



Product Service

**Choose certainty.
Add value.**

Report On

FCC Testing of the
Sharp CDMA SHI12 Tri-band CDMA (BC0/BC3, BC6) Cellular Phone
with Bluetooth, WLAN & FeliCa and GPS

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00150

Document 75913731 Report 03 Issue 1

June 2011



Product Service

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

COMMERCIAL-IN-CONFIDENCE

REPORT ON

FCC Testing of the
Sharp CDMA SH112 Tri-band CDMA (BC0/BC3, BC6) Cellular Phone
with Bluetooth, WLAN & FeliCa and GPS

Document 75913731 Report 03 Issue 1

June 2011

PREPARED FOR

Sharp Communication Compliance Ltd
Azure House
Bagshot Road
Bracknell
Berkshire
RG12 7QY

PREPARED BY

N Bennett
Senior Administrator

APPROVED BY

M Jenkins
Authorised Signatory

DATED

17 June 2011

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 2 and 22. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Russell
R Henley
A Guy



CONTENTS

Section	Page No
1	REPORT SUMMARY 3
1.1	Introduction 4
1.2	Brief Summary of Results 5
1.3	Application Form 6
1.4	Product Information 7
1.5	Test Conditions 8
1.6	Deviations From the Standard 8
1.7	Modification Record 8
2	TEST DETAILS 9
2.1	Spurious Emissions at Band Edge 10
2.2	Effective Radiated Power 14
2.3	Maximum Peak Output Power - Conducted 21
2.4	Emission Limitations for Cellular Equipment 23
2.5	Conducted Spurious Emissions 37
2.6	Occupied Bandwidth 45
2.7	Frequency Stability Under Temperature Variations 50
2.8	Frequency Stability Under Voltage Variations 53
3	TEST EQUIPMENT USED 55
3.1	Test Equipment Used 56
3.2	Measurement Uncertainty 59
4	ACCREDITATION, DISCLAIMERS AND COPYRIGHT 60
4.1	Accreditation, Disclaimers and Copyright 61



Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp CDMA SH112 Tri-band CDMA (BC0/BC3, BC6) Cellular Phone with Bluetooth, WLAN &
FeliCa and GPS



1.1 INTRODUCTION

The information contained in this report is intended to show verification of Sharp CDMA SHI12 Tri-band CDMA (BC0/BC3, BC6) Cellular Phone with Bluetooth, WLAN & FeliCa and GPS to the requirements of FCC CFR 47 Part 2 and 22.

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	Sharp Corporation
Model Number(s)	CDMA SHI12
Serial Number(s)	SSHJ000869
Software Version	A4110
Hardware Version	PP1
Number of Samples Tested	One
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2010 FCC CFR 47 Part 22: 2010
Incoming Release Date	Application Form 14 June 2011
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	8525 10 May 2011
Start of Test	08 June 2011
Finish of Test	16 June 2011
Name of Engineer(s)	M Russell R Henley A Guy
Related Document(s)	ANSI C63.4: 2003



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 2 and 22 is shown below.

Configuration 1:							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Base Standard
	Part 2	Part 22					
2.1	2.1051	22.905	Spurious Emissions at Band Edge	824.70 MHz	0	Pass	
				836.52 MHz		N/A	
				848.37 MHz	0	Pass	
2.2	-	22.913(a)	Effective Radiated Power	824.70 MHz	0	Pass	
				836.52 MHz	0	Pass	
				848.37 MHz	0	Pass	
2.3	2.1046	22.913(a)	Maximum Peak Output Power – Conducted	824.70 MHz	0	Pass	
				836.52 MHz	0	Pass	
				848.37 MHz	0	Pass	
2.4	-	22.917	Emission Limitations for Cellular Equipment	824.70 MHz	0	Pass	
				836.52 MHz	0	Pass	
				848.37 MHz	0	Pass	
2.5	2.1051	22.917(a)	Conducted Spurious Emissions	824.70 MHz	0	Pass	
				836.52 MHz	0	Pass	
				848.37 MHz	0	Pass	
2.6	2.1049(h)	22.917(b)	Occupied Bandwidth	824.70 MHz	0	Pass	
				836.52 MHz	0	Pass	
				848.37 MHz	0	Pass	
2.7	2.1055	22.355	Frequency Stability Under Temperature Variations	824.70 MHz		N/A	
				836.52 MHz	0	Pass	
				848.37 MHz		N/A	
2.8	2.1055	22.355	Frequency Stability Under Voltage Variations	824.70 MHz		N/A	
				836.52 MHz	0	Pass	
				848.37 MHz		N/A	

N/A – Not Applicable



Product Service

1.3 APPLICATION FORM

APPLICANT'S DETAILS			
COMPANY NAME :	Sharp Telecommunications of Europe Ltd		
ADDRESS :	Azure House, Bagshot Road Bracknell, Berkshire RG12 7QY		
NAME FOR CONTACT PURPOSES :	Ken Newman		
TELEPHONE NO: 01344 301 883	FAX NO:	01344 300 293	
	E-MAIL:	ken.newman@sharp.eu	

EQUIPMENT INFORMATION			
<u>Equipment designator:</u>			
Model name/number	CDMA SHI12	Identification number	APYHRO00150
<u>Supply Voltage:</u>			
☐	AC mains	State AC voltage V	and AC frequency Hz
☐	DC (external)	State DC voltage V	and DC current A
☒	DC (internal)	State DC voltage 3.7 V	and Battery type Li-ion
<u>Frequency characteristics:</u>			
Frequency range	2412 MHz to 2462 MHz	Channel spacing	(if channelized)
Designated test frequencies:			
Bottom: 2412 MHz	Middle: 2437 MHz	Top: 2462 MHz	
<u>Power characteristics:</u>			
Maximum transmitter power	17.3 dBm	Minimum transmitter power	 W
☒	Continuous transmission	(if variable)	
☐	Intermittent transmission	State duty cycle	
If intermittent, can transmitter be set to continuous transmit test mode? Y/N			
<u>Antenna characteristics:</u>			
☐	Antenna connector	State impedance	ohm
☒	Temporary antenna connector	State impedance 50 ohm	
☐	Integral antenna	State gain 2.14 dBi	
<u>Modulation characteristics:</u>			
☐	Amplitude	☐	Other
☐	Frequency	Details:	
☒	Phase		
Can the transmitter operate un-modulated?		N	
ITU Class of emission:			
<u>Extreme conditions:</u>			
Maximum temperature	+60 °C	Minimum temperature	-20 °C
Maximum supply voltage	4.0 V	Minimum supply voltage	3.7 V

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature : *M. Kishino*
 Name : Masahiko Kishino
 Position held : Manager
 Date : 14 June 2011



Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was an Sharp CDMA SHI12 Tri-band CDMA (BC0/BC3, BC6) Cellular Phone with Bluetooth, WLAN & FeliCa and GPS. A full technical description can be found in the manufacturer's documentation.

1.4.2 Test Configuration

Configuration 1:

The EUT was configured in accordance with FCC CFR 47 Part 2 and 22.

1.4.3 Modes of Operation

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

Mode 1 – 824.70 MHz

Mode 2 – 836.52 MHz

Mode 3 – 848.37 MHz

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



1.5 TEST CONDITIONS

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

The EUT was powered from either a 3.7 V DC Supply.

FCC Accreditation
90987 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 Testing of the
Sharp CDMA SHI12 Tri-band CDMA (BC0/BC3, BC6) Cellular Phone with Bluetooth, WLAN &
FeliCa and GPS



Product Service

2.1 SPURIOUS EMISSIONS AT BAND EDGE

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 22, Clause 22.905

2.1.2 Equipment Under Test

CDMA SHI12, S/N: SSHFJ000869

2.1.3 Date of Test and Modification State

08 June 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 22.

In accordance with 22.917(e), any emissions outside of the block edges shall be attenuated by at least $43 + 10 \log(P)$. The measurements are shown to ± 1 MHz from the block edges. The plots shown under the Spurious Emissions sections covers the required range of 9 kHz to 9 GHz.

The reference power and path losses of all channels used for testing in each frequency block were measured. Having entered the reference level offset, a limit line was displayed, showing the -13 dBm ($43 + 10 \log(P)$), limit. The EUT was operated at maximum power on 64-Ray Orthogonal and BPSK modulation schemes.

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

Configuration 1 - Mode 1
 - Mode 3

2.1.6 Environmental Conditions

08 June 2011

Ambient Temperature 24.4°C

Relative Humidity 35.8%



2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and 22 for Spurious Emissions at Band Edge.

The test results are shown below.

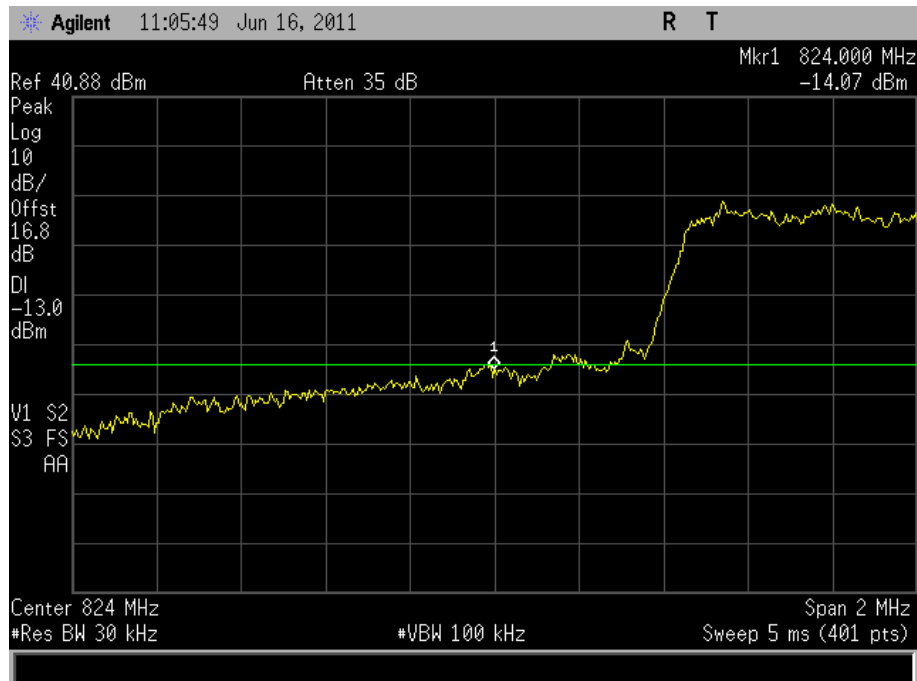
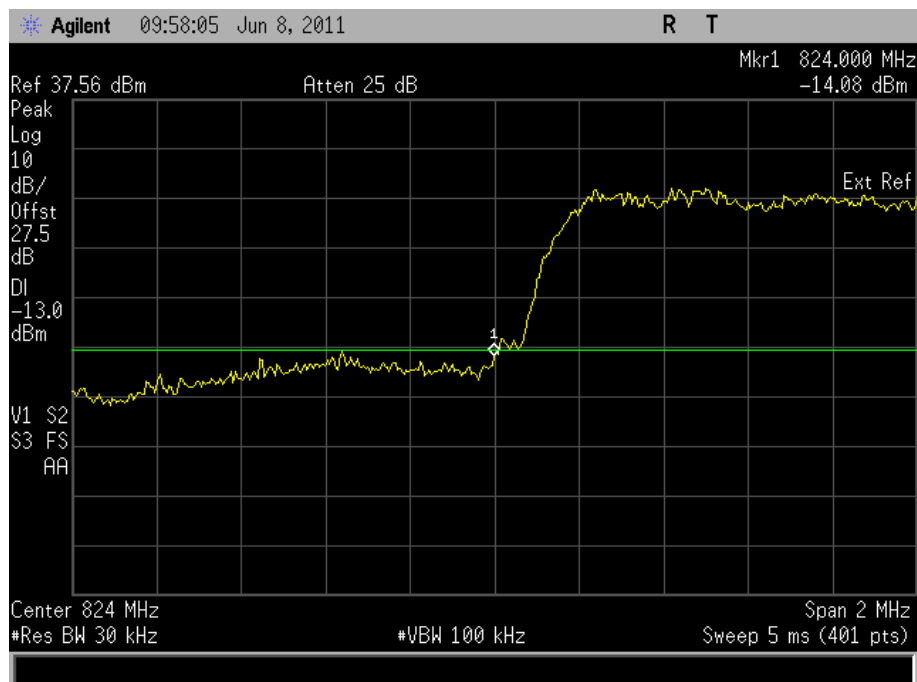
Configuration 1 – Modes 1 and 3

4.0 V DC Supply

Frequency Block (mhz)	Mode	Modulation	Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
A :(824.0 – 835.0)	SO55, RC1	64-Ray Modulation	Channel : 3 Frequency : 825.09 MHz	N/A
B :(846.5 – 849.0)	SO55, RC1	64-Ray Modulation	N/A	Channel : 773 Frequency : 848.19MHz
A :(824.0 – 835.0)	TDSO32, FCH + SCH	BPSK	Channel : 1016 Frequency : 824.79 MHz	N/A
B :(846.5 – 849.0)	TDSO32, FCH + SCH	BPSK	N/A	Channel : 775 Frequency : 848.19MHz

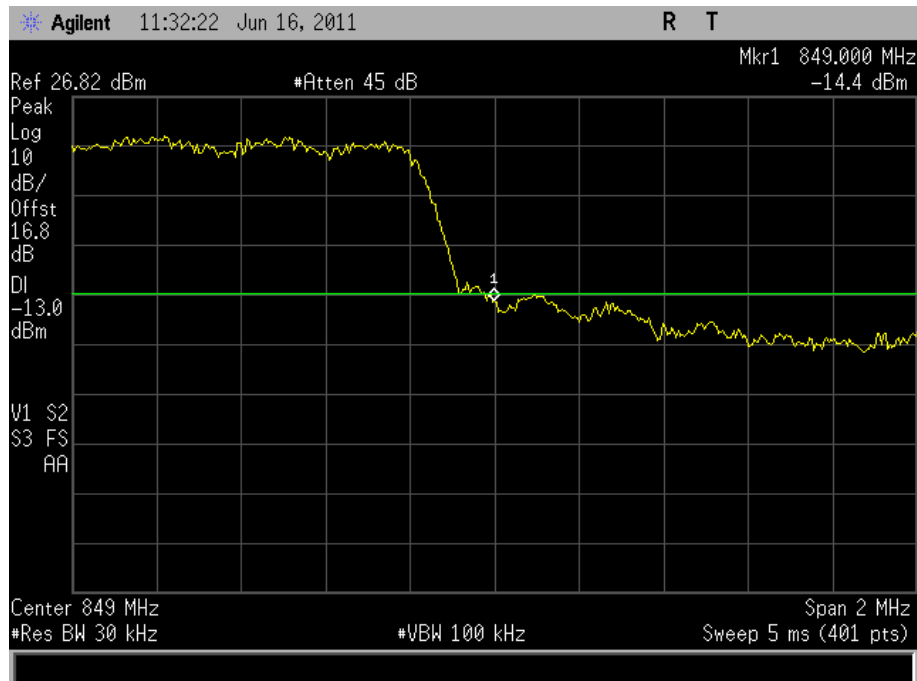
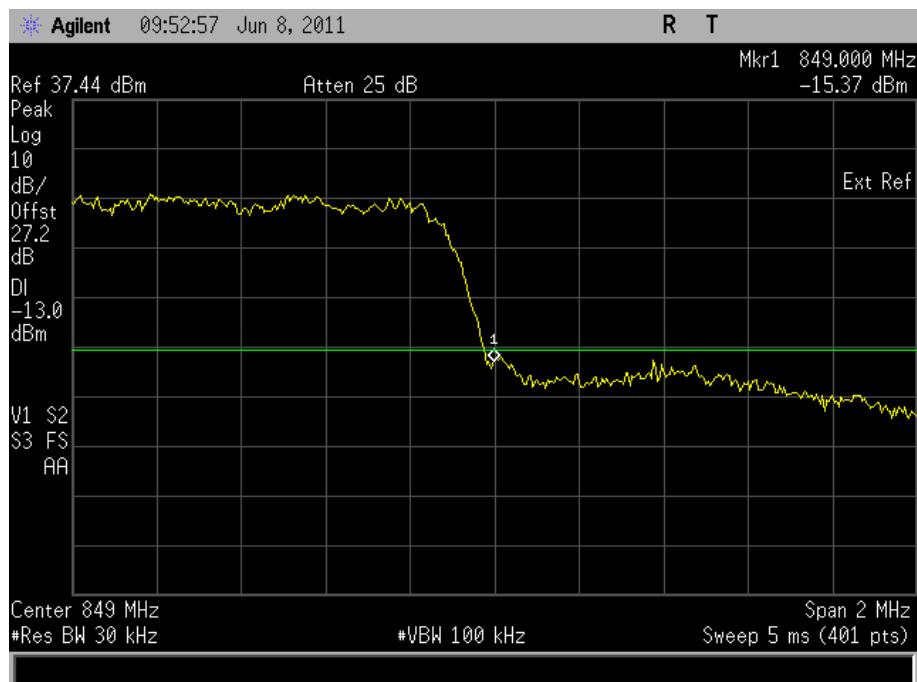


Product Service

Frequency Block ASO55, RC1, 64-Ray ModulationTDSO32, FCH + SCH, BPSK



Product Service

Frequency Block BSO55, RC1, 64-Ray ModulationTDSO32, FCH + SCH, BPSKLimit Clause

-13 dBm at block edge.



Product Service

2.2 EFFECTIVE RADIATED POWER

2.2.1 Specification Reference

FCC CFR 47 Part 22, Clause 22.913(a)

2.2.2 Equipment Under Test

CDMA SHI12, S/N: SSHFJ000869

2.2.3 Date of Test and Modification State

15 June 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 22.

Measurements of the fundamental from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The fundamental frequency was maximised by adjusting the antenna height, antenna polarisation and turntable azimuth. A peak detector was used with the trace set to max hold. The maximum result was recorded.

The EUT was then removed from the chamber and replaced with a substitution antenna. Using a signal generator the level was adjusted to achieve the same value on the measuring instrument as previously recorded with the EUT. The final result (ERP) was determined by a calculation using the signal generator level, antenna gain and cable loss.

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

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

15 June 2011

Ambient Temperature 20.0°C

Relative Humidity 59.0%



2.2.7 Test Results

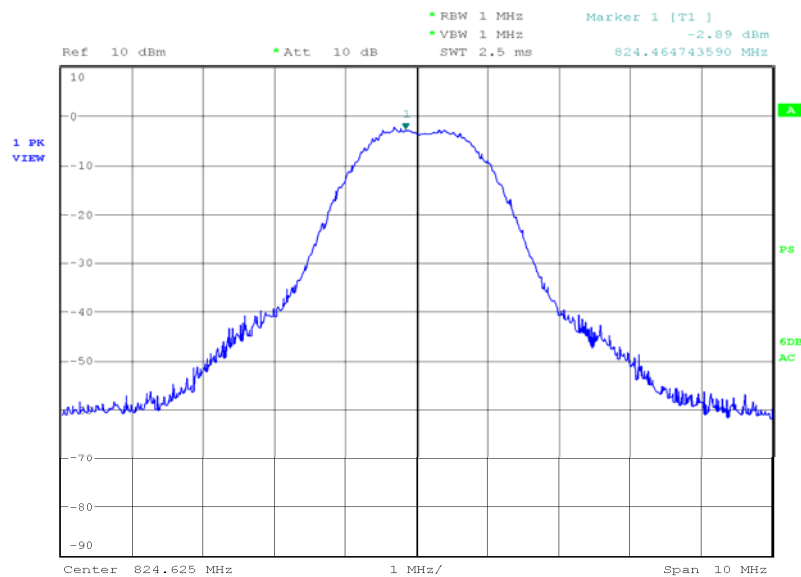
For the period of test the EUT met the requirements of FCC CFR 47 Part 22 for Effective Isotropic Radiated Power.

The test results are shown below.

Configuration 1 - Mode 1

64-Ray Orthogonal

Frequency (MHz)	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
824.70	25.21	38.45	0.332	7.0



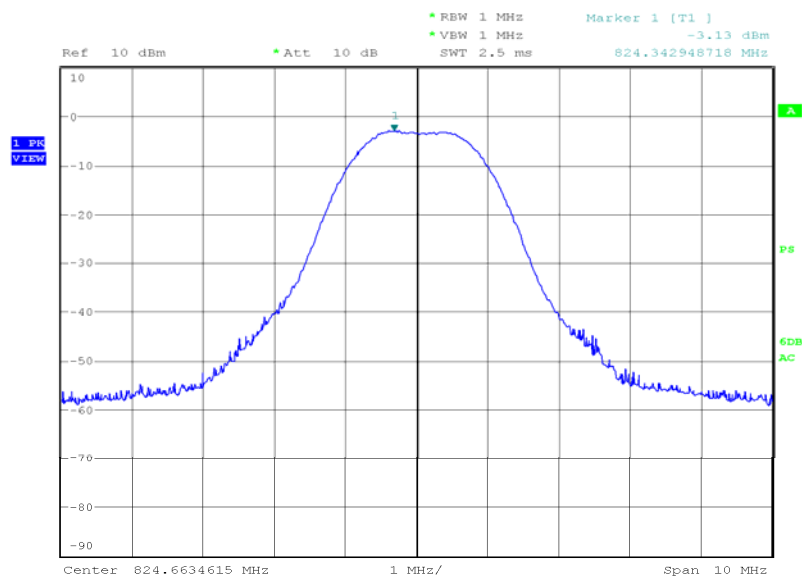
Date: 15.JUN.2011 20:24:59



Product Service

BPSK

Frequency (MHz)	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
824.70	25.05	38.45	0.319	7.0



Date: 15.JUN.2011 19:35:40

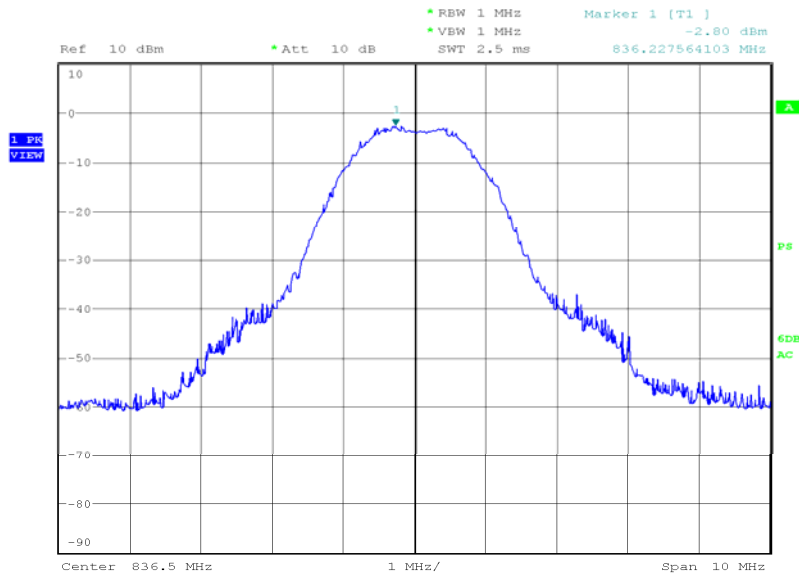


Product Service

Configuration 1 - Mode 2

64-Ray Orthogonal

Frequency (MHz)	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
836.52	26.0	38.45	0.398	7.0



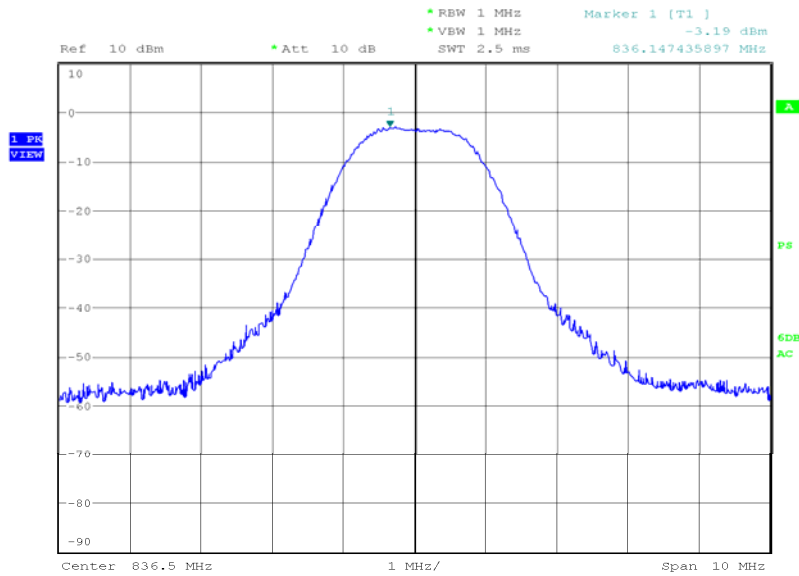
Date: 15.JUN.2011 20:27:37



Product Service

BPSK

Frequency (MHz)	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
836.52	25.7	38.45	0.371	7.0



Date: 15.JUN.2011 19:37:56

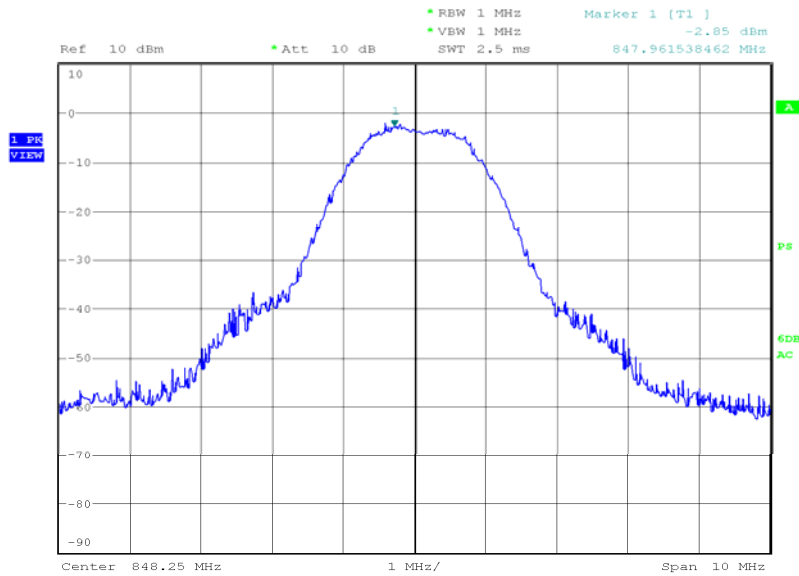


Product Service

Configuration 1 - Mode 3

64-Ray Orthogonal

Frequency (MHz)	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
848.37	25.8	38.45	0.380	7.0



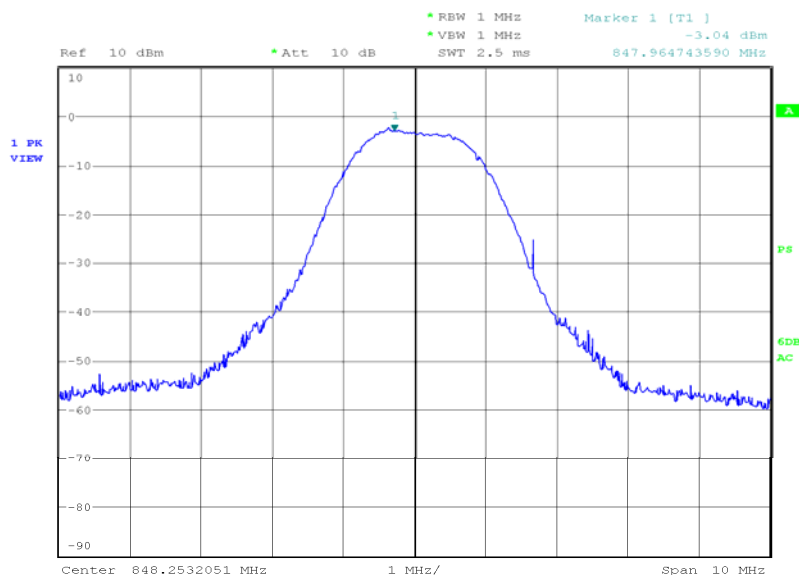
Date: 15.JUN.2011 20:30:13



Product Service

BPSK

Frequency (MHz)	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
848.37	25.5	38.45	0.355	7.0



Date: 15.JUN.2011 19:23:30

Limit Clause

Mobile – 7 W, Base Stations – 500 W



Product Service

2.3 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.3.1 Specification Reference

FCC CFR 47 Part 22, Clause 2.1046
FCC CFR 47 Part 22, Clause 22.913(a)

2.3.2 Equipment Under Test

CDMA SHI12, S/N: SSHFJ000869

2.3.3 Date of Test and Modification State

08 June 2011 - Modification State 0

2.3.4 Test Equipment Used

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

2.3.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 2 and 22.

Using a spectrum analyser and attenuator(s), the output power of the EUT was measured at the antenna terminals.

The EUT supports CDMA 2000. The EUT was tested in SO55, RC1 and TDSO32, FCH + SCH modes of operation.

The spectrum analyser RBW and VBW were set to 1 MHz 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

2.3.6 Environmental Conditions

08 June 2011

Ambient Temperature 21.3°C

Relative Humidity 41.2%



Product Service

2.3.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and 22 for Maximum Peak Output Power - Conducted.

The test results are shown below.

Configuration 1 - Modes 1, 2 and 3

4.0 V DC Supply

Frequency (MHz)	Mode	Modulation	Result (dBm)	Result (W)
824.70 MHz	SO55, RC1	64-Ray Orthogonal	3.027	1.064
836.52 MHz	SO55, RC1	64-Ray Orthogonal	29.55	0.902
848.37 MHz	SO55, RC1	64-Ray Orthogonal	29.48	0.887
824.70 MHz	TDSO32, FCH + SCH	BPSK	29.55	0.902
836.52 MHz	TDSO32, FCH + SCH	BPSK	29.06	0.805
848.37 MHz	TDSO32, FCH + SCH	BPSK	28.90	0.776

Limit Clause

Mobile – 7 W

Base Stations – 500 W



2.4 EMISSION LIMITATIONS FOR CELLULAR EQUIPMENT

2.4.1 Specification Reference

FCC CFR 47 Part 22, Clause 22.917

2.4.2 Equipment Under Test

CDMA SHI12, S/N: SSHFJ000869

2.4.3 Date of Test and Modification State

15 June 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 22.

A preliminary profile of the Spurious Radiated Emissions was obtained up to the 10th harmonic by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, the list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

The EUT was set to transmit on full power on 64-Ray Orthogonal and BPSK modulations. The EUT was tested on bottom, middle and top channels at maximum power.

For any emissions found the EUT was then removed from the chamber and replaced with a substitution antenna. Using a signal generator the level was adjusted to achieve the same value on the measuring instrument as previously recorded with the EUT. The final result was determined by a calculation using the signal generator level, antenna gain and cable loss. The measurements were performed at a 3m distance unless otherwise stated.

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 June 2011

Ambient Temperature 19.5°C

Relative Humidity 55.0%

2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 22 for Emission Limitations for Cellular Equipment.

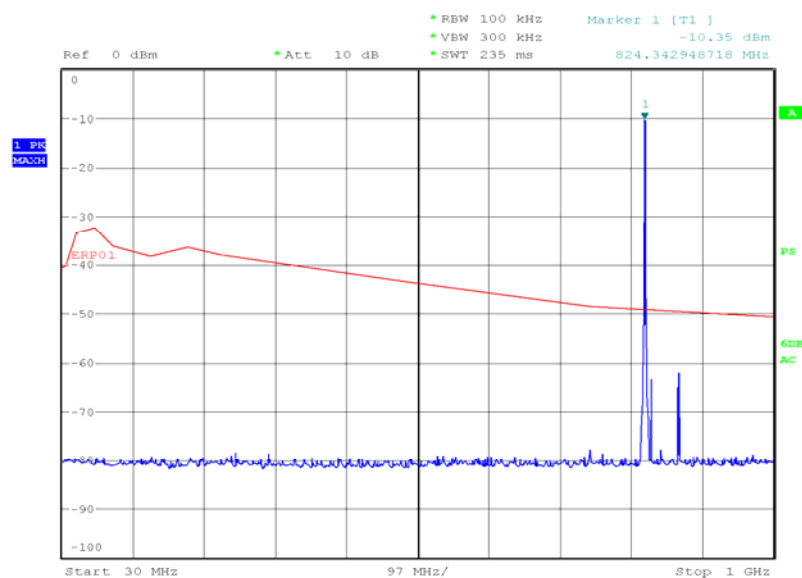
The test results are shown below.

Configuration 1 - Mode 1

64-Ray Orthogonal

Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
1648	Vertical	100	25	-42.2	-13.0	-29.2	Pass

30MHz to 1GHz

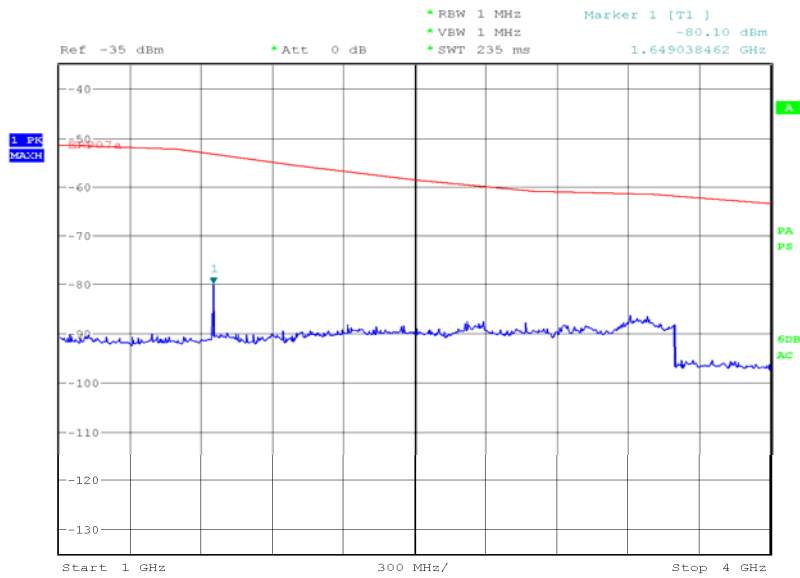


Date: 15.JUN.2011 20:57:14



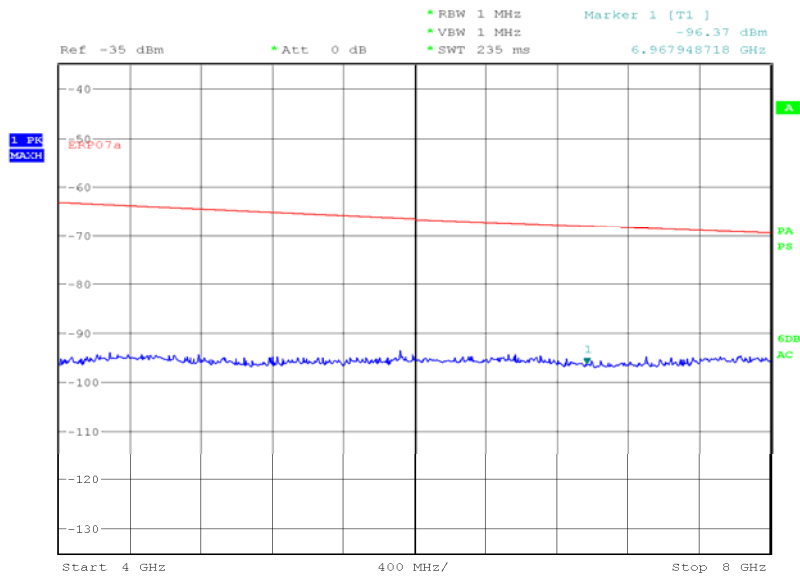
Product Service

1GHz to 4GHz



Date: 16.JUN.2011 01:02:52

4GHz to 8GHz

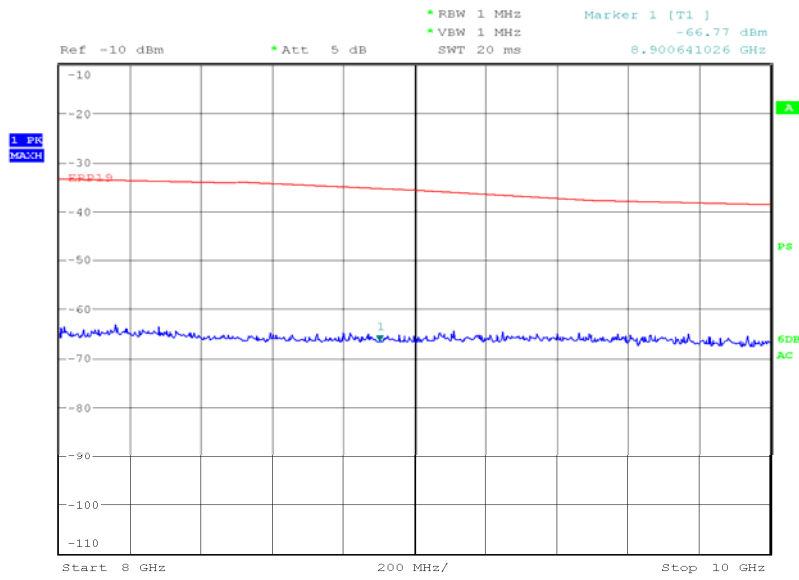


Date: 16.JUN.2011 01:05:22



Product Service

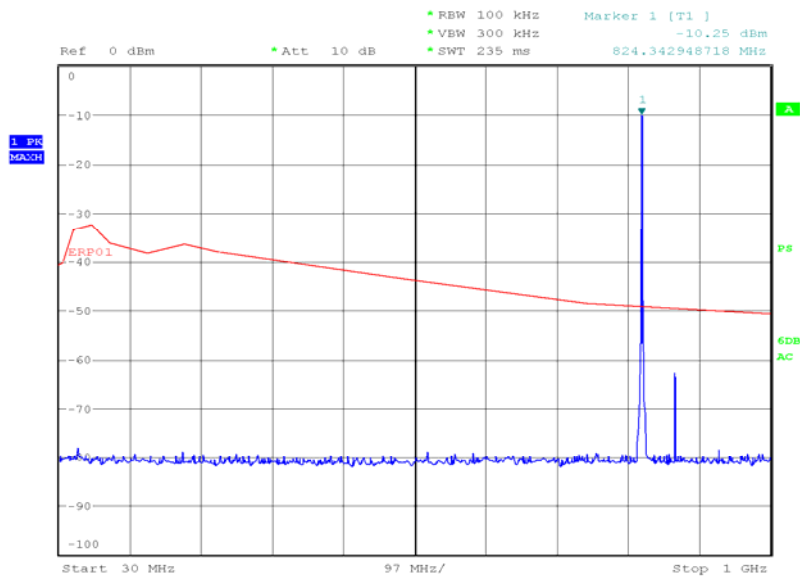
8GHz to 10GHz



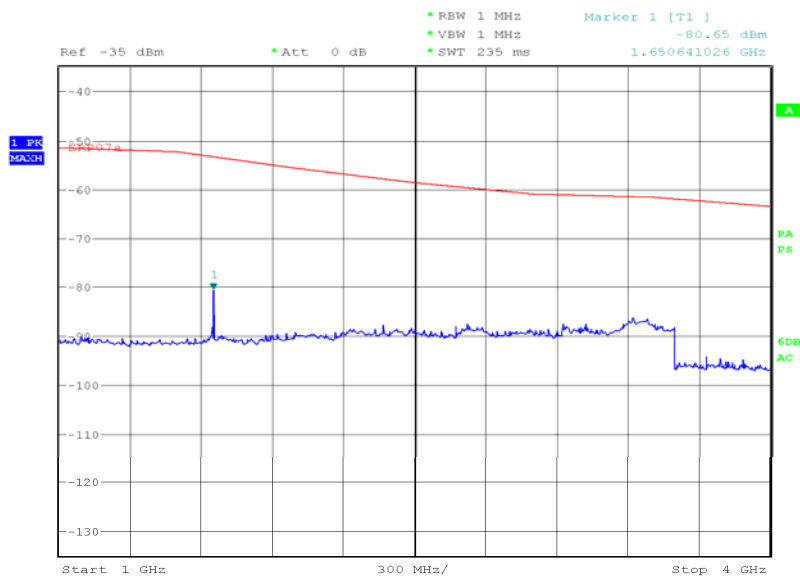
Date: 16.JUN.2011 02:37:03

BPSK

Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
1648	Vertical	100	25	-41.7	-13.0	-28.7	Pass

30MHz to 1GHz

Date: 15.JUN.2011 21:24:52

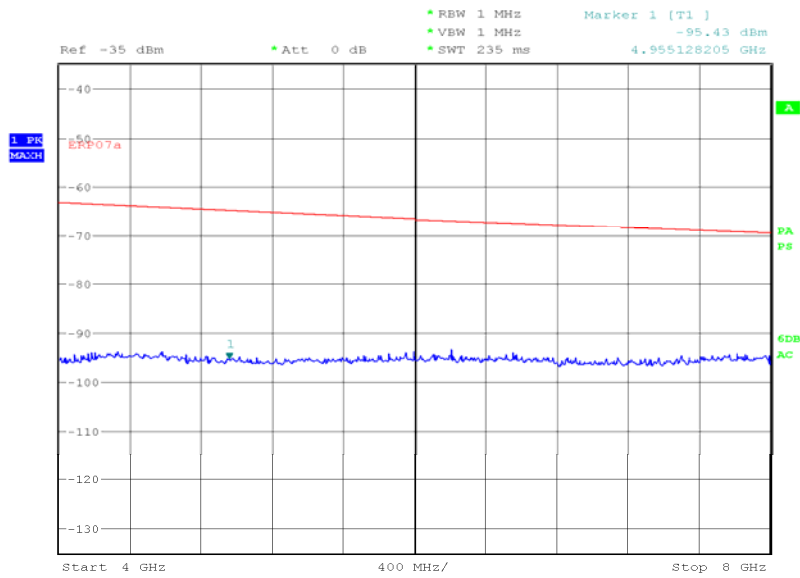
1GHz to 4GHz

Date: 16.JUN.2011 00:44:34



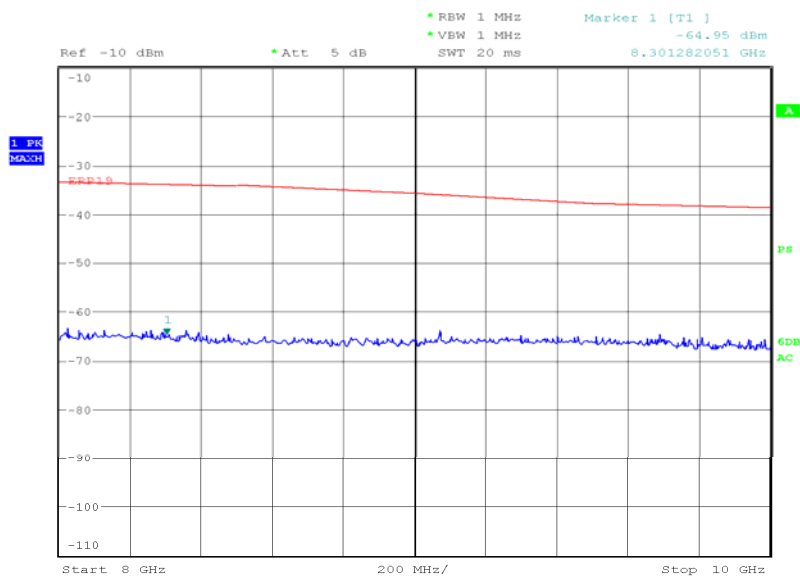
Product Service

4GHz to 8GHz



Date: 16.JUN.2011 00:49:14

8GHz to 10GHz



Date: 16.JUN.2011 02:18:49

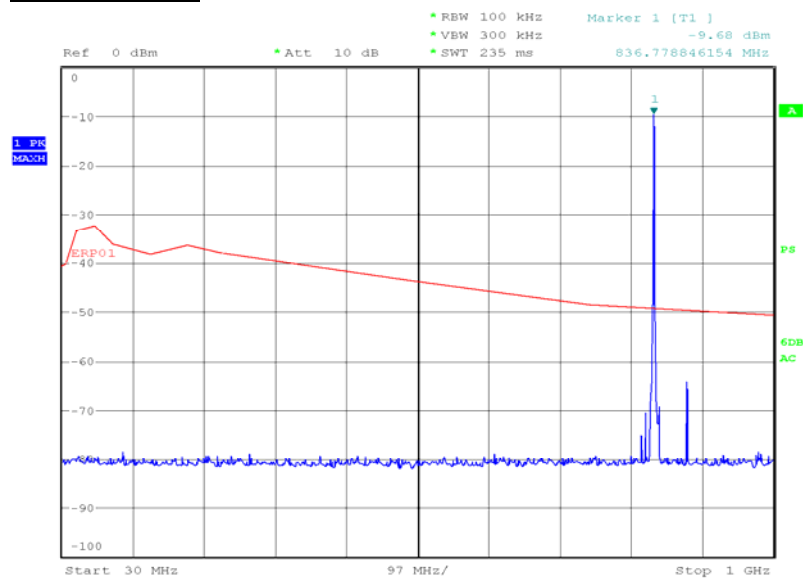


Configuration 1 - Mode 2

64-Ray Orthogonal

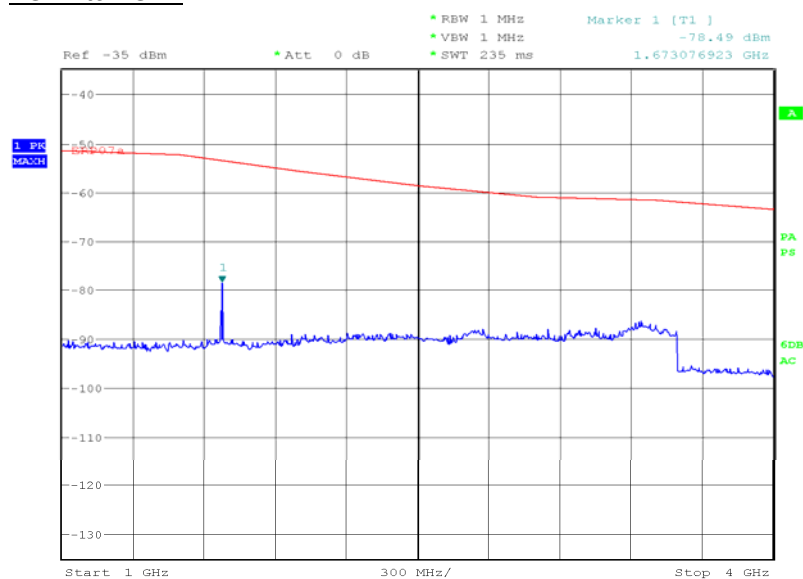
Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
1672	Vertical	100	20	-41.3	-13.0	-28.3	Pass

30MHz to 1GHz



Date: 15.JUN.2011 20:55:36

1GHz to 4GHz

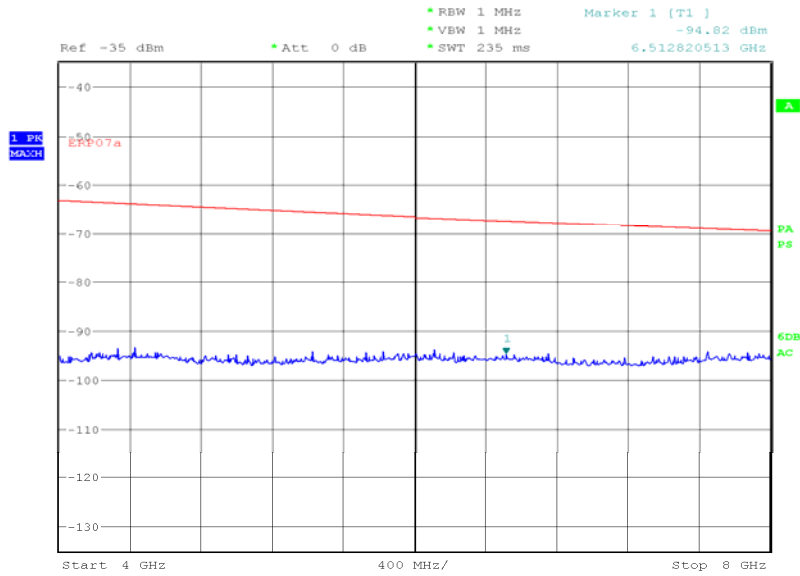


Date: 16.JUN.2011 01:09:37



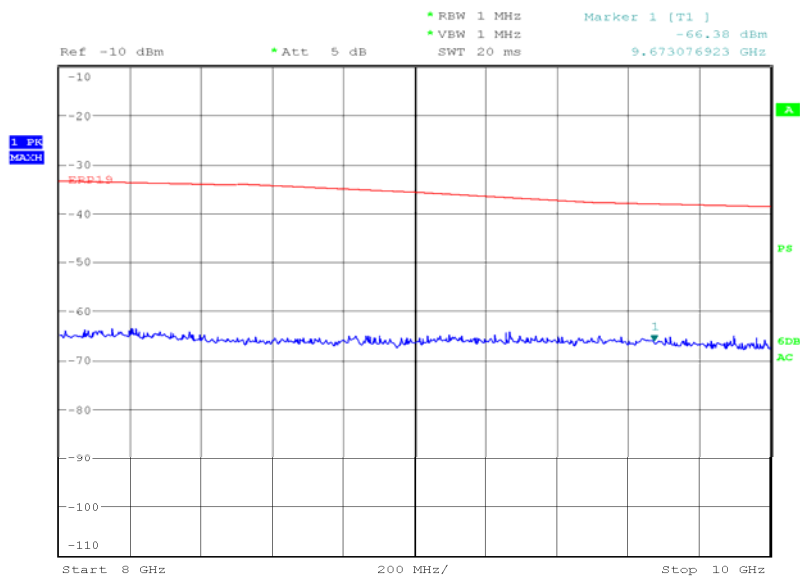
Product Service

4GHz to 8GHz



Date: 16.JUN.2011 01:07:25

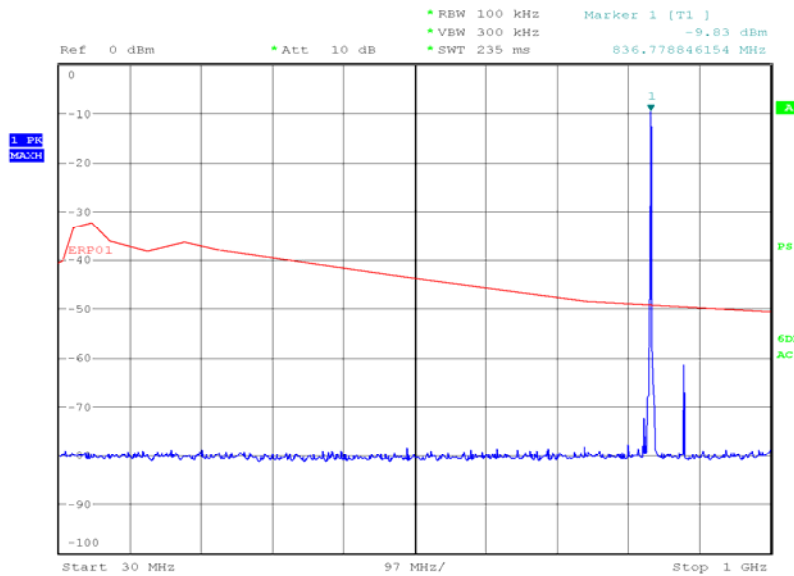
8GHz to 10GHz



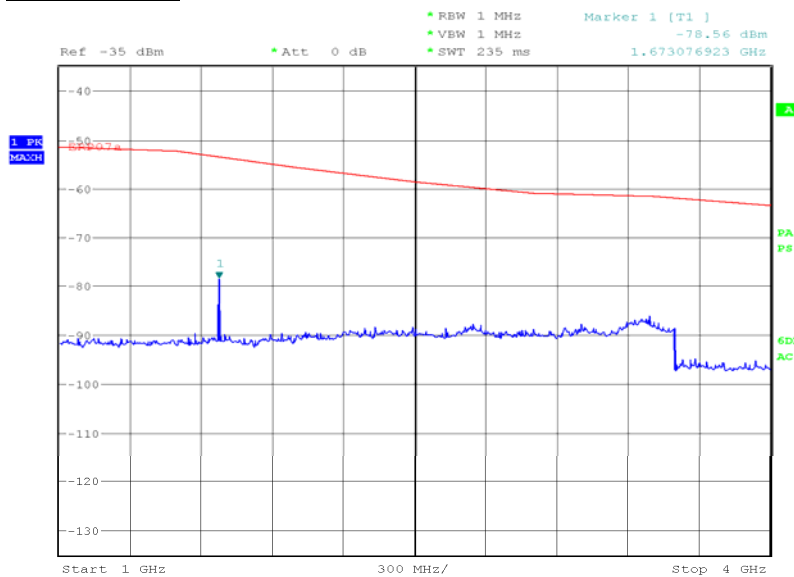
Date: 16.JUN.2011 02:32:51

BPSK

Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
1672	Vertical	100	22	-40.1	-13.0	-27.1	Pass

30MHz to 1GHz

Date: 15.JUN.2011 21:28:05

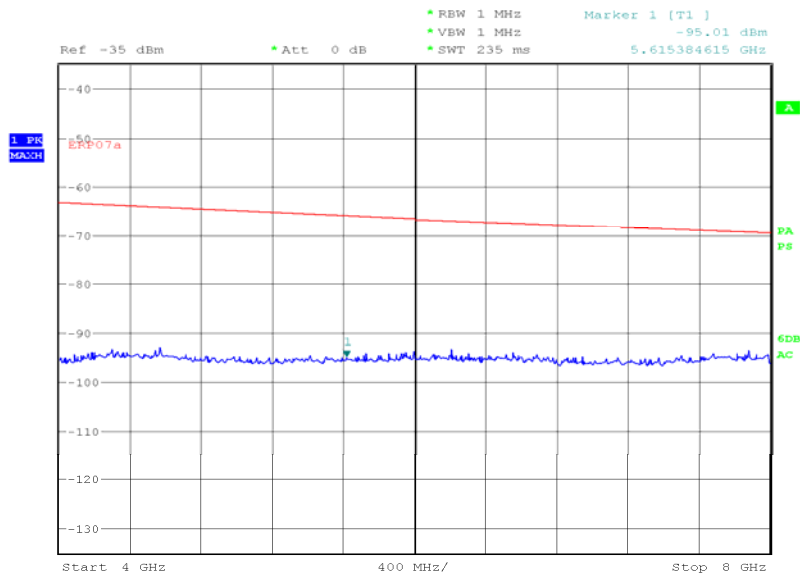
1GHz to 4GHz

Date: 16.JUN.2011 00:53:25



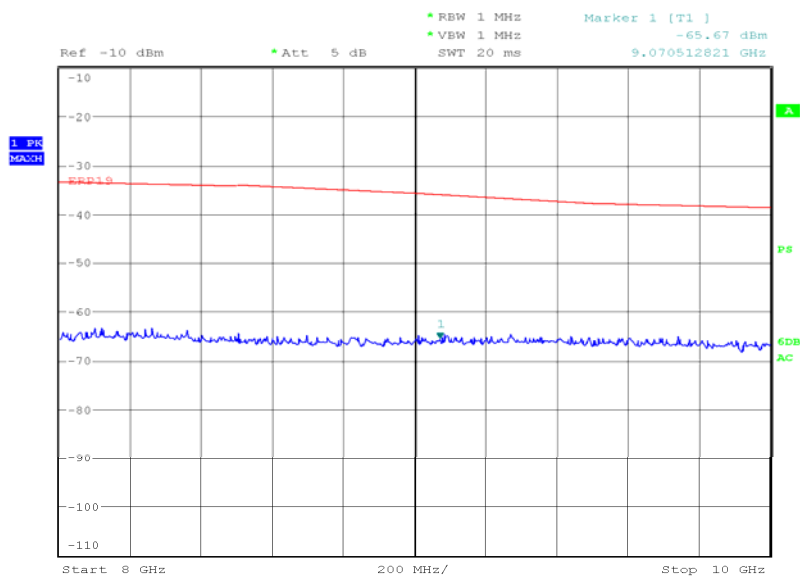
Product Service

4GHz to 8GHz



Date: 16.JUN.2011 00:51:30

8GHz to 10GHz



Date: 16.JUN.2011 02:22:28

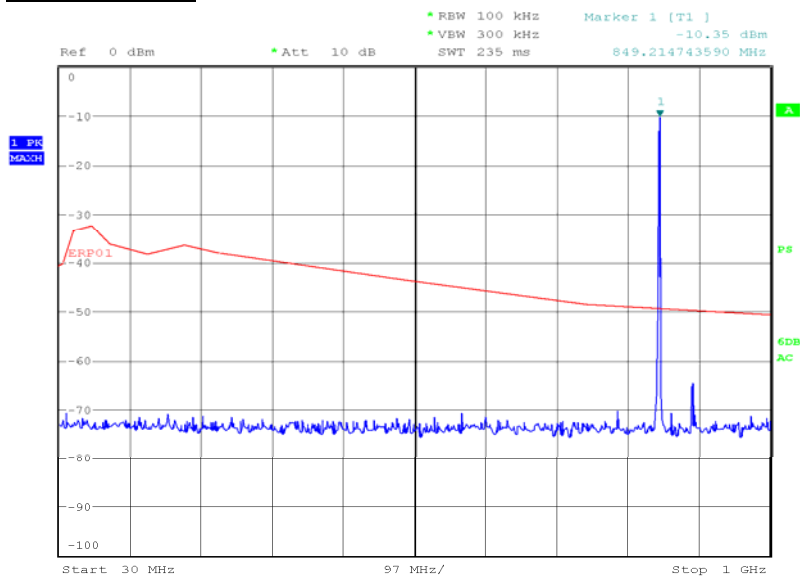


Configuration 1 - Mode 3

64-Ray Orthogonal

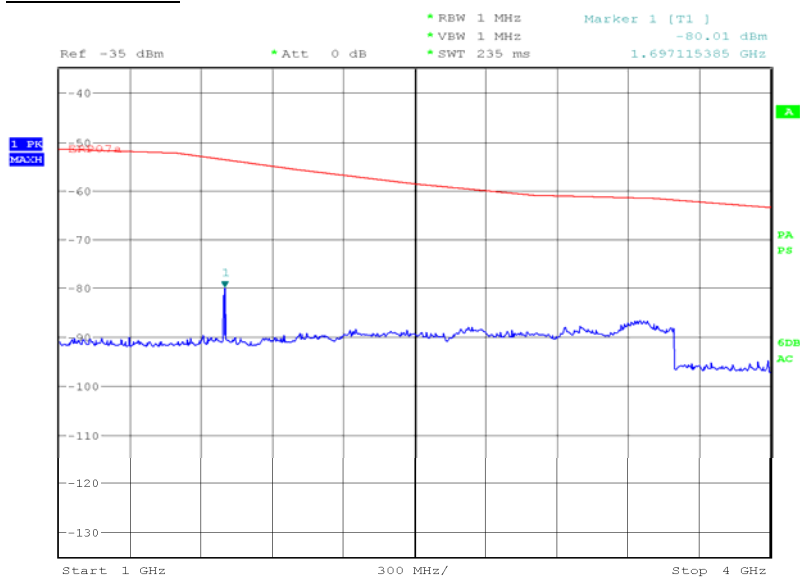
Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
1696	Vertical	100	35	-39.9	13.0	-26.9	Pass

30MHz to 1GHz



Date: 15.JUN.2011 20:34:52

1GHz to 4GHz

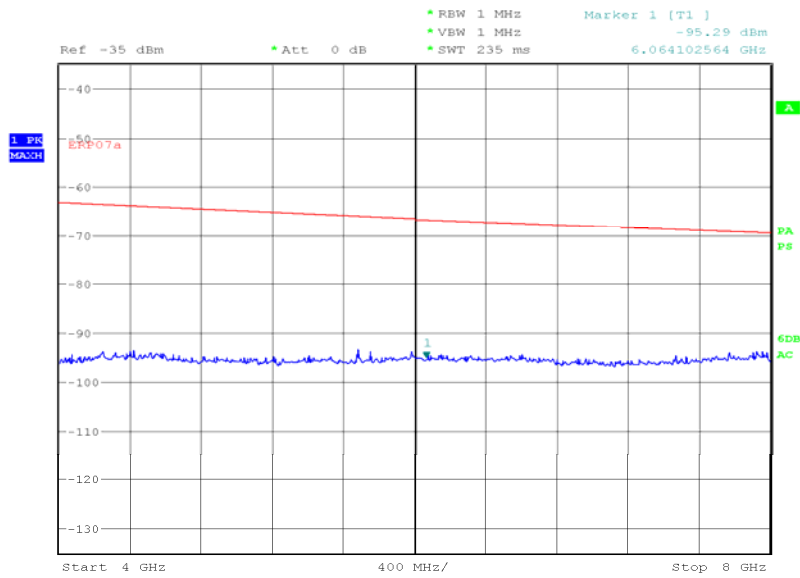


Date: 16.JUN.2011 01:14:12



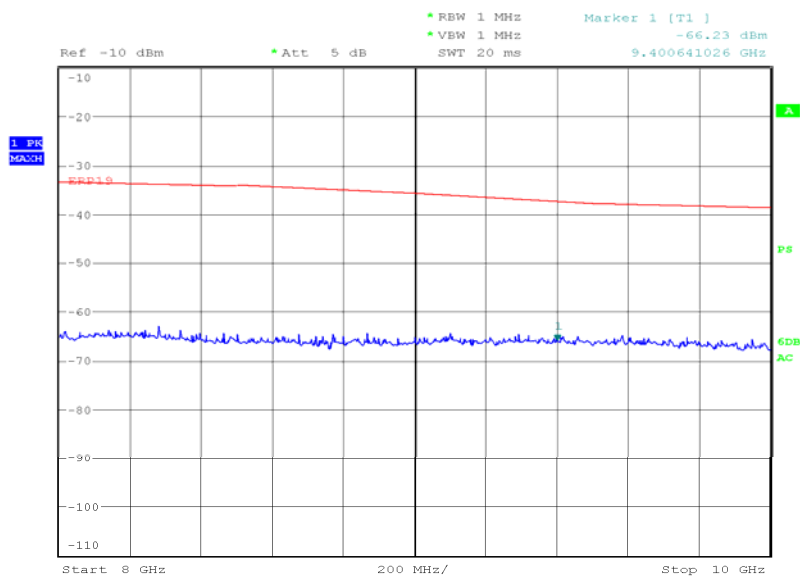
Product Service

4GHz to 8GHz



Date: 16.JUN.2011 01:19:17

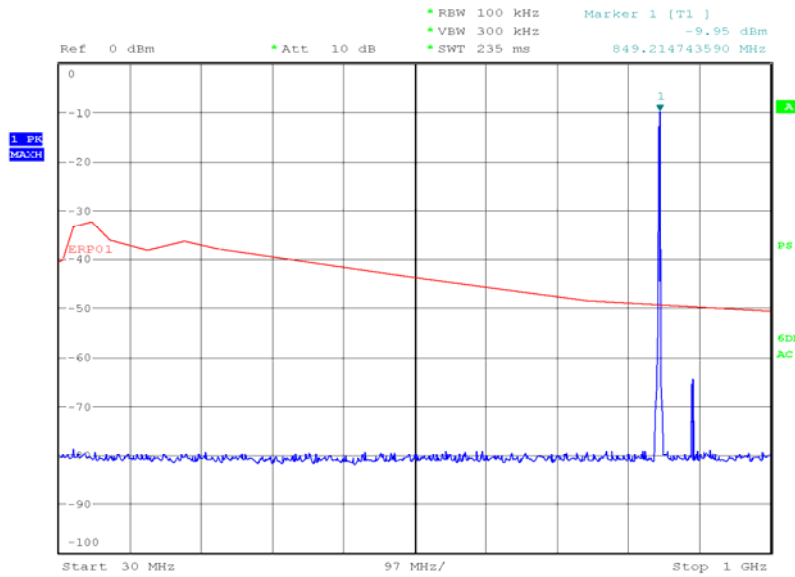
8GHz to 10GHz



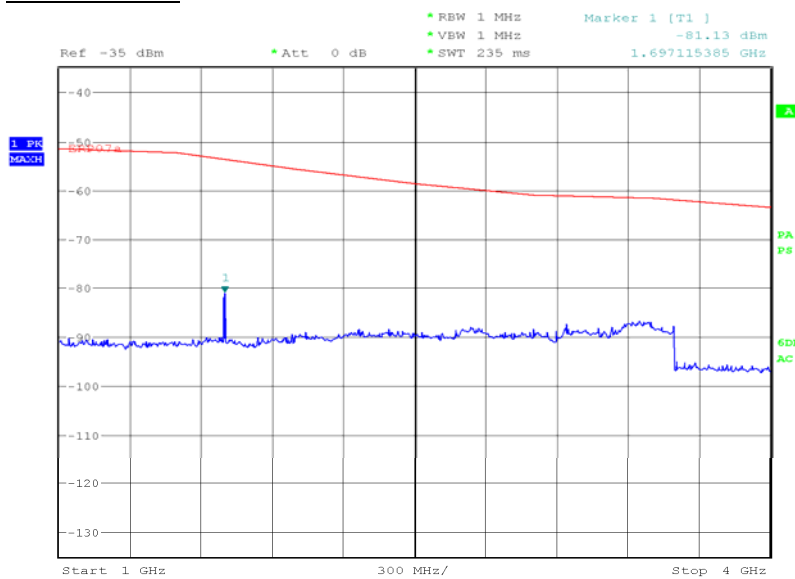
Date: 16.JUN.2011 02:29:01

**BPSK**

Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
1696	Vertical	100	32	-39.9	13.0	-26.9	Pass

30MHz to 1GHz

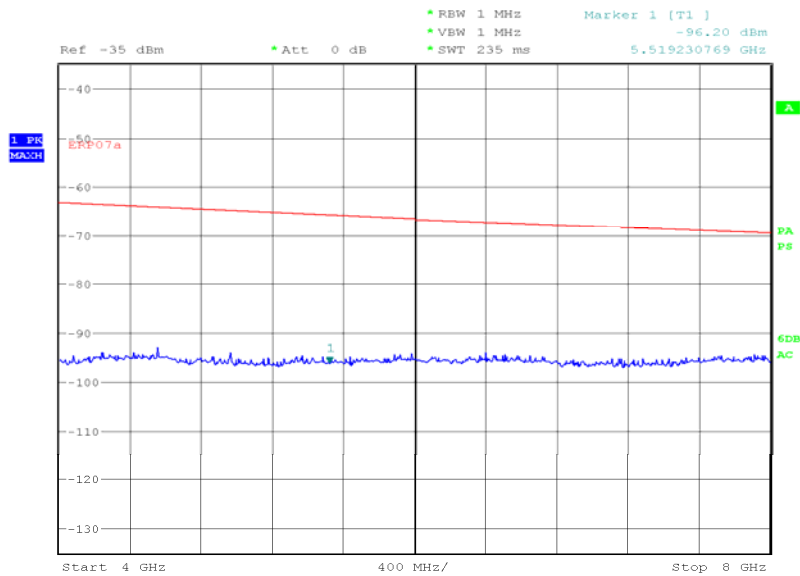
Date: 15.JUN.2011 21:33:03

1GHz to 4GHz

Date: 16.JUN.2011 00:56:32

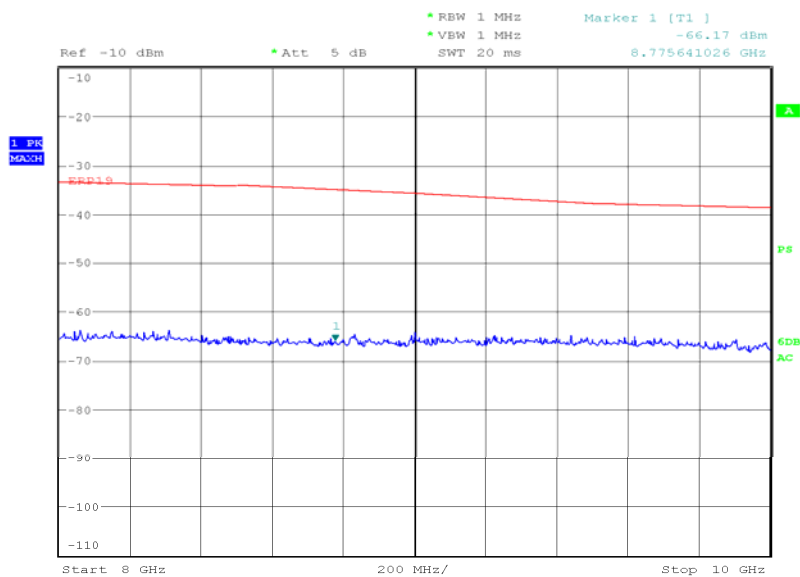


4GHz to 8GHz



Date: 16.JUN.2011 00:59:28

8GHz to 10GHz



Date: 16.JUN.2011 02:25:20

Limit Clause

$43 + 10 \log(P)$ or -13 dBm



Product Service

2.5 CONDUCTED SPURIOUS EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 22, Clause 22.917(a)

2.5.2 Equipment Under Test

CDMA SHI12, S/N: SSHFJ000869

2.5.3 Date of Test and Modification State

08 June 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 22.

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 9 GHz. The EUT was set to transmit on full power on 64-Ray Orthogonal and BPSK modulations. The EUT was tested on Bottom, Middle and Top channels for maximum power. The resolution and video bandwidths were set to 1 MHz and 3 MHz thus meeting the requirements of Part 22.917(b). The spectrum analyser detector was set to max hold.

From 9 kHz to 1.5 GHz, an attenuator was used. For measuring the range 1.5 GHz to 9 GHz an attenuator and high pass filter were used. This was to reduce saturation effects in the spectrum analyser.

The maximum path loss across the measurement band were used as reference level offsets 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

2.5.6 Environmental Conditions

08 June 2011

Ambient Temperature 24.4°C

Relative Humidity 35.8%



Product Service

2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and 22 for Conducted Spurious Emissions.

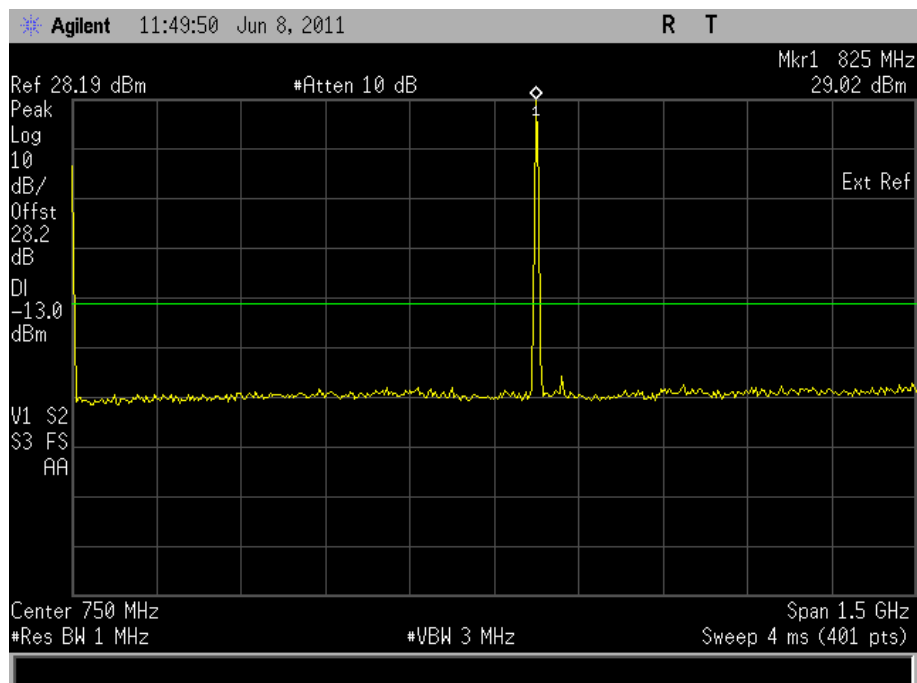
The test results are shown below.

4.0 V DC Supply

Configuration 1 – Mode 1

SO55, RC1

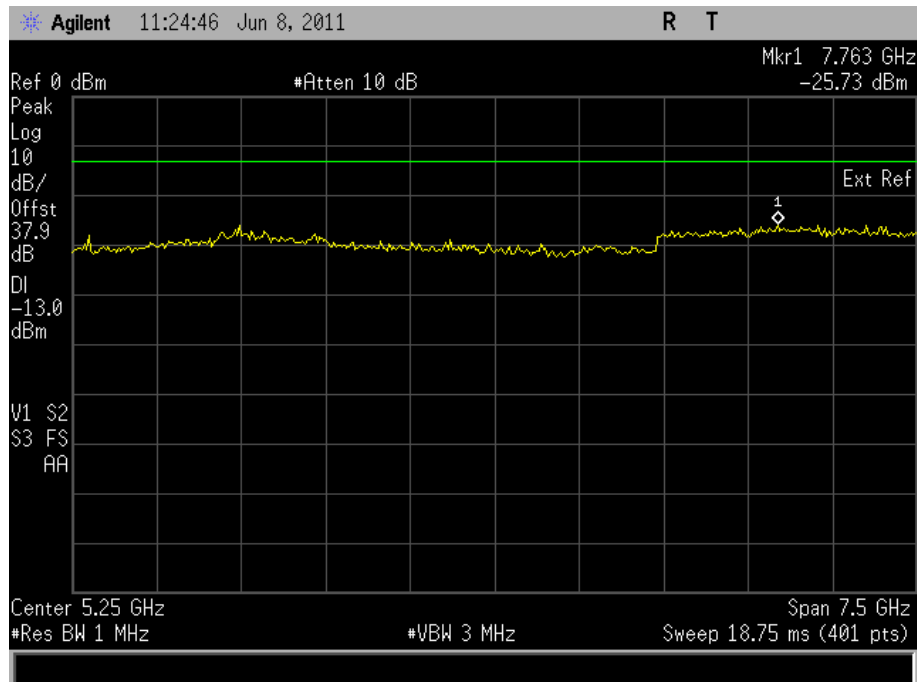
9 kHz to 1.5 GHz





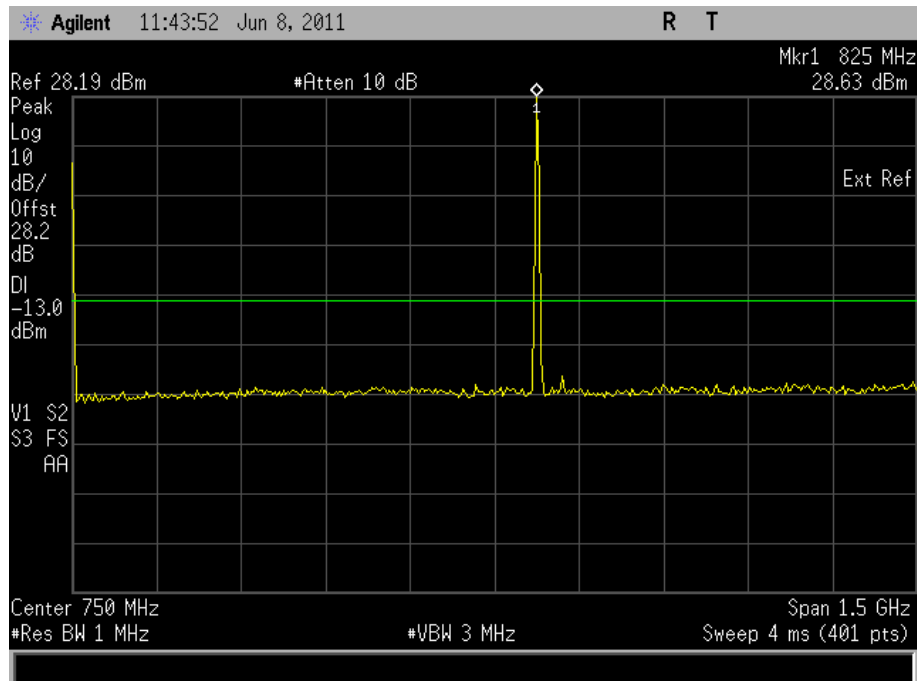
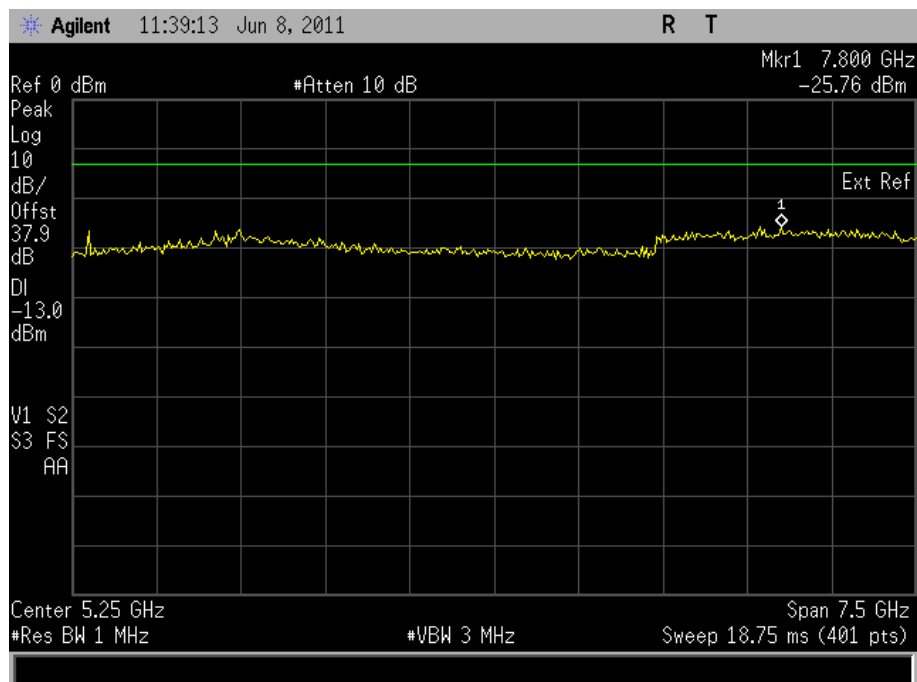
Product Service

1.5 GHz to 9 GHz



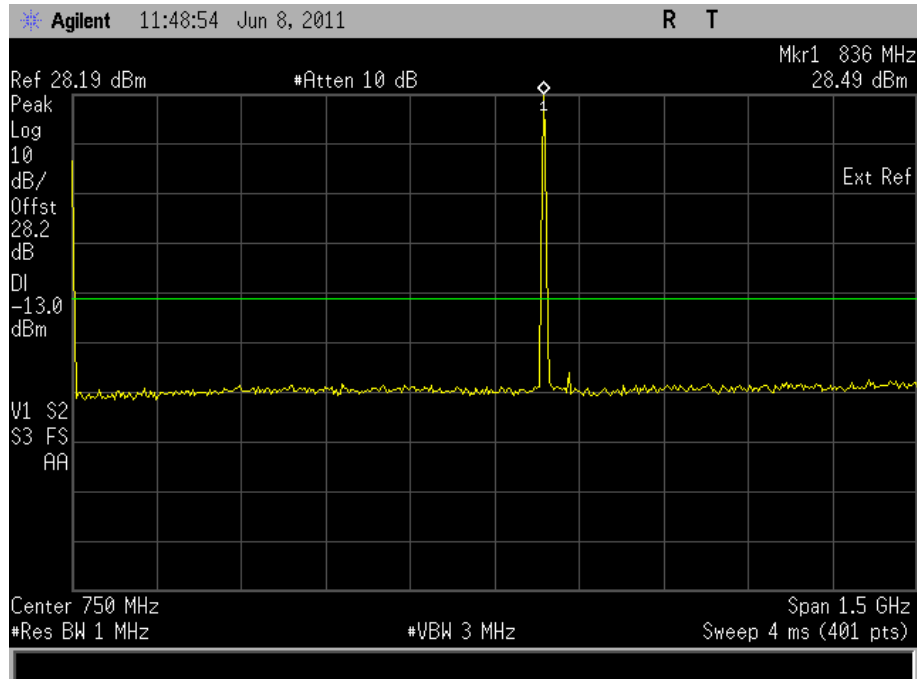
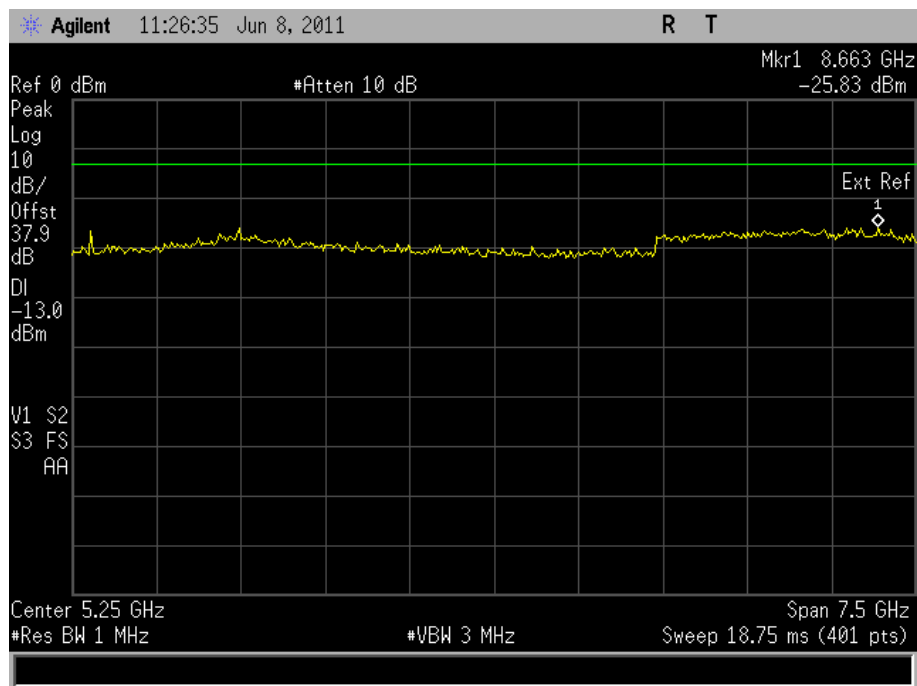


Product Service

TDSO32, FCH + SCH9 kHz to 1.5 GHz1.5 GHz to 9 GHz

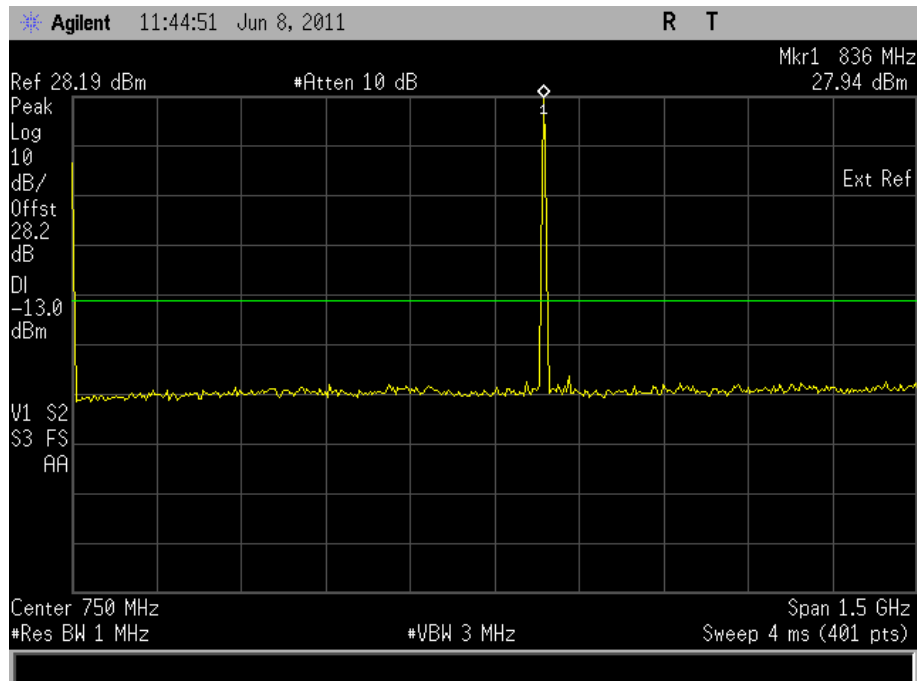
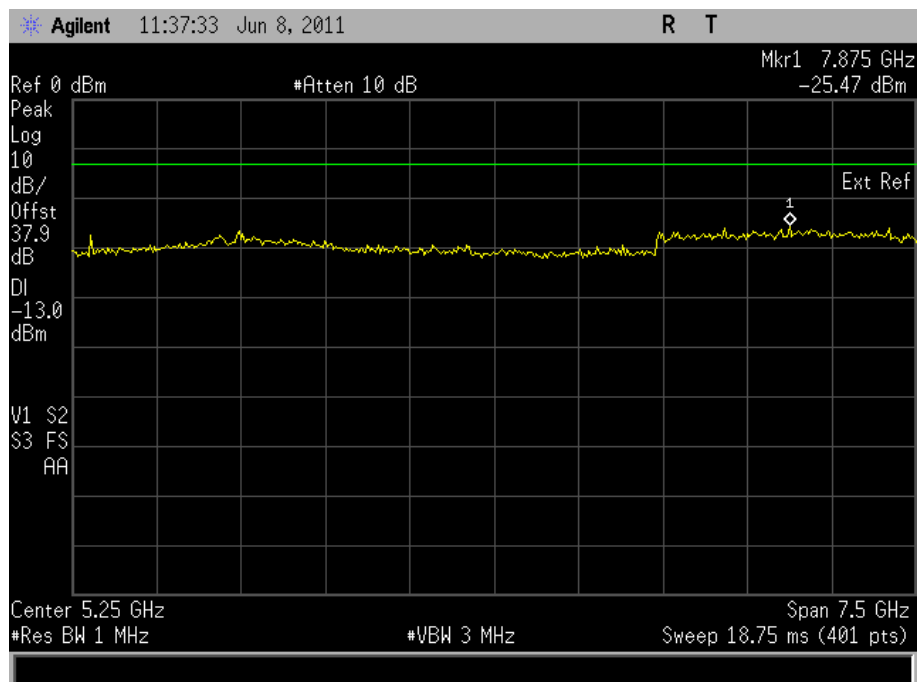


Product Service

Configuration 1 - Mode 2SO55, RC19 kHz to 1.5 GHz1.5 GHz to 9 GHz

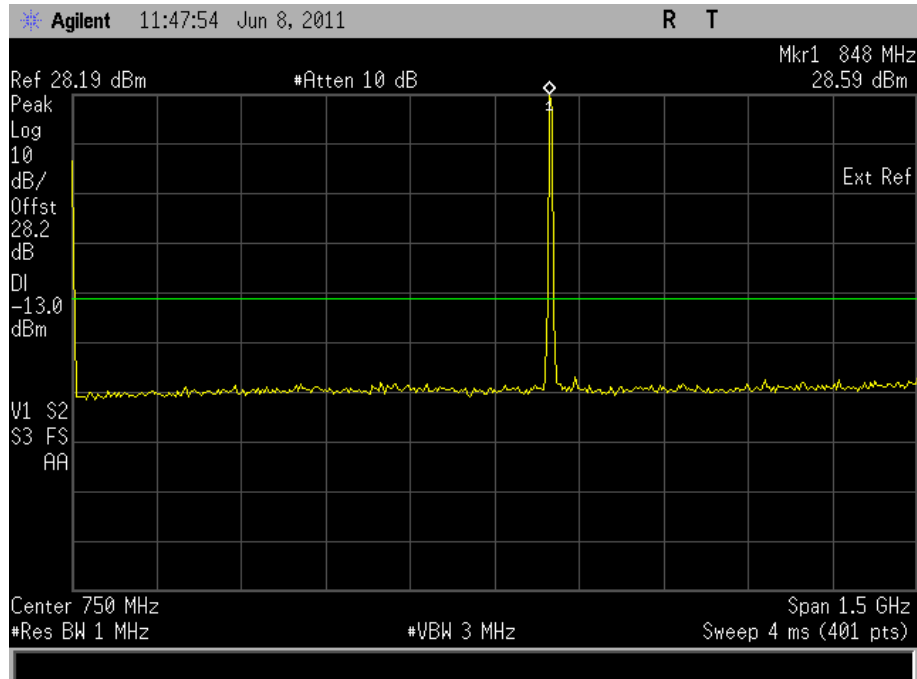
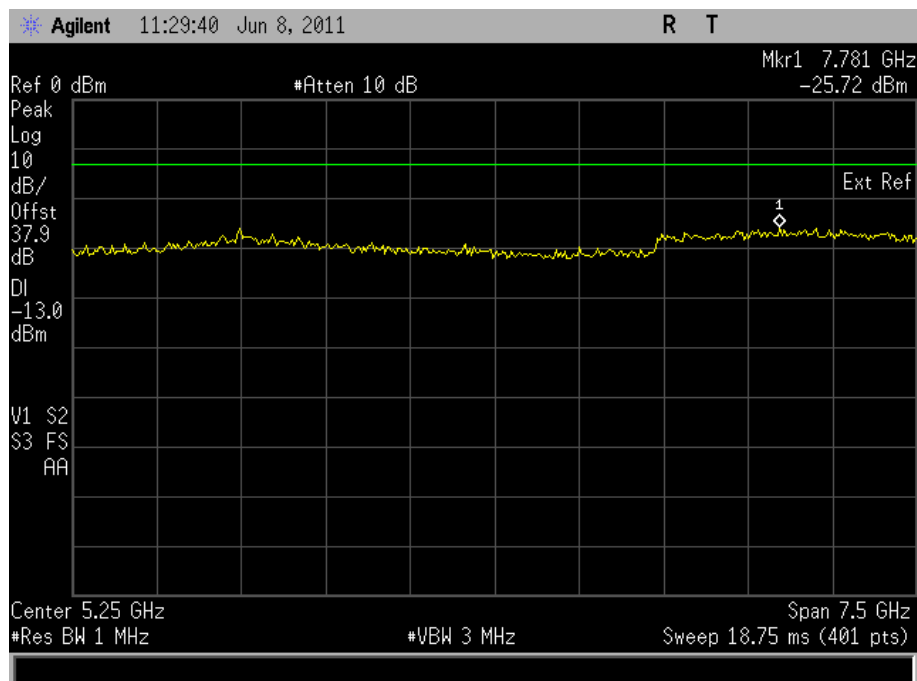


Product Service

TDSO32, FCH + SCH9 kHz to 1.5 GHz1.5 GHz to 9 GHz

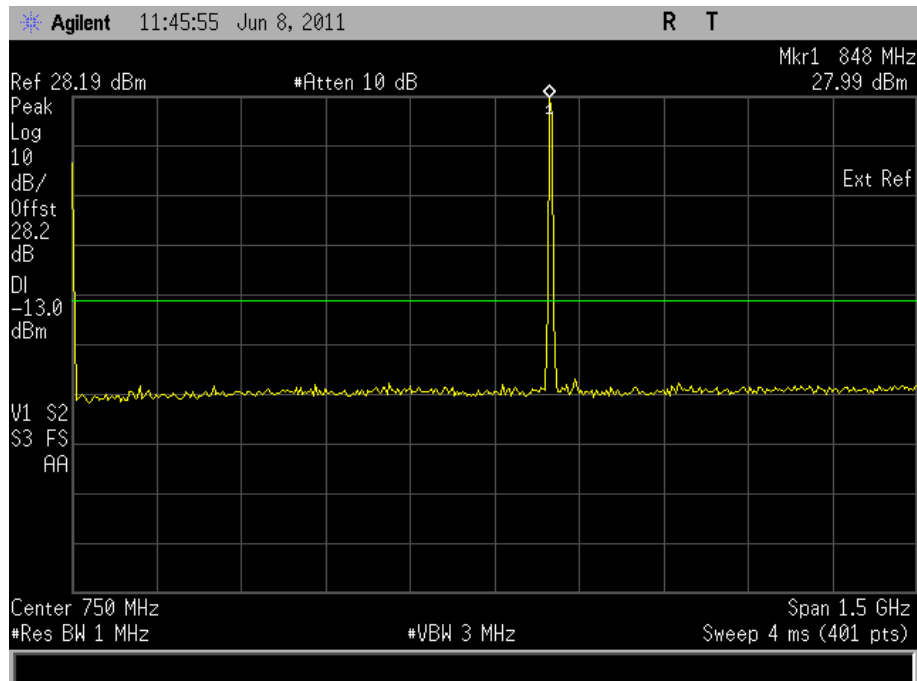
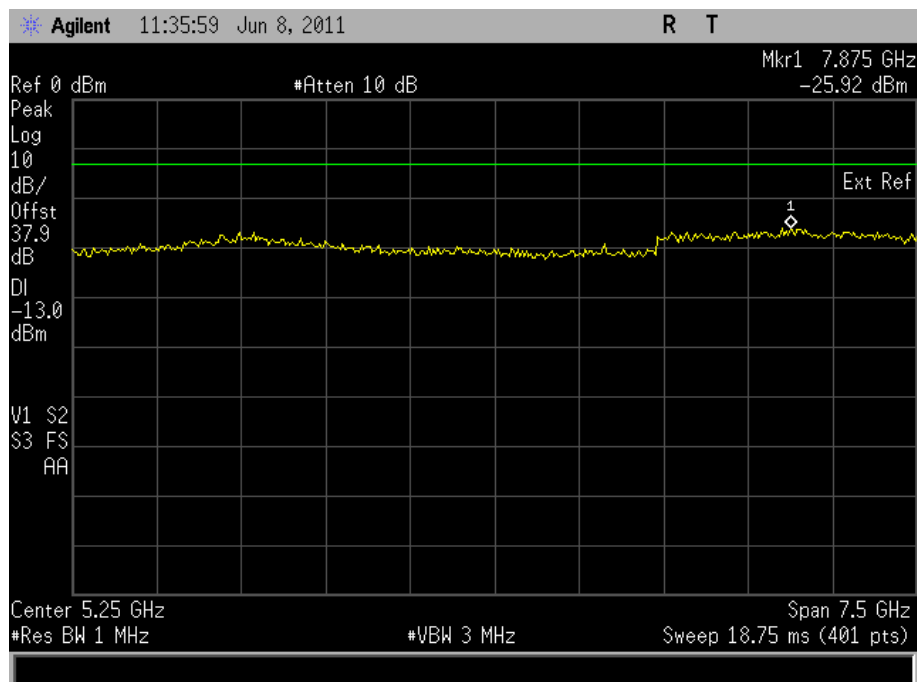


Product Service

Configuration 1 - Mode 3SO55, RC19 kHz to 1.5 GHz1.5 GHz to 9 GHz



Product Service

TDSO32, FCH + SCH9 kHz to 1.5 GHz1.5 GHz to 9 GHzLimit Clause

43+10log(P) or -13 dBm



Product Service

2.6 OCCUPIED BANDWIDTH

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049 (h)
FCC CFR 47 Part 22, Clause 22.917(b)

2.6.2 Equipment Under Test

CDMA SHI12, S/N: SSHFJ000869

2.6.3 Date of Test and Modification State

08 June 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 22.

The EUT was transmitting at maximum power on 64-Ray Orthogonal and BPSK modulations. 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 plot of the following pages 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 1
 - Mode 2
 - Mode 3

2.6.6 Environmental Conditions

08 June 2011

Ambient Temperature 21.3°C

Relative Humidity 41.2%



Product Service

2.6.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and 22 for Occupied Bandwidth.

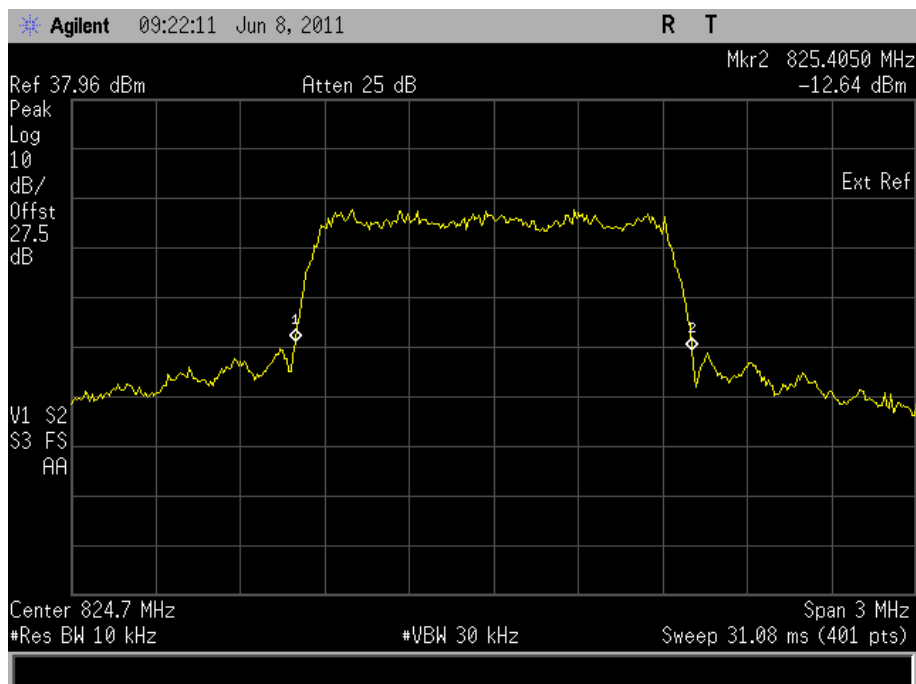
The test results are shown below.

4.0 V DC Supply

Frequency (MHz)	Mode	Modulation	Occupied Bandwidth (kHz)
824.70 MHz	SO55, RC1	64-Ray Orthogonal	1410.0
836.52 MHz	SO55, RC1	64-Ray Orthogonal	1417.5
848.37 MHz	SO55, RC1	64-Ray Orthogonal	1417.5
824.70 MHz	TDSO32, FCH + SCH	BPSK	1417.5
836.52 MHz	TDSO32, FCH + SCH	BPSK	1417.5
848.37 MHz	TDSO32, FCH + SCH	BPSK	1417.5

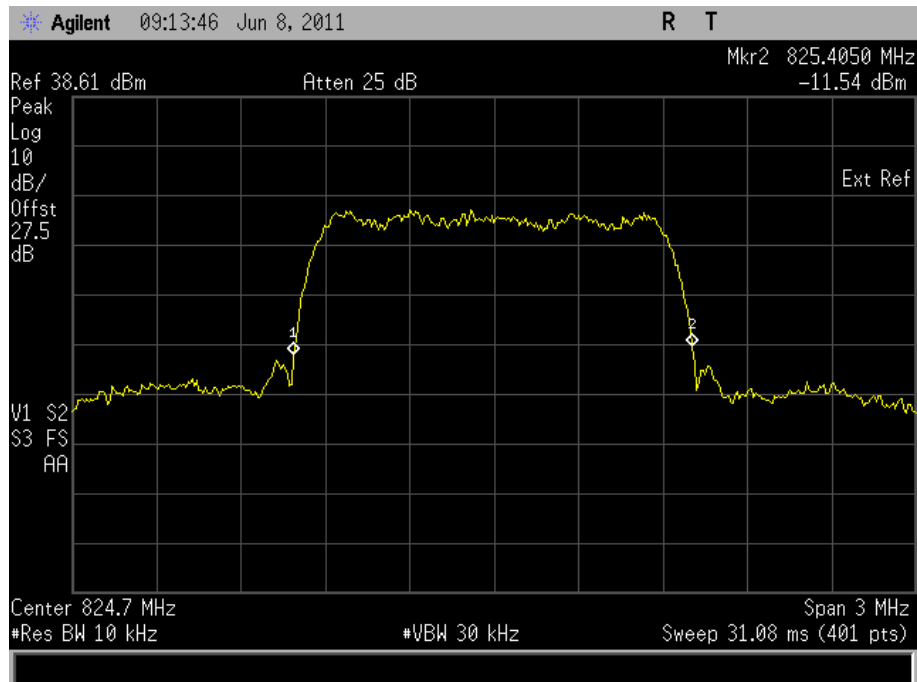
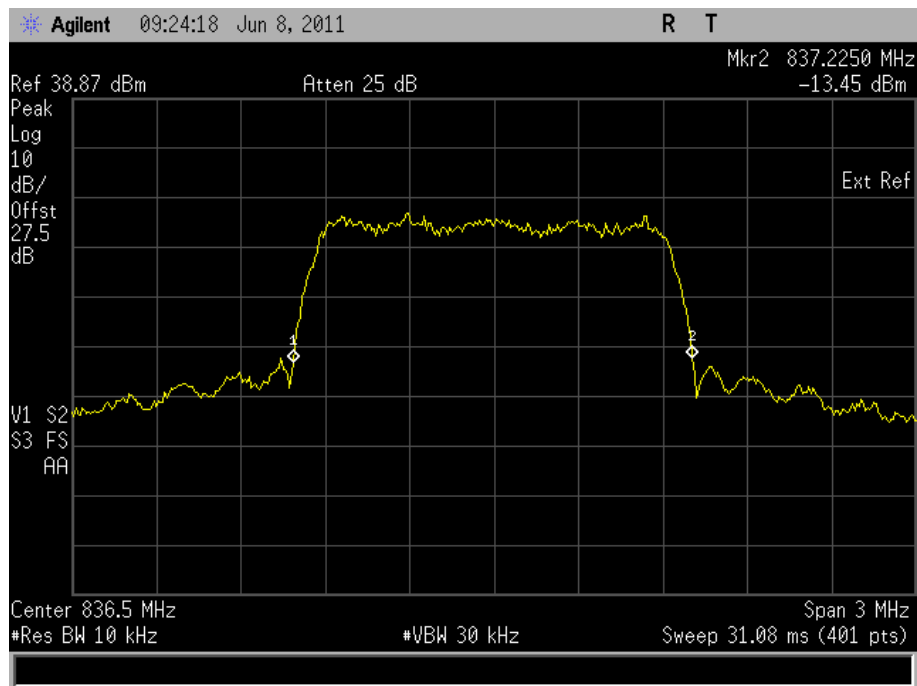
Configuration 1 – Mode 1

SO55, RC1, 64-Ray Orthogonal



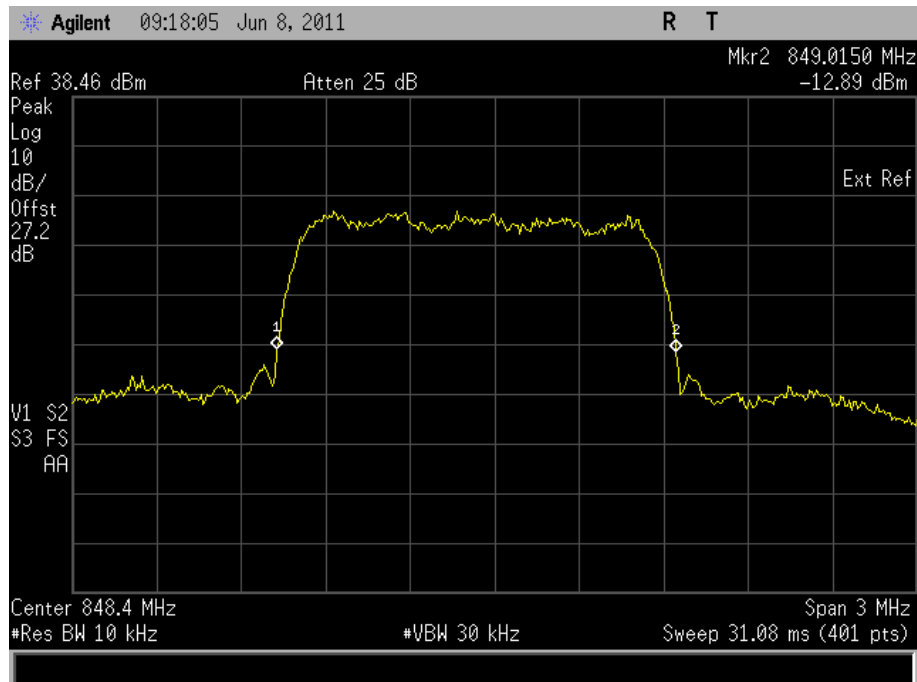
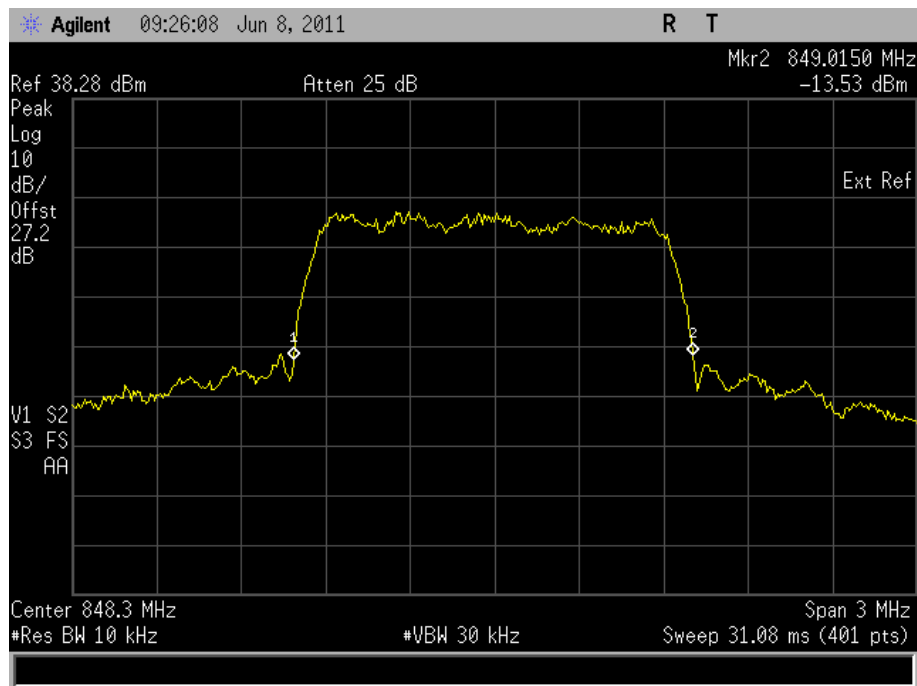


Product Service

TDSO32, FCH + SCH, BPSKConfiguration 1 - Mode 2SO55, RC1, 64-Ray Orthogonal

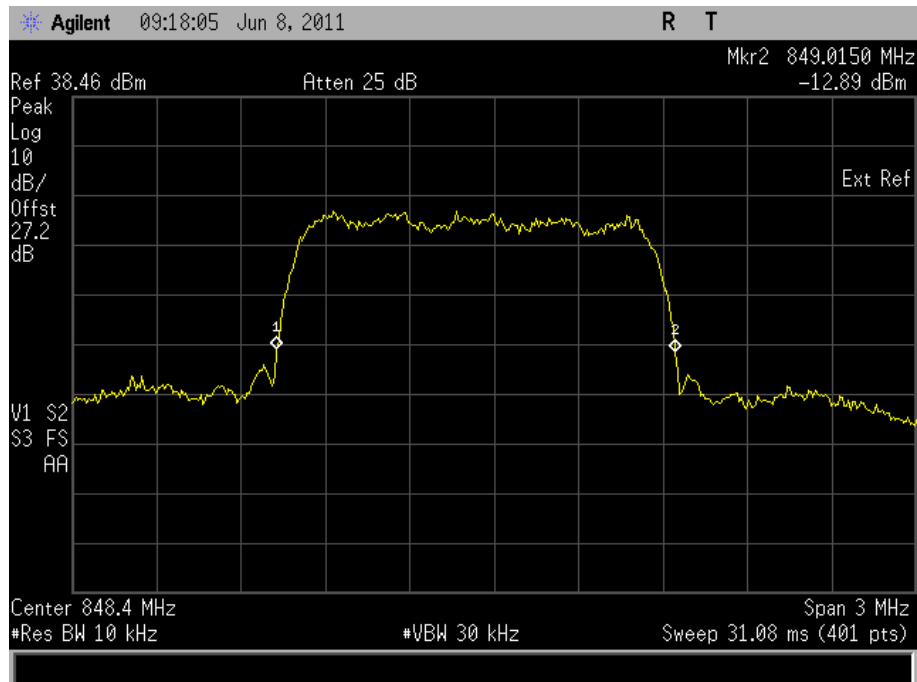


Product Service

TDSO32, FCH + SCH, BPSKConfiguration 1 - Mode 3SO55, RC1, 64-Ray Orthogonal



Product Service

TDSO32, FCH + SCH, BPSKLimit Clause

The occupied bandwidth, that is the frequency bandwidth such that, below is lower and above is upper frequency limits, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.



Product Service

2.7 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.7.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 22, Clause 22.355

2.7.2 Equipment Under Test

CDMA SHI12, S/N: SSHFJ000869

2.7.3 Date of Test and Modification State

13 and 14 June 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 22.

The EUT was set to transmit on maximum power with 64-Ray Orthogonal and BPSK modulations. A Digital Communications Analyser (CMU 200), was used to measure the frequency error. The maximum result was taken over 200 bursts. 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

2.7.6 Environmental Conditions

	13 June 2011	14 June 2011
Ambient Temperature	23.4°C	23.4°C
Relative Humidity	36.5%	36.5%



2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and 22 for Frequency Stability Under Temperature Variations.

The test results are shown below.

Configuration 1 - Mode 2

4.0 V DC Supply

Temperature Interval (°C)	Test Frequency (MHz)	Mode	Modulation	Deviation (Hz)	Limit (kHz)
-30	836.52	SO55, RC1	64-Ray Orthogonal	+15	±1.5ppm or ±2.091
-20	836.52	SO55, RC1	64-Ray Orthogonal	+12	±1.5ppm or ±2.091
-10	836.52	SO55, RC1	64-Ray Orthogonal	-12	±1.5ppm or ±2.091
0	836.52	SO55, RC1	64-Ray Orthogonal	-14	±1.5ppm or ±2.091
+10	836.52	SO55, RC1	64-Ray Orthogonal	-14	±1.5ppm or ±2.091
+20	836.52	SO55, RC1	64-Ray Orthogonal	-21	±1.5ppm or ±2.091
+30	836.52	SO55, RC1	64-Ray Orthogonal	-5	±1.5ppm or ±2.091
+40	836.52	SO55, RC1	64-Ray Orthogonal	-12	±1.5ppm or ±2.091
+50	836.52	SO55, RC1	64-Ray Orthogonal	-10	±1.5ppm or ±2.091
-30	836.52	TDSO32, FCH + SCH	BPSK	+5	±1.5ppm or ±2.091
-20	836.52	TDSO32, FCH + SCH	BPSK	-3	±1.5ppm or ±2.091
-10	836.52	TDSO32, FCH + SCH	BPSK	-3	±1.5ppm or ±2.091
0	836.52	TDSO32, FCH + SCH	BPSK	-5	±1.5ppm or ±2.091
+10	836.52	TDSO32, FCH + SCH	BPSK	-6	±1.5ppm or ±2.091
+20	836.52	TDSO32, FCH + SCH	BPSK	-5	±1.5ppm or ±2.091
+30	836.52	TDSO32, FCH + SCH	BPSK	-4	±1.5ppm or ±2.091
+40	836.52	TDSO32, FCH + SCH	BPSK	-4	±1.5ppm or ±2.091
+50	836.52	TDSO32, FCH + SCH	BPSK	-3	±1.5ppm or ±2.091



Product Service

Limit Clause

Frequency Range (MHz)	Base, Fixed (ppm)	Mobile ≤ 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20	20	50
50 to 450	5	5	50
450 to 512	2.5	5	5
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10	n/a	n/a



Product Service

2.8 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.8.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 22, Clause 22.355

2.8.2 Equipment Under Test

CDMA SHI12, SSHFJ000869

2.8.3 Date of Test and Modification State

08 June 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 22.

The EUT was set to transmit on maximum power on 64-Ray Orthogonal and BPSK modulations schemes. A Digital Communications Analyser (CMU 200), was used to measure the frequency error. The maximum result was taken over 200 bursts.

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

Configuration 1 - Mode 2

2.8.6 Environmental Conditions

08 June 2011

Ambient Temperature 24.4°C

Relative Humidity 35.8%



2.8.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 2 and 22 for Frequency Stability Under Voltage Variations.

The test results are shown below.

Configuration 1 - Mode 2

DC Voltage (V)	Test Frequency (MHz)	Mod	Modulation	Deviation (Hz)	Deviation Limit (kHz)
3.7	836.52	SO55, RC1	64-Ray Orthogonal	+23	±1.5ppm or ±2.091
4.0	836.52	SO55, RC1	64-Ray Orthogonal	+25	±1.5ppm or ±2.091
3.7	836.52	TDSO32, FCH + SCH	BPSK	-21	±1.5ppm or ±2.091
4.0	836.52	TDSO32, FCH + SCH	BPSK	+23	±1.5ppm or ±2.091

Limit Clause

Frequency Range (MHz)	Base, Fixed (ppm)	Mobile ≤ 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20	20	50
50 to 450	5	5	50
450 to 512	2.5	5	5
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10	n/a	n/a



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 – Spurious Emissions at Band Edge					
Multimeter	White Gold	WG022	190	12	26-Oct-2011
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	17-Jun-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	11-Sep-2011
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	12	10-Jun-2012
Combiner/Splitter	Weinschel	1506A	3877	12	22-Feb-2012
Section 2.2 - Effective Radiated Power					
Antenna (Double Ridge Guide)	EMCO	3115	34	12	17-Jul-2011
Spectrum Analyser	Rohde & Schwarz	FSEM	37	12	18-Apr-2012
Power Meter	Hewlett Packard	436A	94	12	11-Oct-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	11-Sep-2011
Screened Room (8)	Rainford	Rainford	1548	-	TU
Hygrometer	Rotronic	I-1000	2882	12	10-Jul-2012
Antenna (DRG Horn)	ETS-LINDGREN	3115	3125	12	27-Apr-2012
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	13-Oct-2011
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2011
Section 2.3- Maximum Peak Output Power – Conducted					
Multimeter	White Gold	WG022	190	12	26-Oct-2011
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	17-Jun-2011
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	12	10-Jun-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	8-Feb-2012
Combiner/Splitter	Weinschel	1506A	3877	12	22-Feb-2012



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.4 - Emission Limitations for Cellular Equipment					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	12-Nov-2011
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	12-Nov-2011
Amplifier (Low Noise, 18GHz-40GHz)	Narda	NARDA DB02-0447	237	12	25-Jun-2011
Antenna (Bilog)	Schaffner	CBL6143	287	24	19-Jan-2012
Antenna (Active Loop, 9kHz-30MHz)	Rohde & Schwarz	HFH2-Z2	333	24	20-Sep-2012
Antenna (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	2-Aug-2012
Pre-Amplifier	Phase One	PS04-0086	1533	12	15-Sep-2011
Pre-Amplifier	Phase One	PS04-0087	1534	12	22-Sep-2011
Screened Room (5)	Rainford	Rainford	1545	24	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
4GHz HPF	Sematron	F-100-4000-5-R	2245	-	TU
High Pass Filter (7GHz)	Lorch	9HP7-7000-SR	2246	12	TU
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	12-Aug-2011
Amplifier (1 - 8GHz)	Phase One	PS06-0060	3175	12	2-Jul-2011
Amplifier (8 - 18GHz)	Phase One	PS06-0061	3176	12	2-Jul-2011
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	9-Sep-2011
3 GHz High Pass Filter	K&L Microwave	11SH10-3000/X18000-O/O	3552	12	14-Apr-2012
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	10-Aug-2011
Tilt Antenna Mast	maturo GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	maturo GmbH	NCD	3917	-	TU
Section 2.5 - Conducted Spurious Emissions					
Multimeter	White Gold	WG022	190	12	26-Oct-2011
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	17-Jun-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	11-Sep-2011
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	3-Sep-2011
Programmable Power Supply	Iso-tech	IPS 2010	2437	-	O/P Mon
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	12-Nov-2011
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	6-Sep-2011
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	22-Dec-2011
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	12	10-Jun-2011
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	10-Jun-2012
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	8-Feb-2012
Combiner/Splitter	Weinschel	1506A	3877	12	22-Feb-2012



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.6 - Occupied Bandwidth					
Spectrum Analyser	Rohde & Schwarz	FSEM	37	12	18-Apr-2012
Multimeter	White Gold	WG022	190	12	26-Oct-2011
DC Power Supply Unit	Hewlett Packard	6267B	294	-	O/P Mon
RF Coupler	TUV	TUV	415	-	TU
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	17-Jun-2011
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	12	10-Jun-2011
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	8-Feb-2012
Combiner/Splitter	Weinschel	1506A	3877	12	22-Feb-2012
Section 2.7 - Frequency Stability under Temperature Variations					
Spectrum Analyser	Rohde & Schwarz	FSEM	37	12	18-Apr-2012
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Multimeter	White Gold	WG022	190	12	26-Oct-2011
DC Power Supply Unit	Hewlett Packard	6267B	294	-	O/P Mon
Termination 50ohm/50W	Bird	8085	389	12	3-Sep-2011
RF Coupler	TUV	TUV	415	-	TU
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	23-Jun-2011
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Thermocouple Thermometer	Fluke	51	3172	12	12-Jul-2011
Thermocouple Thermometer	Fluke	51	3173	12	12-Jul-2011
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	11-Jan-2012
Combiner/Splitter	Weinschel	1506A	3880	12	22-Feb-2012
Radiocommunications Tester	Rohde & Schwarz	CMU 200	-	12	02-Feb-2012
Section 2.8 - Frequency Stability under Voltage Variations					
Multimeter	White Gold	WG022	190	12	26-Oct-2011
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	23-Jun-2011
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	11-Jan-2012
Combiner/Splitter	Weinschel	1506A	3880	12	22-Feb-2012
Radiocommunications Tester	Rohde & Schwarz	CMU 200	-	12	02-Feb-2012

TU – Traceability Unscheduled

O/P Mon – Output monitored using calibrated equipment.



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	10MHz to 6GHz Test Amplitude	2.0dB†
Conducted Susceptibility RF	50kHz to 1000MHz Amplitude	3.1dB•
	EM Clamp Method of Test	1.2dB•
	CDN Method of Test	1.1dB•
	BCI Clamp Method of Test	1.2dB•
Conducted Susceptibility LF	DC to 150kHz	1.0%†
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°
Channel Occupancy/Separation	19.1kHz	N/A
Maximum Output Power	Not Applicable	±0.5dB
Number of Channels	Not Applicable	N/A
20dB Bandwidth	19.1kHz	±0.5dB

Worst case error for both Time and Frequency measurement 12 parts in 10^6 .

- * In accordance with CISPR 16-4-2
- † In accordance with UKAS Lab 34
- In accordance with EN61000-4-6



Product Service

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

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

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA
(Not UKAS Accredited).

This report must not be reproduced, except in its entirety, without the written permission of
TÜV SÜD Product Service Limited

© 2011 TÜV SÜD Product Service Limited