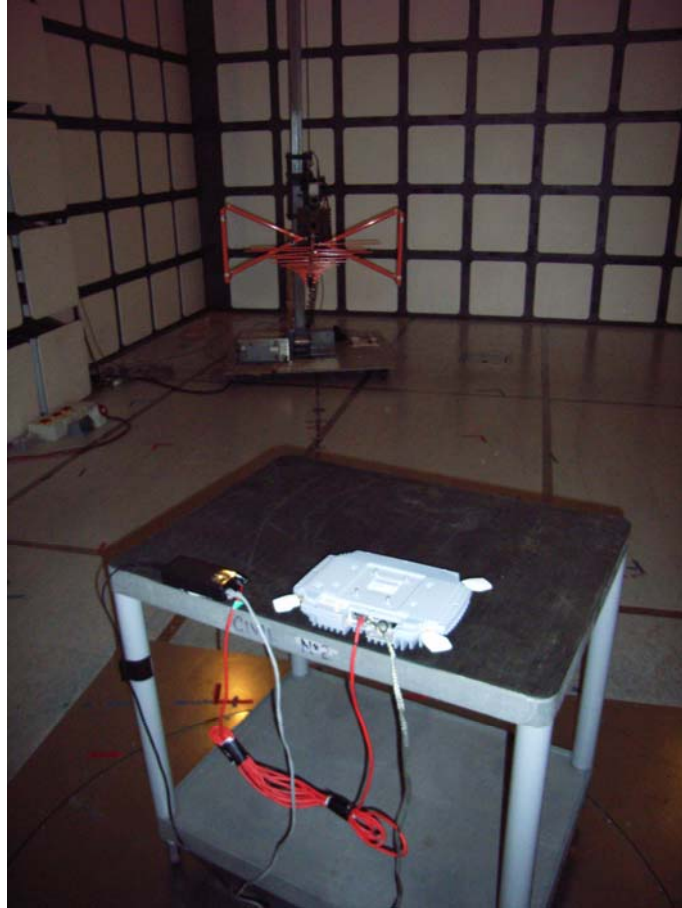
Product Service

SECTION 4

PHOTOGRAPHS



4.1 TEST SET UP PHOTOGRAPHS



Emissions for Broadband PCS Equipment



EIRP Peak Power



Product Service

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

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