Product Service

Choose certainty.
Add value.

Report On

FCC Testing of the Sharp SHL25 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDD I, FDD V) & Quad-band LTE (B1, B3, B17, B18) & AXGP (TDD 41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS in accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 22 (CDMA 2000)

COMMERCIAL-IN-CONFIDENCE
FCC ID: APYHRO00206

Document 75925936 Report 01 Issue 1 May 2014

Product Service

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

REPORT ON

FCC Testing of the Sharp SHL25 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDD I, FDD V) & Quad-band LTE (B1, B3, B17, B18) & AXGP (TDD 41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS in accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 22 (CDMA 2000)

Document 75925936 Report 01 Issue 1

May 2014

PREPARED FOR

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

PREPARED BY

Natalie Bennett
Senior Administrator, Technical Solutions

APPROVED BY

Ryan Henley
Authorised Signatory

DATED 13 May 2014

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 FCC CFR 47 Part 22. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Russell G Lawler A Galpin

UKAS TESTING 0141

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp SHL25 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDD I, FDD V) & Quad-band LTE (B1, B3, B17, B18) & AXGP (TDD 41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 22 (CDMA 2000)

Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp SHL25 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDD I, FDD V) & Quad-band LTE (B1, B3, B17, B18) & AXGP (TDD 41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS to the requirements of FCC CFR 47 Part 2 and FCC CFR 47 Part 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)	SHL25
Serial Number(s)	IMEI 004401115170793 IMEI 004401115171528
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 2 (2013) FCC CFR 47 Part 22 (2013)
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	10070 10 March 2014
Start of Test	10 April 2014
Finish of Test	1 May 2014
Name of Engineer(s)	M Russell G Lawler A Galpin
Related Document(s)	ANSI C63.4: 2009 KDB 971168 v02 r01

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 22 is shown below.

Section	Spec Clause		Test Description	Result	Comments/Base Standard
	Pt 2	Pt 22			
CDMA 2000 - Loopback Service					
2.1	2.1051	22.905	Spurious Emissions at Band Edge	Pass	
2.2	-	22.913 (a)	Effective Radiated Power	Pass	
2.3	2.1046 and	22.913 (a)	Maximum Peak Output Power - Conducted	Pass	
2.4	-	22.917	Emission Limitations for Cellular Equipment	Pass	
2.5	2.1051 and	22.917 (a)	Conducted Spurious Emissions	Pass	
2.6	2.1049 (h)	22.917 (b)	Occupied Bandwidth	Pass	
2.7	2.1047 (d)	-	Modulation Characteristics	-	Customer Declaration
2.8	2.1055	22.355	Frequency Stability	Pass	

Product Service

Section	Spec Clause		Test Description	Result	Comments/Base Standard
	Pt 2	Pt 22			
CDMA 2000 - Test Data Service					
2.1	2.1051	22.905	Spurious Emissions at Band Edge	Pass	
2.2	-	22.913 (a)	Effective Radiated Power	Pass	
2.3	2.1046	22.913 (a)	Maximum Peak Output Power - Conducted	Pass	
2.4	-	22.917	Emission Limitations for Cellular Equipment	Pass	
2.5	2.1051	22.917 (a)	Conducted Spurious Emissions	Pass	
2.6	2.1049 (h)	22.917 (b)	Occupied Bandwidth	Pass	
2.7	2.1047 (d)	-	Modulation Characteristics	-	Customer Declaration
2.8	2.1055	22.355	Frequency Stability	Pass	

Product Service

1.3 PRODUCT TECHNICAL DESCRIPTION

Please refer to the SHL25 Model Description Form.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp SHL25 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDD I, FDD V) & Quad-band LTE (B1, B3, B17, B18) & AXGP (TDD 41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS. A full technical description can be found in the manufacturer's documentation.

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.

The EUT was powered from a 4.0 V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

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

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.

Product Service

SECTION 2

TEST DETAILS

FCC Testing of the
Sharp SHL25 Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDD I, FDD V) & Quad-band LTE (B1, B3, B17, B18) & AXGP (TDD 41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 22 (CDMA 2000)

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 and Modification State

SHL25 S/N: IMEI 004401115170793 - Modification State 0

2.1.3 Date of Test

23 April 2014

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 Procedure

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 22.905 and KDB 971168.

The EUT was configured in a CDMA 2000 1xRTT connection using SO55, RC3 forward/reverse radio configuration and test data SO32 RC3 forward/reverse radio configuration transmitting full rate on FCH with all other code channels disabled at maximum output power using a communications test set. The EUT was connected to a spectrum analyser via a cable, combiner and attenuator. The path loss was entered as a reference level offset. The RBW was adjusted to a minimum of 1% of the emission bandwidth with a VBW of 3 times RBW using a peak detector and max hold. A sufficient number of sweeps were allowed for the trace to stabilise before measuring the greatest emission within 1 MHz adjacent to the authorised bandwidth edge. This test sequence was repeated to measure the emissions adjacent to the bottom and top edges of the authorised bandwidth.

2.1.6 Environmental Conditions

Ambient Temperature	25.6°C
Relative Humidity	40.1%

Product Service

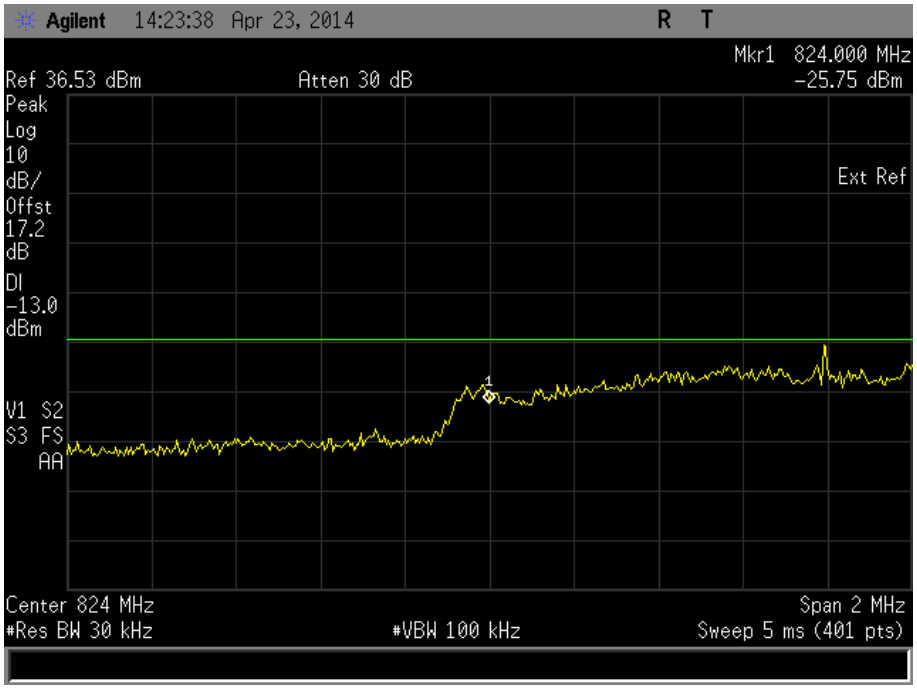
2.1.7 Test Results

CDMA 2000 - Loopback Service

4.0 V DC Supply

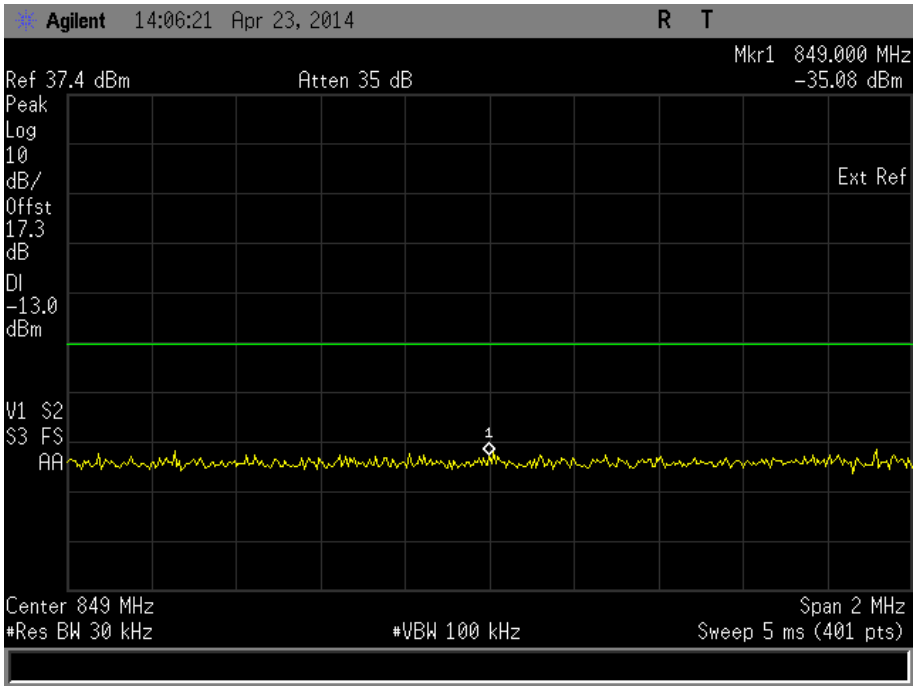
Frequency Block (MHz)	Mode	Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
A :(824.0 – 835.0)	SO55, RC3	Channel : 26 Frequency : 825.78 MHz	N/A
B :(846.5 – 849.0)	SO55, RC3	N/A	Channel : 136 Frequency : 829.08MHz

Frequency Block A



Product Service

Frequency Block B



Limit Clause

-13 dBm at block edge.

Remarks

CDMA 200 Band Class 0 Band Sub Class 2 (800 MHz cellular band) is restricted to the following operating range:

Tx: 825.78 MHz – 829.08 MHz (26CH – 136CH)
Rx: 870.78 MHz – 874.08 MHz (26CH – 136CH)

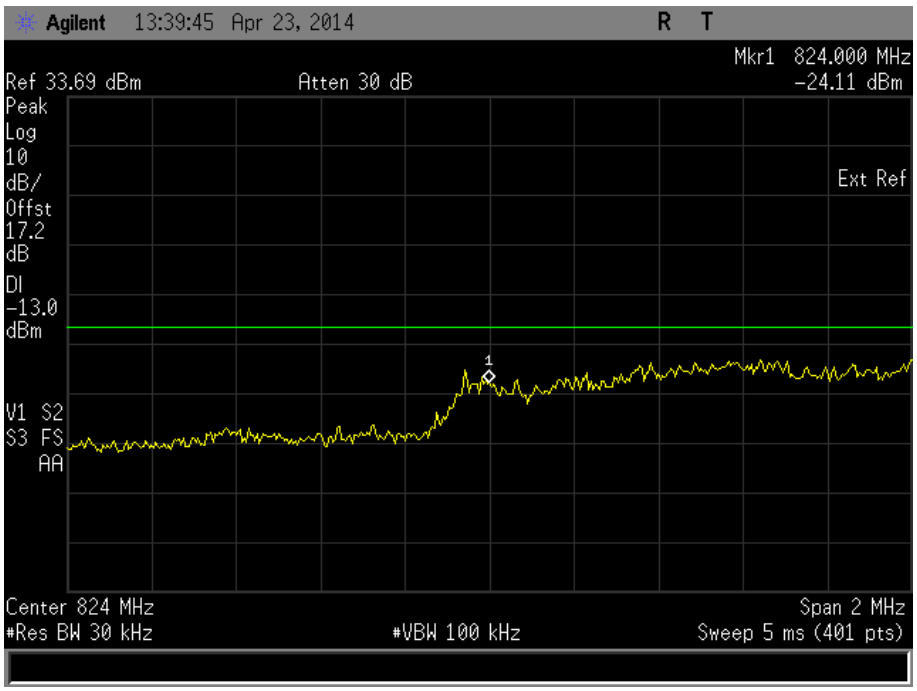
Product Service

CDMA 2000 - Test Data Service

4.0 V DC Supply

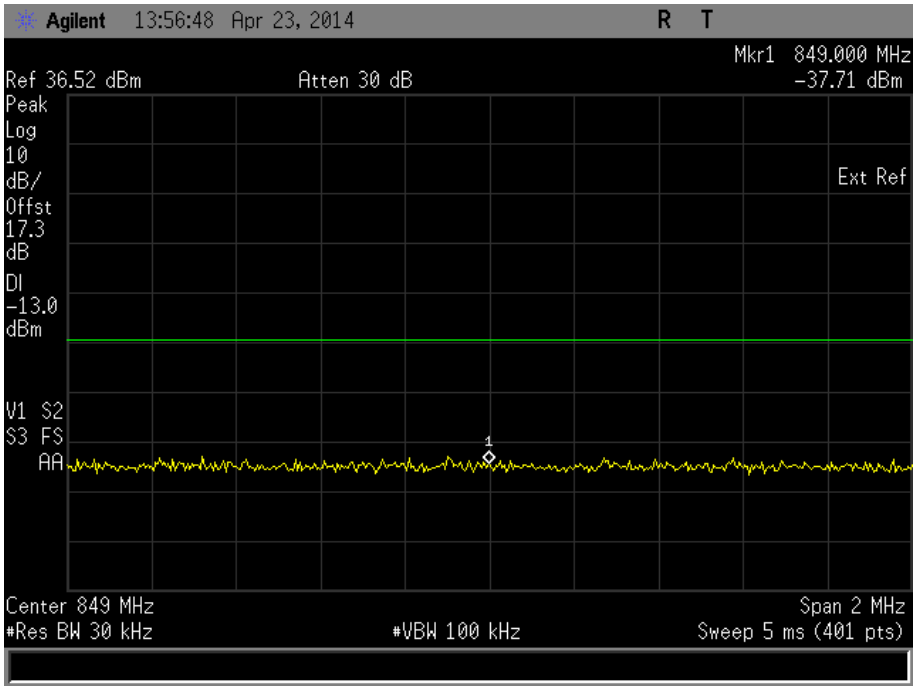
Frequency Block (MHz)	Mode	Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
A :(824.0 – 835.0)	TDSO32 +FCH, RC3	Channel : 26 Frequency : 825.78 MHz	N/A
B :(846.5 – 849.0)	TDSO32 +FCH, RC3	N/A	Channel : 136 Frequency : 829.08MHz

Frequency Block A



Product Service

Frequency Block B



Limit Clause

-13 dBm at block edge.

Remarks

CDMA 200 Band Class 0 Band Sub Class 2 (800 MHz cellular band) is restricted to the following operating range:

Tx: 825.78 MHz – 829.08 MHz (26CH – 136CH)
Rx: 870.78 MHz – 874.08 MHz (26CH – 136CH)

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 and Modification State

SHL25 S/N: IMEI 004401115171528 - Modification State 0

2.2.3 Date of Test

14 April 2014

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 Procedure

The EUT was transmitted at maximum power via a cable to the Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a resolution bandwidth and video bandwidth of 1 MHz were used to perform the measurement. The level on the spectrum analyser was maximised by rotating the EUT through 360° and a height search of the measuring antenna. A substitution was then performed using a suitable calibrated antenna and signal generator.

This level was maximised by adjusting the height of the measuring antenna once more. The level from the signal generator was then adjusted to achieve the same raw result as with the EUT. This level was then corrected to account for cable loss and antenna factor.

A calculation was then performed to obtain the final figure.

2.2.6 Environmental Conditions

Ambient Temperature	20.4°C
Relative Humidity	30.0%

Product Service

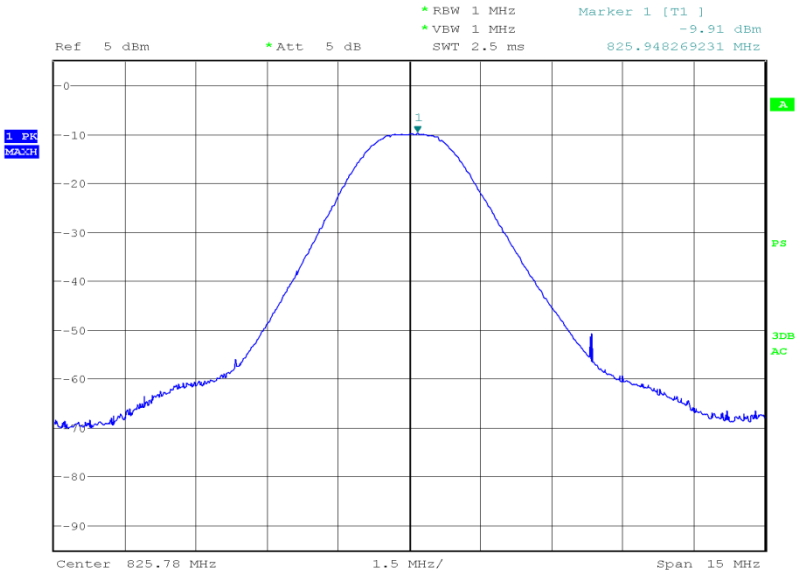
2.2.7 Test Results

CDMA 2000 - Loopback Service

4.0 V DC Supply

825.78 MHz

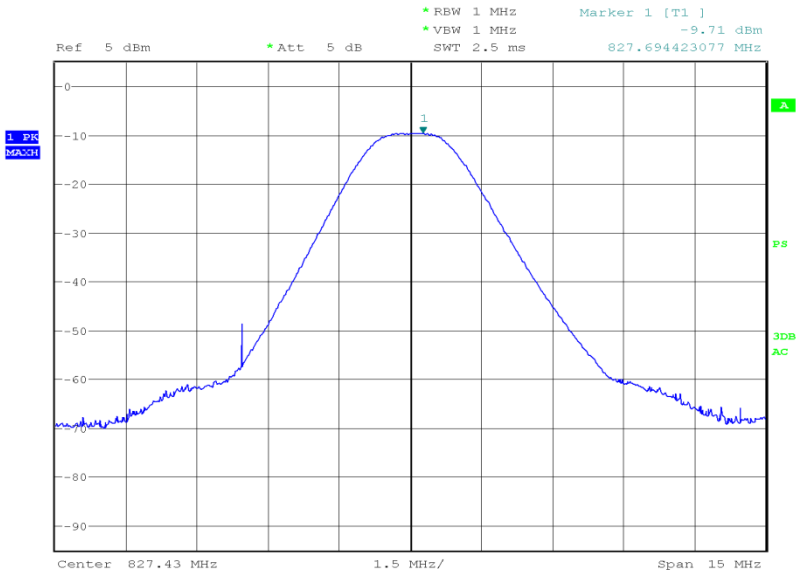
Result (dBm)	Result (W)
22.27	0.169



Date: 14.APR.2014 20:16:04

827.43 MHz

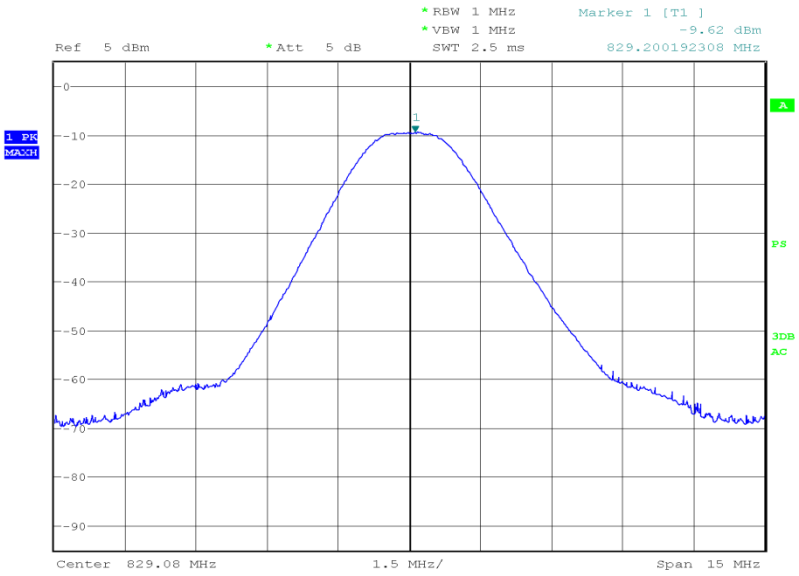
Result (dBm)	Result (W)
22.36	0.172



Date: 14.APR.2014 20:33:05

829.08 MHz

Result (dBm)	Result (W)
22.42	0.175



Date: 14.APR.2014 20:36:58

Limit Clause

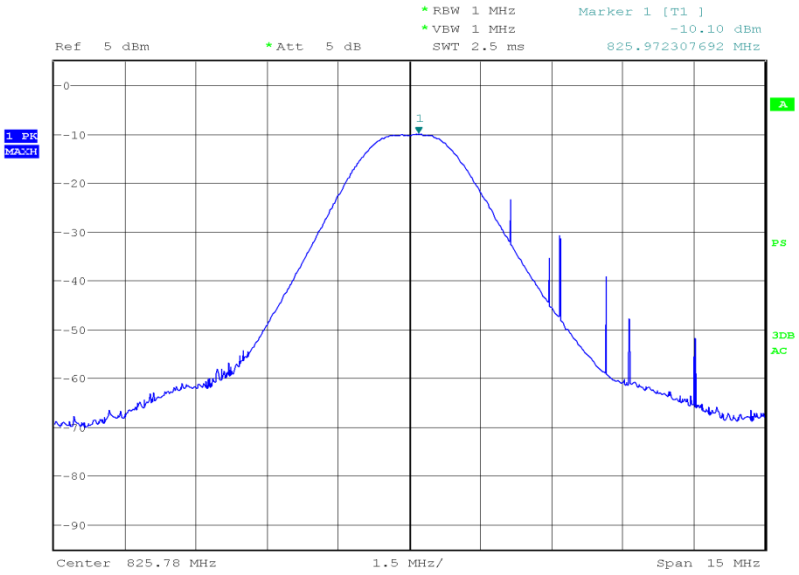
Mobile – 7 W or 38.45 dBm

CDMA 2000 - Test Data Service

4.0 V DC Supply

825.78 MHz

Result (dBm)	Result (W)
22.08	0.161

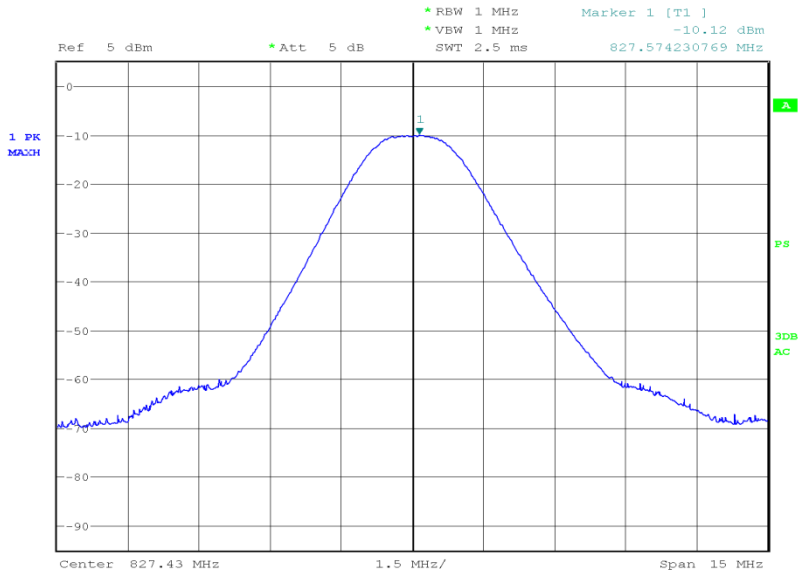


Date: 14.APR.2014 18:52:23

Product Service

827.43 MHz

Result (dBm)	Result (W)
21.95	0.157

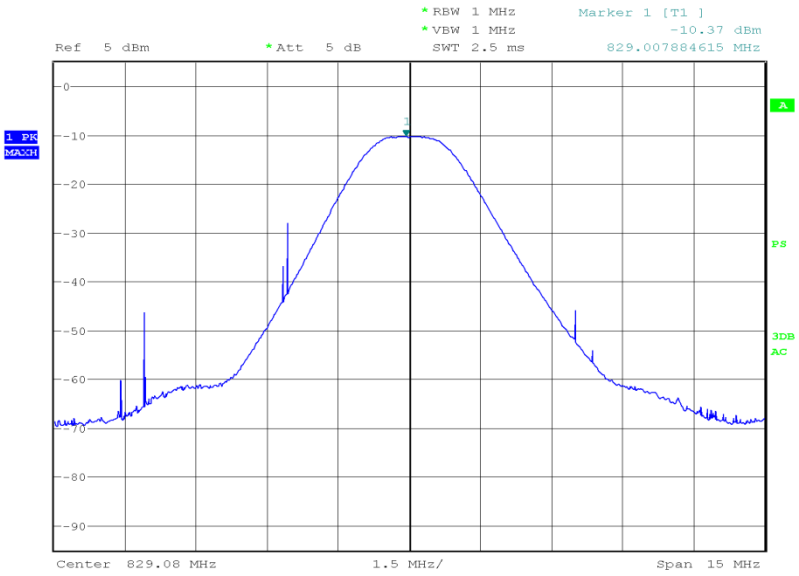


Date: 14.APR.2014 18:55:03

Product Service

829.08 MHz

Result (dBm)	Result (W)
21.67	0.147



Date: 14.APR.2014 19:00:38

Limit Clause

Mobile – 7 W or 38.45 dBm

2.3 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 22, Clause 22.913 (a)

2.3.2 Equipment Under Test and Modification State

SHL25 S/N: IMEI 004401115170793 - Modification State 0

2.3.3 Date of Test

10 April 2014

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 Procedure

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 22.913 (a), FCC CFR 47 Part 2.1046 and KDB 971168.

The EUT was configured in a CDMA 2000 1xRTT connection using SO55 Loopback Service Option RC3 forward/reverse radio configuration and test data SO32 RC3 forward/reverse radio configuration transmitting full rate on FCH with all other code channels disabled at maximum output power using a communications test set.. The EUT was connected to a wideband power meter via a cable, combiner and attenuator. The path loss was entered as an offset on the power meter and the peak result was recorded.

2.3.6 Environmental Conditions

Ambient Temperature	23.2°C
Relative Humidity	29.5 - 29.8%

Product Service

2.3.7 Test Results

CDMA 2000 - Loopback Service

4.0 V DC Supply

825.78 MHz

Mode	Result (dBm)	Result (W)
SO55, RC3	28.57	0.72

827.43 MHz

Mode	Result (dBm)	Result (W)
SO55, RC3	28.75	0.75

829.08 MHz

Mode	Result (dBm)	Result (W)
SO55, RC3	28.69	0.74

Limit Clause

Mobile – 7 W or 38.45 dBm

Product Service

CDMA 2000 - Test Data Service

4.0 V DC Supply

825.78 MHz

Mode	Result (dBm)	Result (W)
TDSO32 +FCH, RC3	28.54	0.72

827.43 MHz

Mode	Result (dBm)	Result (W)
TDSO32 +FCH, RC3	28.75	0.75

829.08 MHz

Mode	Result (dBm)	Result (W)
TDSO32 +FCH, RC3	28.69	0.74

Limit Clause

Mobile – 7 W or 38.45 dBm

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 and Modification State

SHL25 S/N: IMEI 004401115171528 - Modification State 0

2.4.3 Date of Test

14 April 2014

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 Procedure

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 maximum power with modulation. 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.

2.4.6 Environmental Conditions

Ambient Temperature	20.4°C
Relative Humidity	30.0%

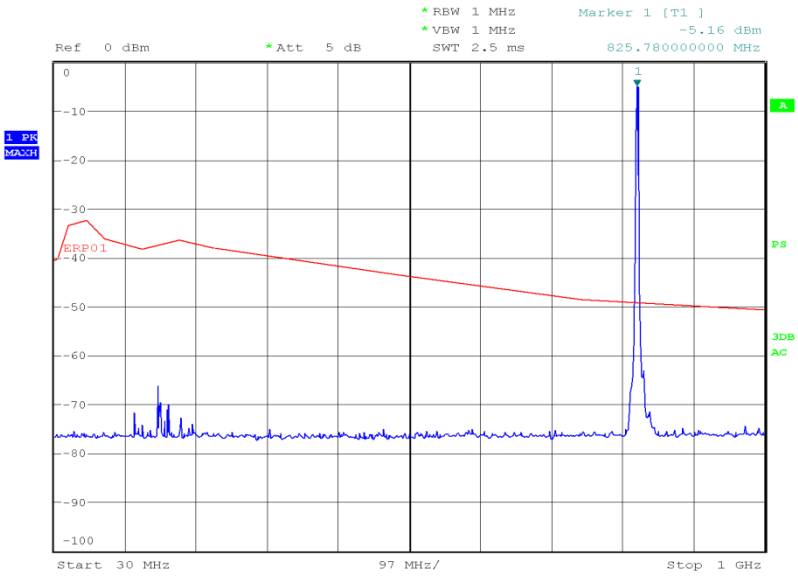
Product Service

2.4.7 Test Results

CDMA 2000 - Loopback Service

825.78 MHz

30 MHz to 1 GHz



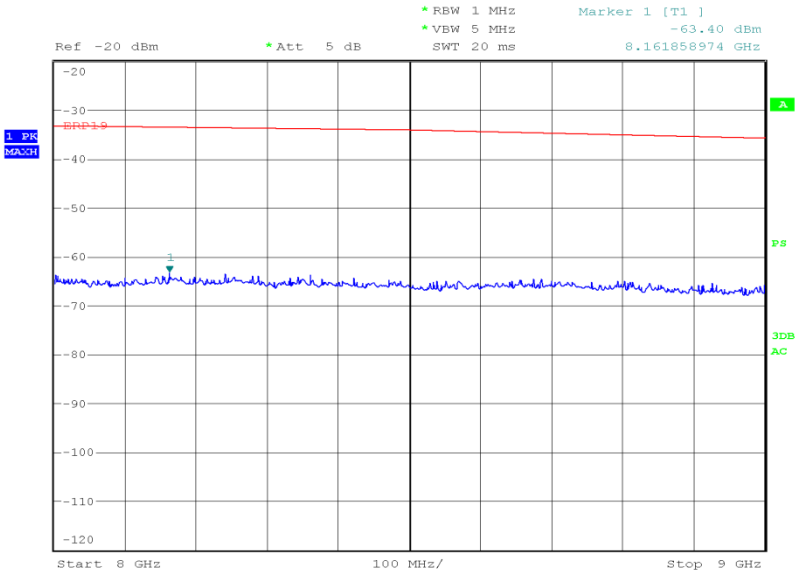
Date: 14.APR.2014 17:14:03

1 GHz to 8 GHz

Date: 14.APR.2014 19:29:37

Product Service

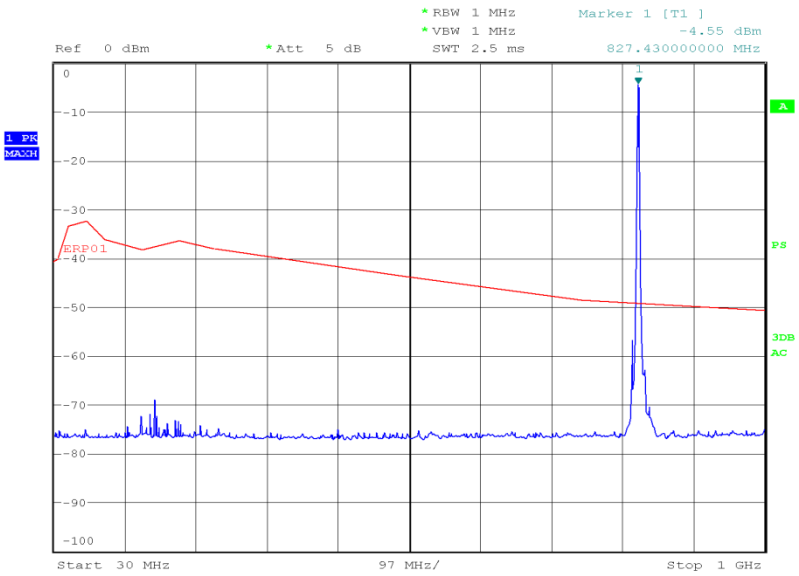
8 GHz to 9 GHz



Date: 14.APR.2014 21:25:13

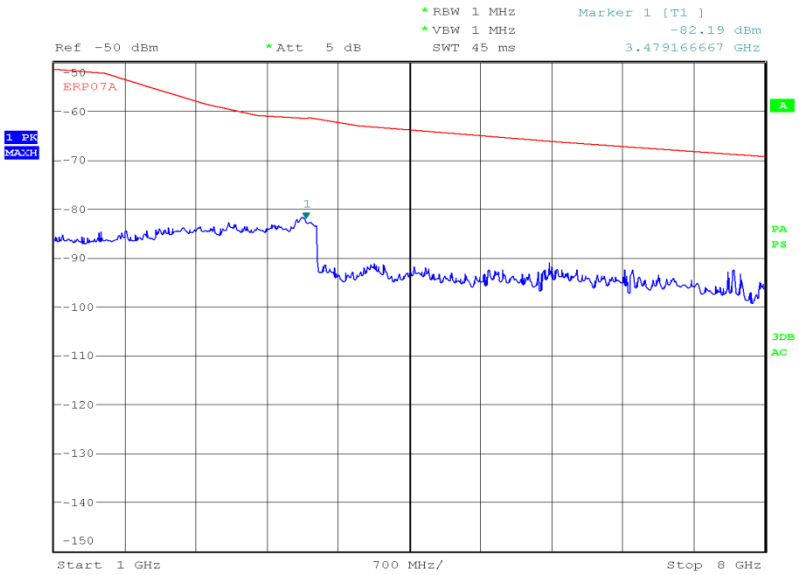
827.43 MHz

30 MHz to 1 GHz



Date: 14.APR.2014 17:20:09

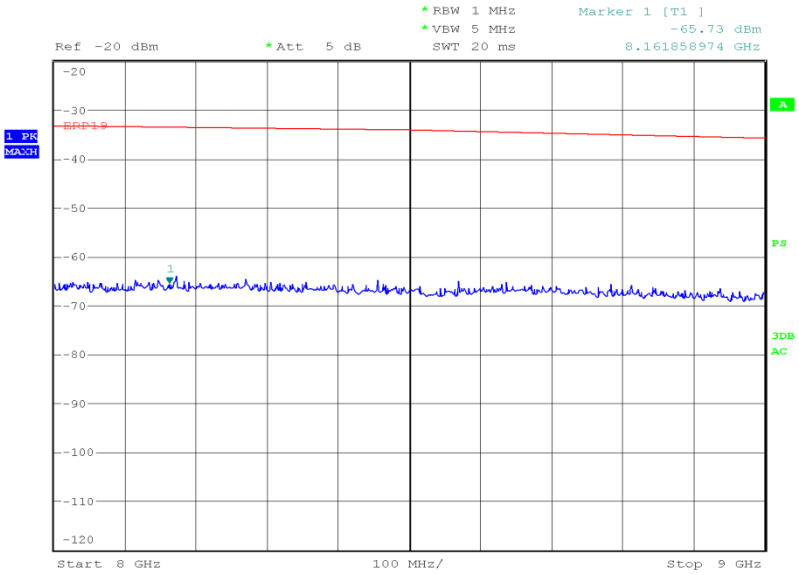
1 GHz to 8 GHz



Date: 14.APR.2014 19:38:30

Product Service

8 GHz to 9 GHz

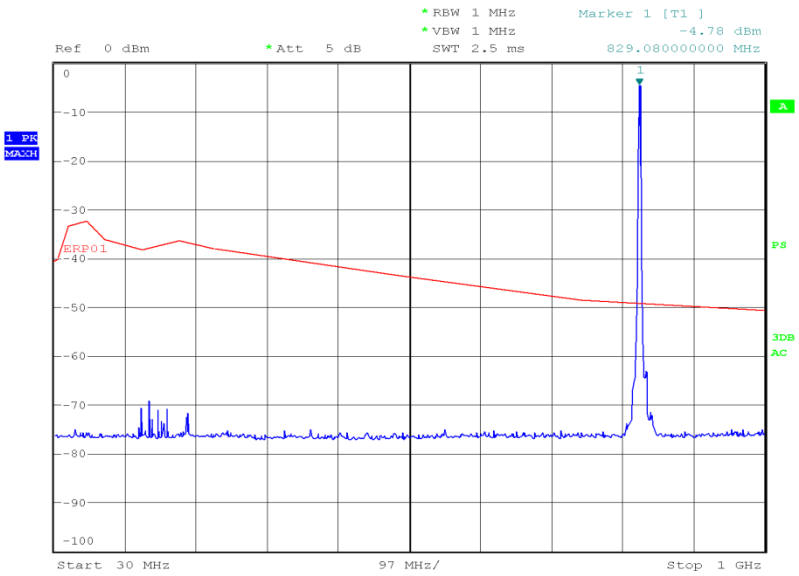


Date: 14.APR.2014 21:26:57

Product Service

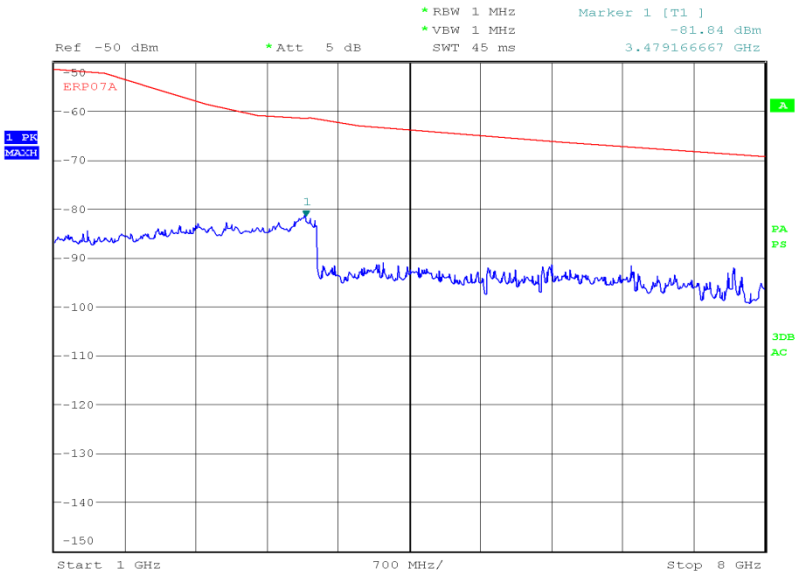
829.08 MHz

30 MHz to 1 GHz



Date: 14.APR.2014 17:25:18

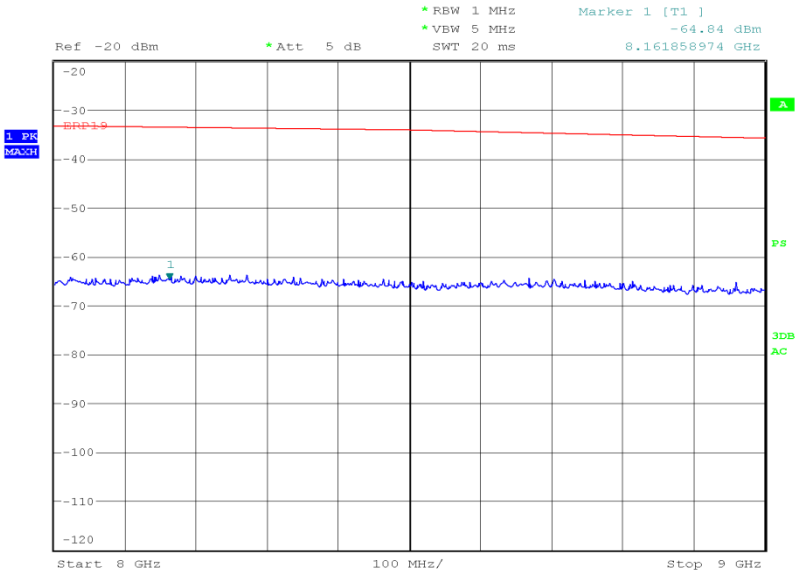
1 GHz to 8 GHz



Date: 14.APR.2014 20:01:03

Product Service

8 GHz to 9 GHz



Date: 14.APR.2014 21:29:36

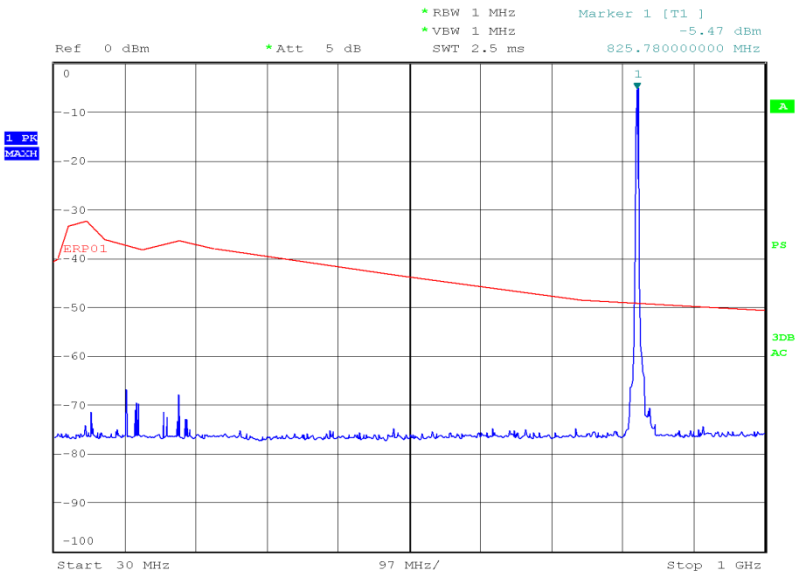
Limit Clause

43+10log(P) or -13 dBm

CDMA 2000 - Test Data Service

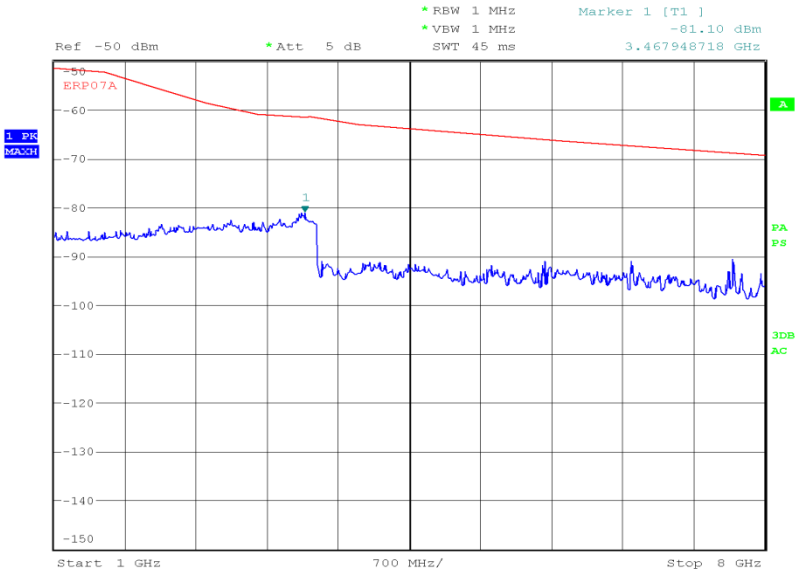
825.78 MHz

30 MHz to 1 GHz



Date: 14.APR.2014 18:11:36

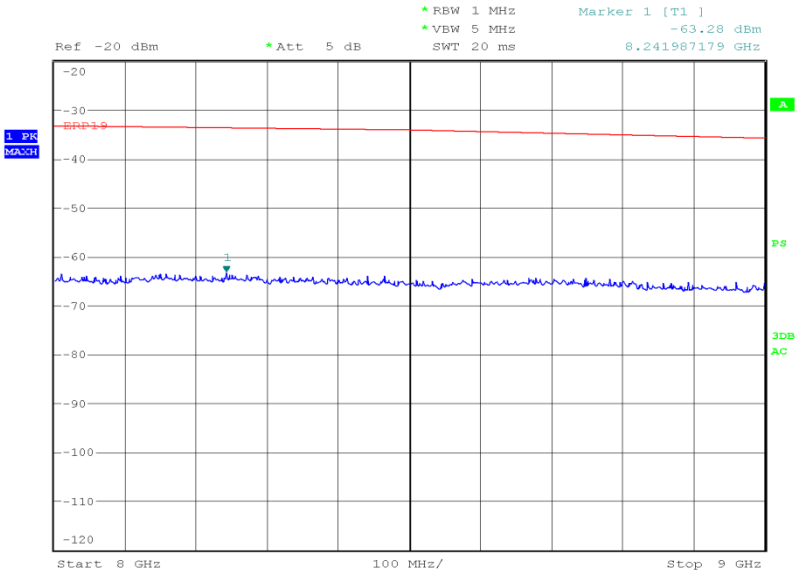
1 GHz to 8 GHz



Date: 14.APR.2014 19:12:47

Product Service

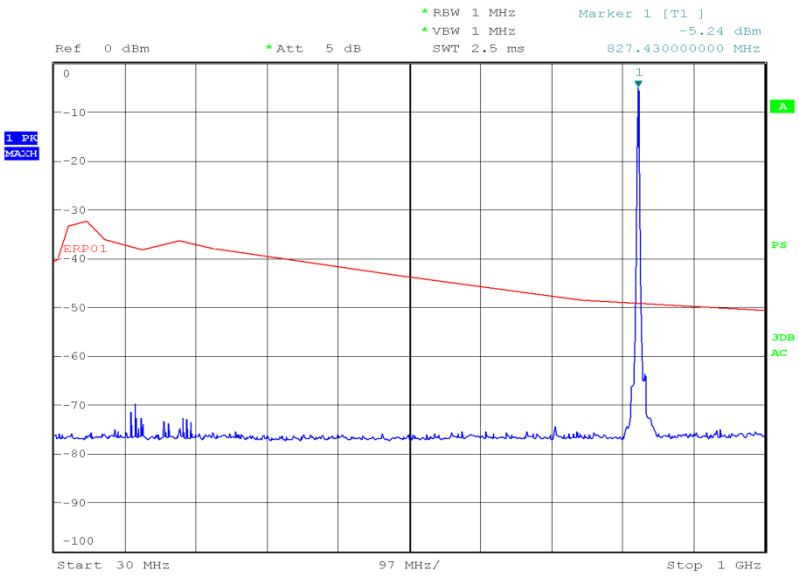
8 GHz to 9 GHz



Date: 14.APR.2014 21:34:40

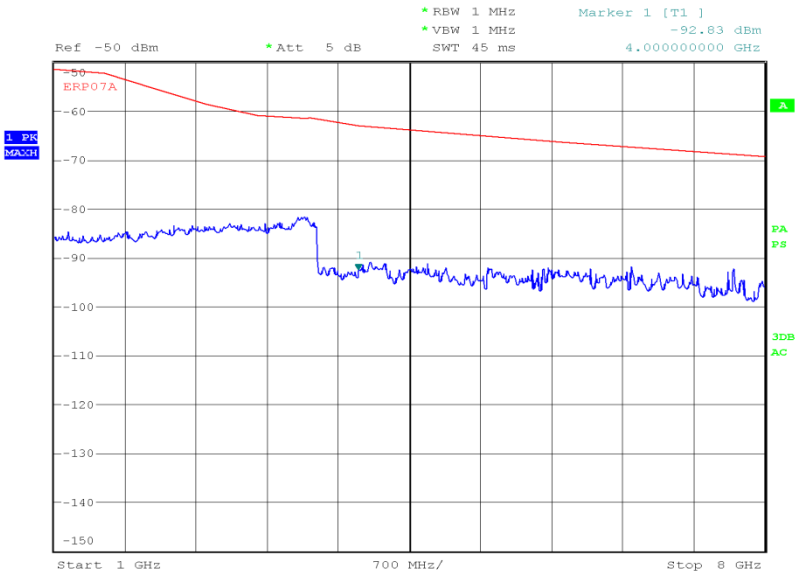
827.43 MHz

30 MHz to 1 GHz



Date: 14.APR.2014 18:14:19

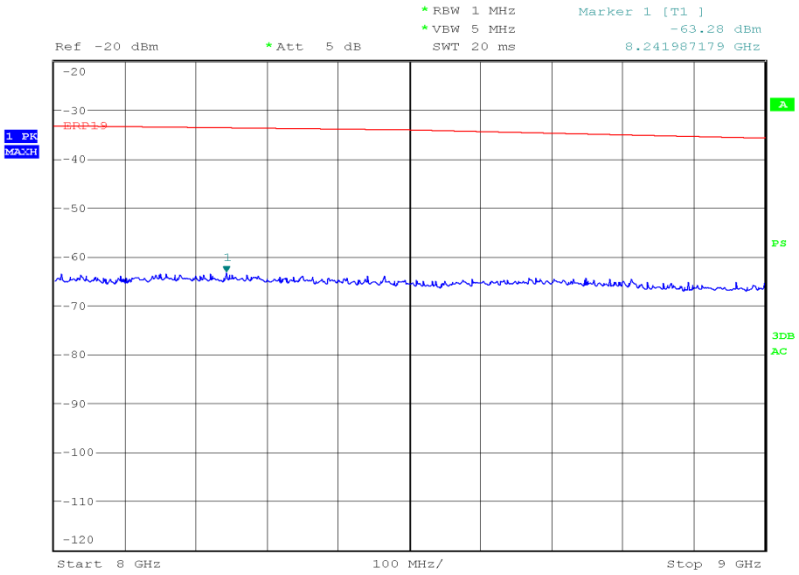
1 GHz to 8 GHz



Date: 14.APR.2014 19:09:10

Product Service

8 GHz to 9 GHz

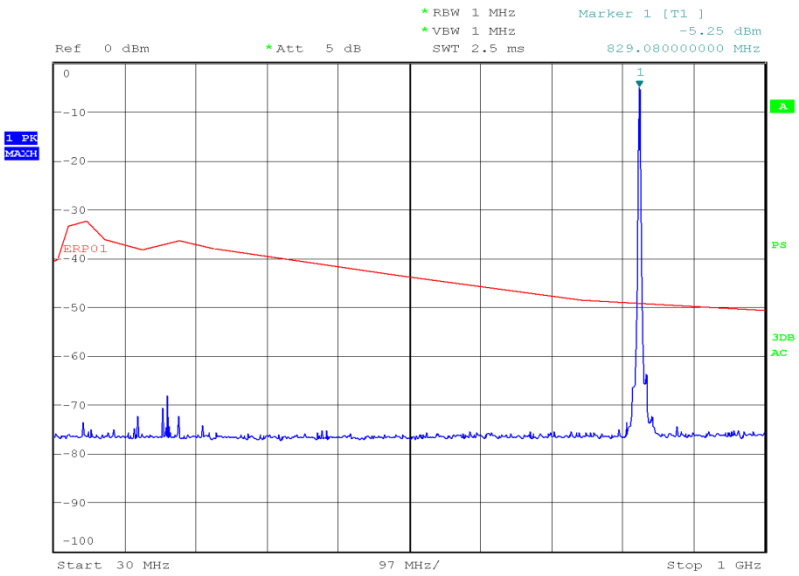


Date: 14.APR.2014 21:36:49

Product Service

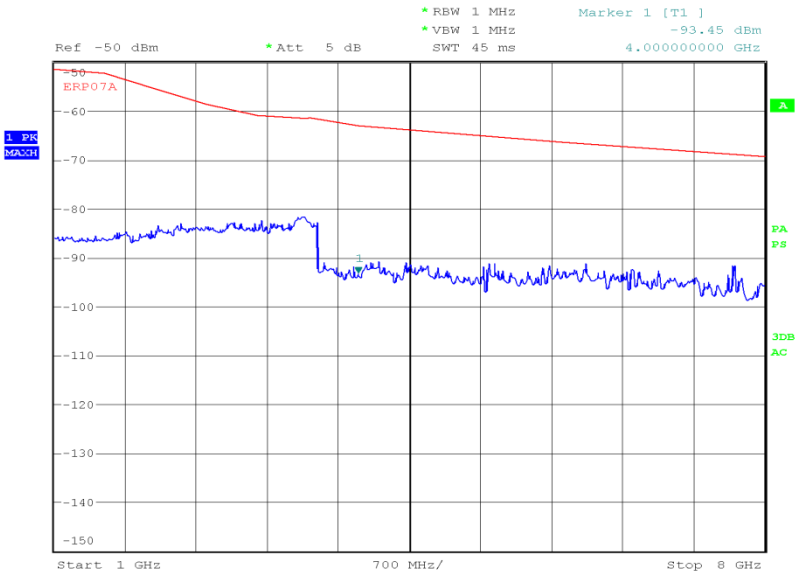
829.08 MHz

30 MHz to 1 GHz



Date: 14.APR.2014 18:21:20

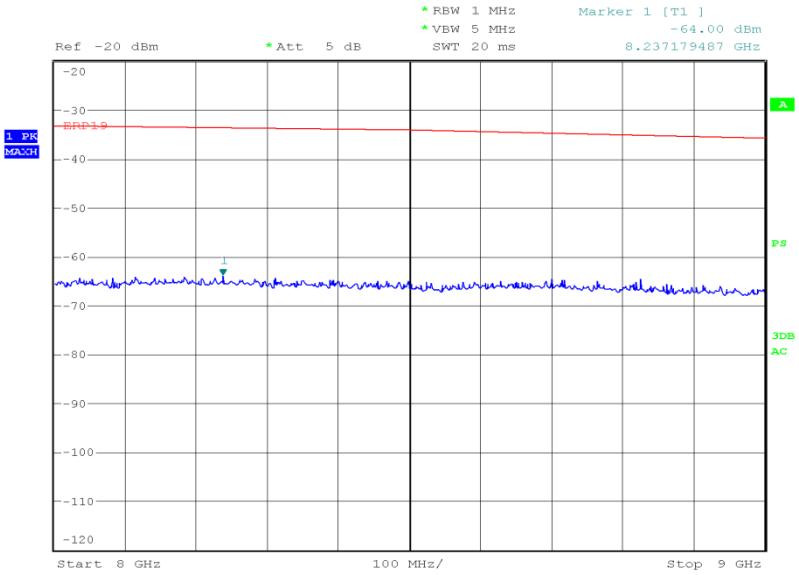
1 GHz to 8 GHz



Date: 14.APR.2014 19:05:01

Product Service

8 GHz to 9 GHz



Date: 14.APR.2014 21:38:30

Limit Clause

43+10log(P) or -13 dBm

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 and Modification State

SHL25 S/N: IMEI 004401115170793 - Modification State 0

2.5.3 Date of Test

23 April 2014

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 Procedure

The test was applied in accordance with the requirements of FCC CFR 47 Part 22.917 in conjunction with the test methods described in KDB 971168.

The EUT was configured in a CDMA 2000 1xRTT connection using SO55, RC3 forward/reverse radio configuration and test data SO32 RC3 forward/reverse radio configuration transmitting full rate on FCH with all other code channels disabled at maximum output power using a communications test set. The EUT was connected to a spectrum analyser via a cable, combiner and an attenuator. When measuring emissions frequencies greater than 1.5 GHz, a 1.5 GHz High Pass Filter was utilised. The path loss was entered as a reference level offset. A spectrum analyser was used to perform the measurements with resolution and video bandwidths settings of 1 MHz and 3 MHz respectively, using a peak detector and max hold trace. A sufficient number of sweeps were allowed for the trace to stabilise before measuring the greatest emission with a peak marker. This test sequence was repeated to measure the greatest peak emissions when operating the EUT on the bottom, middle and top operating channel within the authorised band.

2.5.6 Environmental Conditions

Ambient Temperature	25.6°C
Relative Humidity	40.1%

Product Service

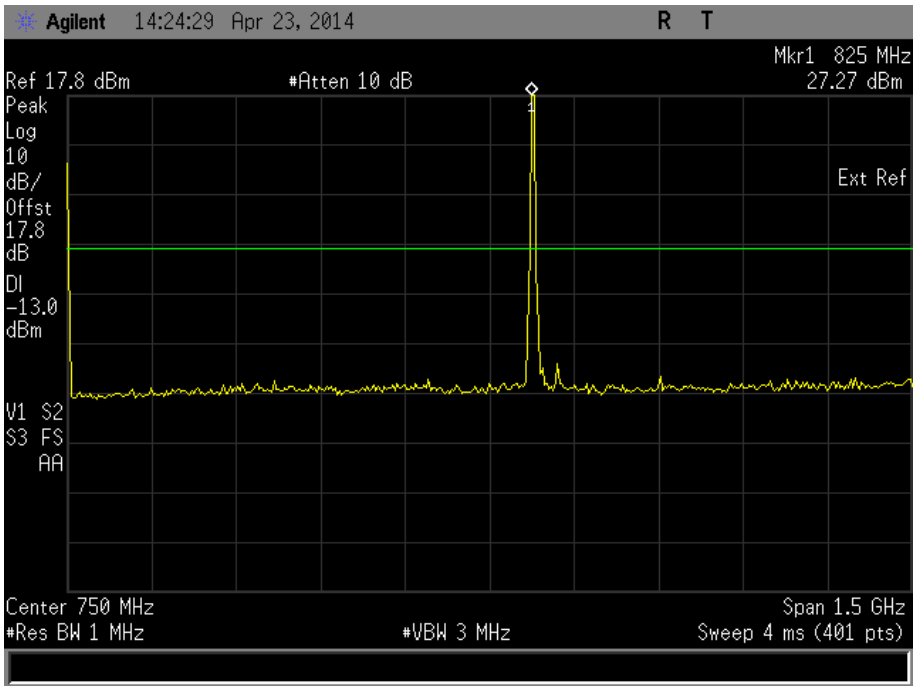
2.5.7 Test Results

CDMA 2000 - Loopback Service

4.0 V DC Supply

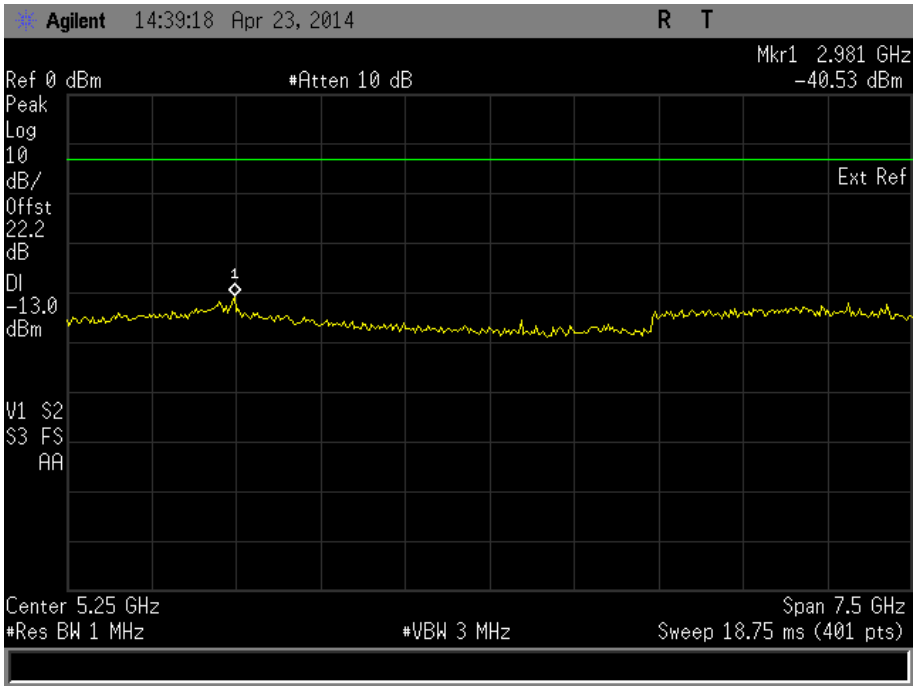
825.78 MHz

9 kHz to 1.5 GHz



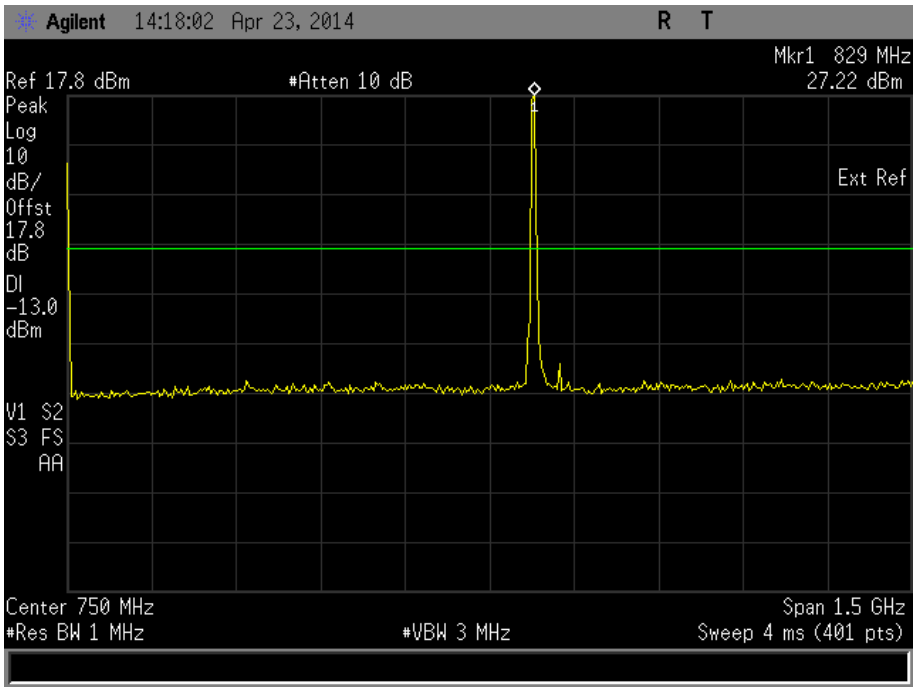
Product Service

1.5 GHz to 9 GHz



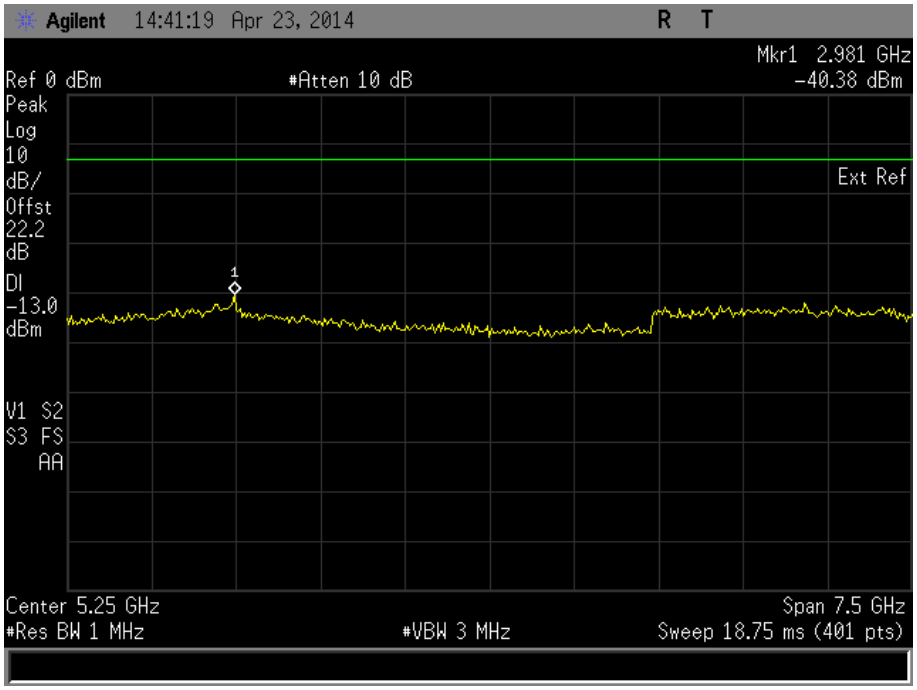
827.43 MHz

9 kHz to 1.5 GHz



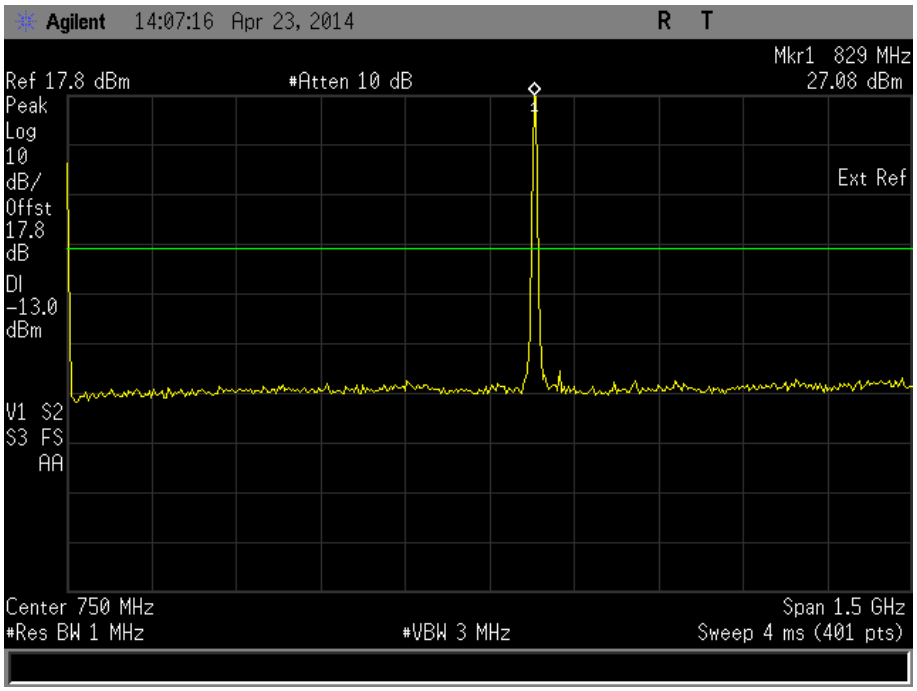
Product Service

1.5 GHz to 9 GHz



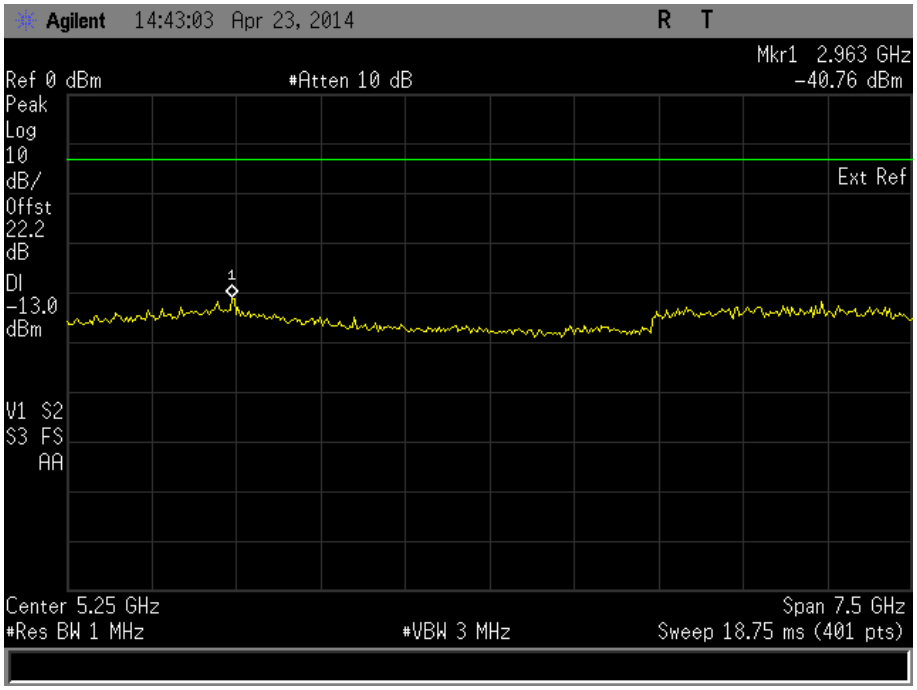
829.08 MHz

9 kHz to 1.5 GHz



Product Service

1.5 GHz to 9 GHz



Limit Clause

43+10log(P) or -13 dBm

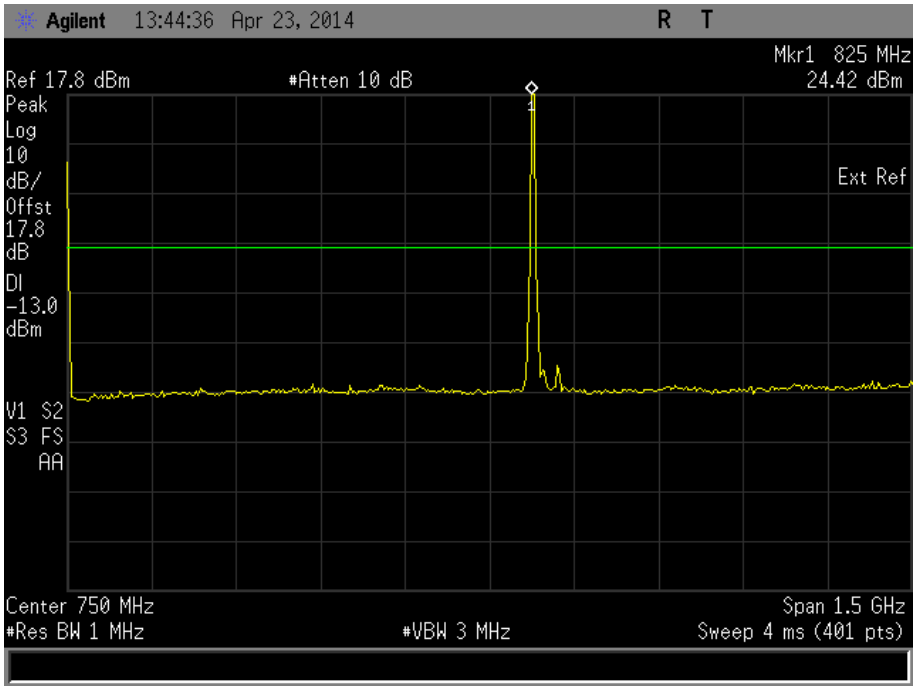
Product Service

CDMA 2000 - Test Data Service

4.0 V DC Supply

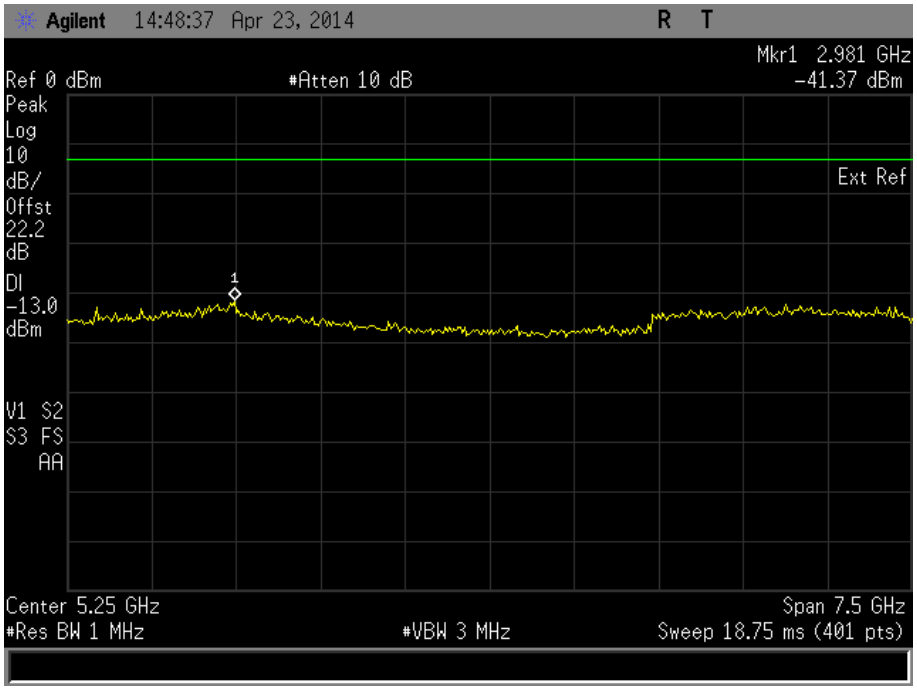
825.78 MHz

9 kHz to 1.5 GHz



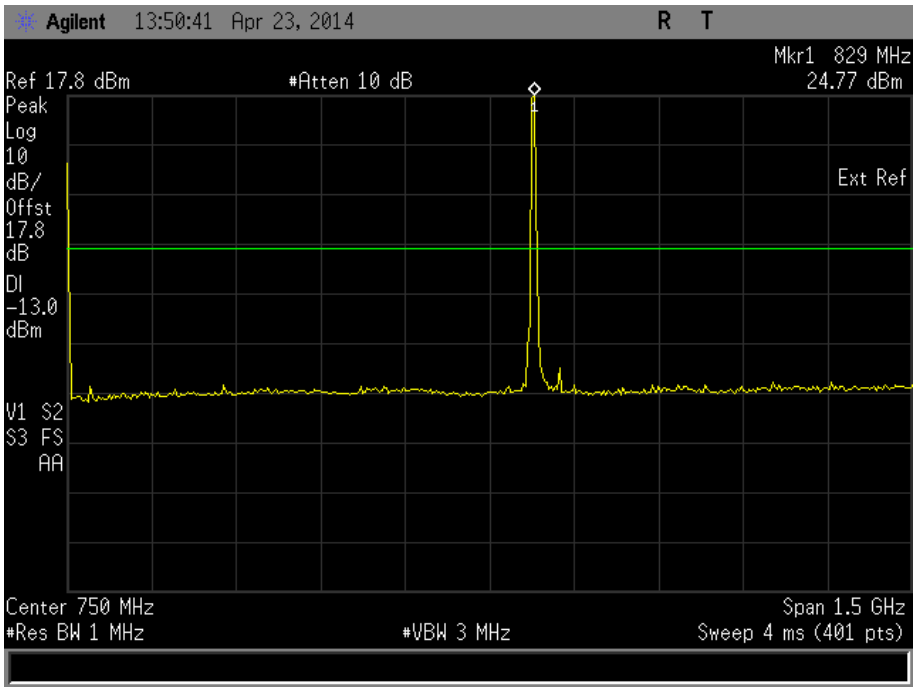
Product Service

1.5 GHz to 9 GHz



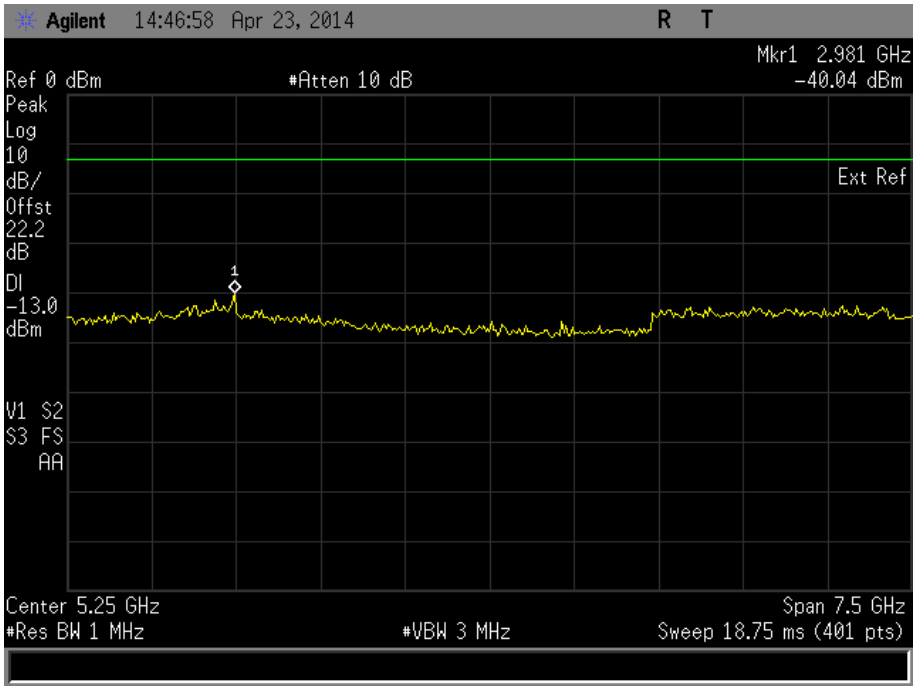
827.43 MHz

9 kHz to 1.5 GHz



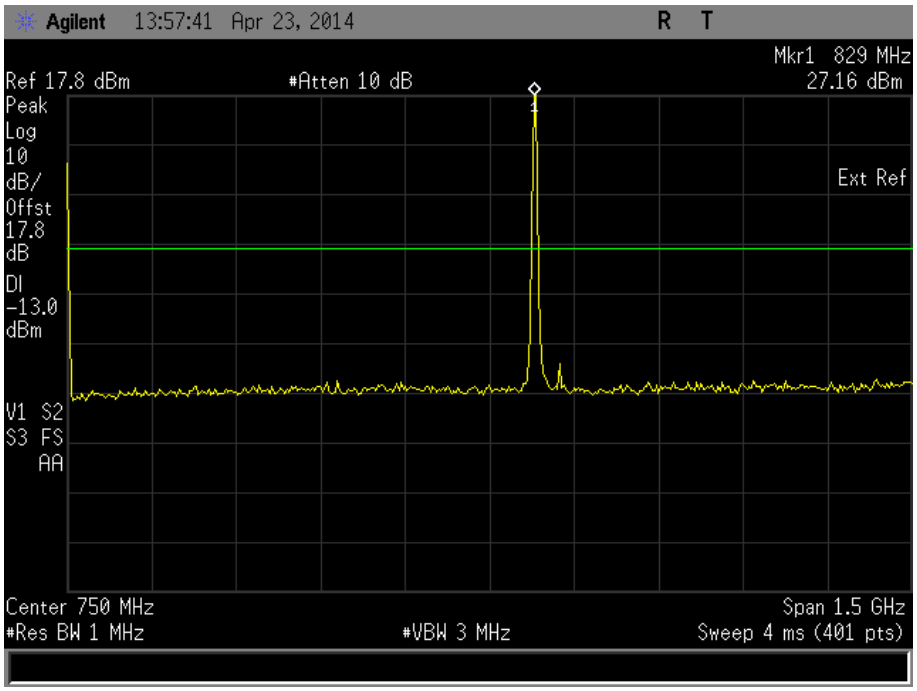
Product Service

1.5 GHz to 9 GHz



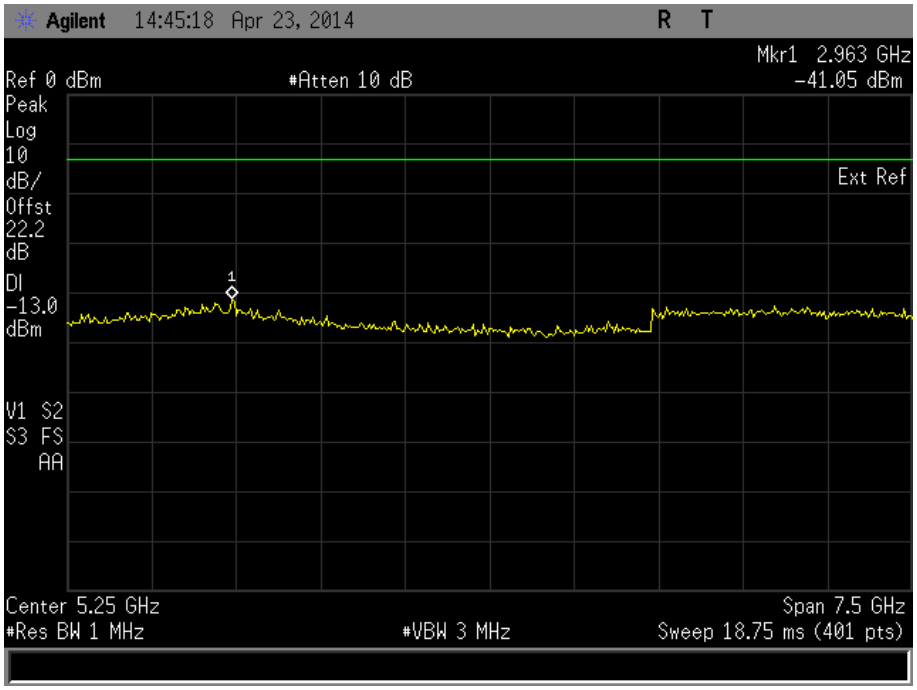
829.08 MHz

9 kHz to 1.5 GHz



Product Service

1.5 GHz to 9 GHz



Limit Clause

43+10log(P) or -13 dBm

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 and Modification State

SHL25 S/N: IMEI 004401115170793 - Modification State 0

2.6.3 Date of Test

23 April 2014

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 Procedure

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 22.917 (b), FCC CFR 47 Part 2.1051 and KDB 971168.

The EUT was configured in a CDMA 2000 1xRTT connection using SO55, RC3 forward/reverse radio configuration and test data SO32 RC3 forward/reverse radio configuration transmitting full rate on FCH with all other code channels disabled at maximum output power using a communications test set. The EUT was connected to a spectrum analyser via a cable, combiner and attenuator. The path loss was entered as a reference level offset. A spectrum analyser was used to perform the measurements with resolution and video bandwidths settings of 3 kHz and 10 kHz respectively, using a peak detector and max hold trace. A sufficient number of sweeps were allowed for the trace to stabilise and using an occupied bandwidth measurement function of the spectrum analyser; the 26 dB bandwidth was recorded. This test sequence was repeated to measure the 26 dB bandwidths of the bottom, middle and top operating channel within the authorised band.

2.6.6 Environmental Conditions

Ambient Temperature	25.6°C
Relative Humidity	40.1%

Product Service

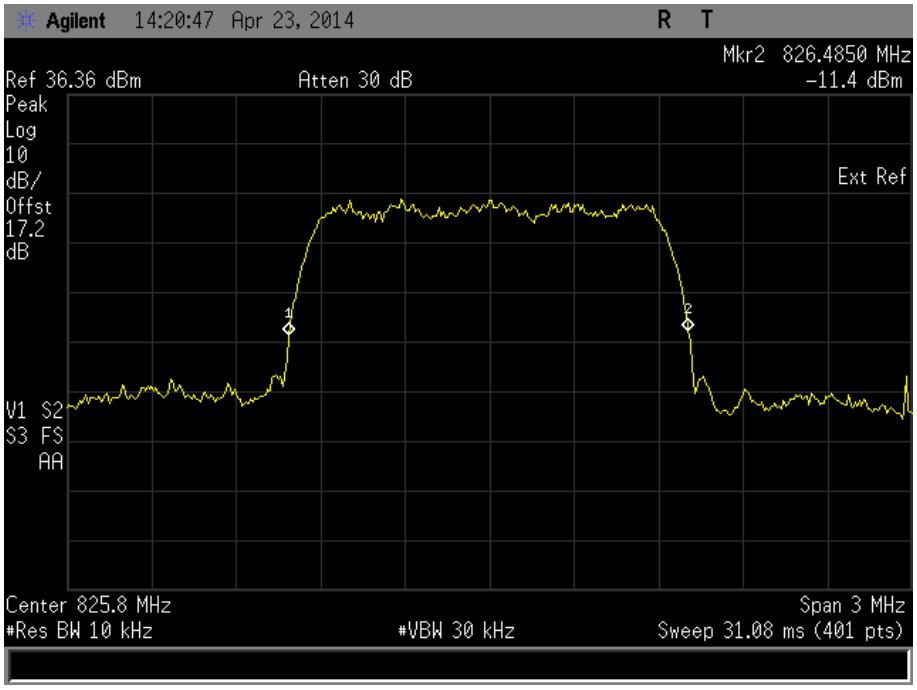
2.6.7 Test Results

CDMA 2000 - Loopback Service

4.0 V DC Supply

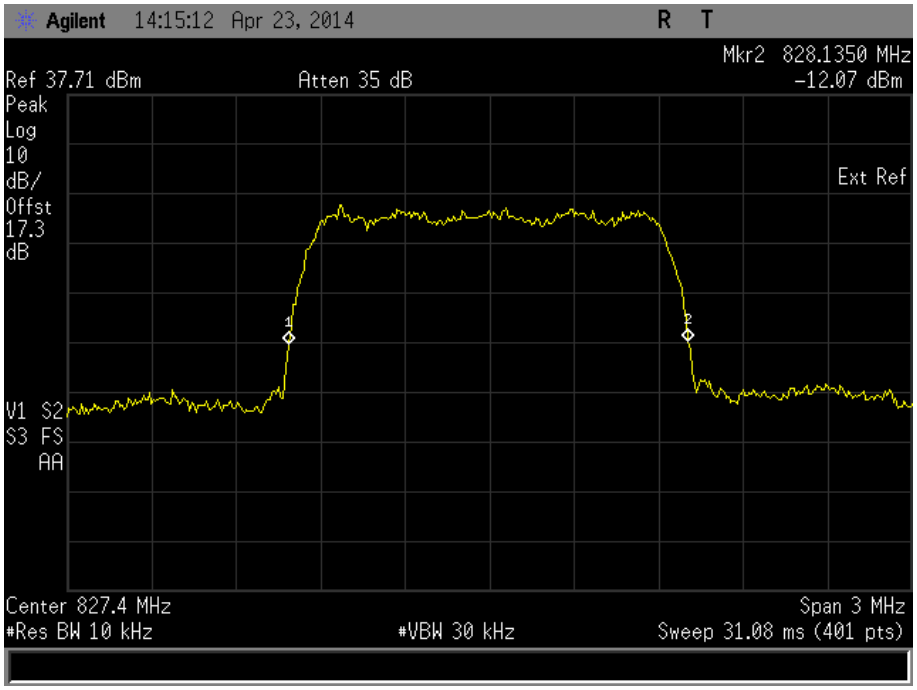
825.78 MHz

Mode	Occupied Bandwidth (kHz)
SO55, RC3	1417.5



827.43 MHz

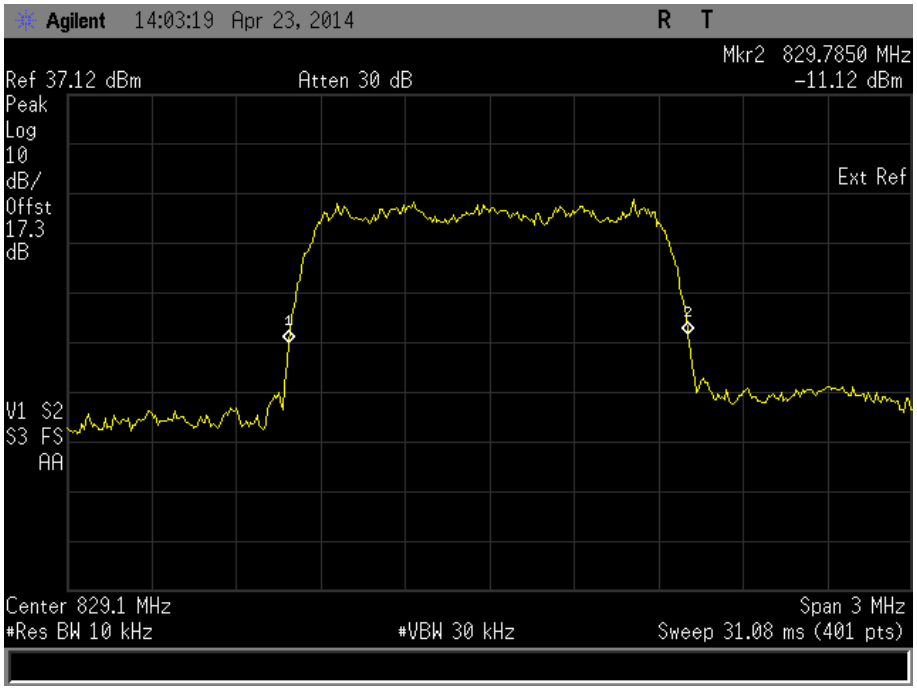
Mode	Occupied Bandwidth (kHz)
SO55, RC3	1417.5



Product Service

829.08 MHz

Mode	Occupied Bandwidth (kHz)
SO55, RC3	1417.5



Limit 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.

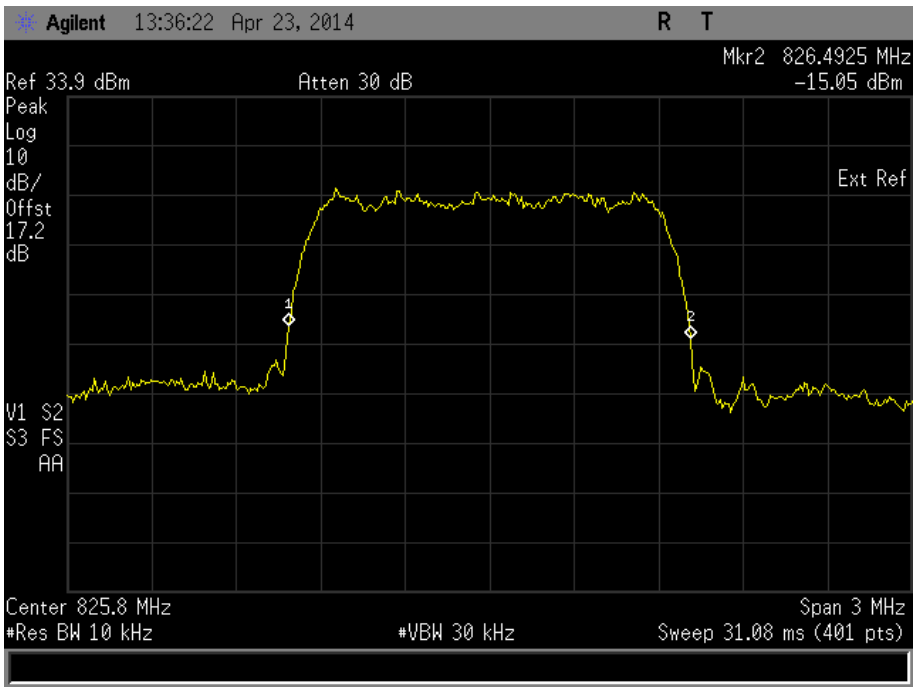
Product Service

CDMA 2000 - Test Data Service

4.0 V DC Supply

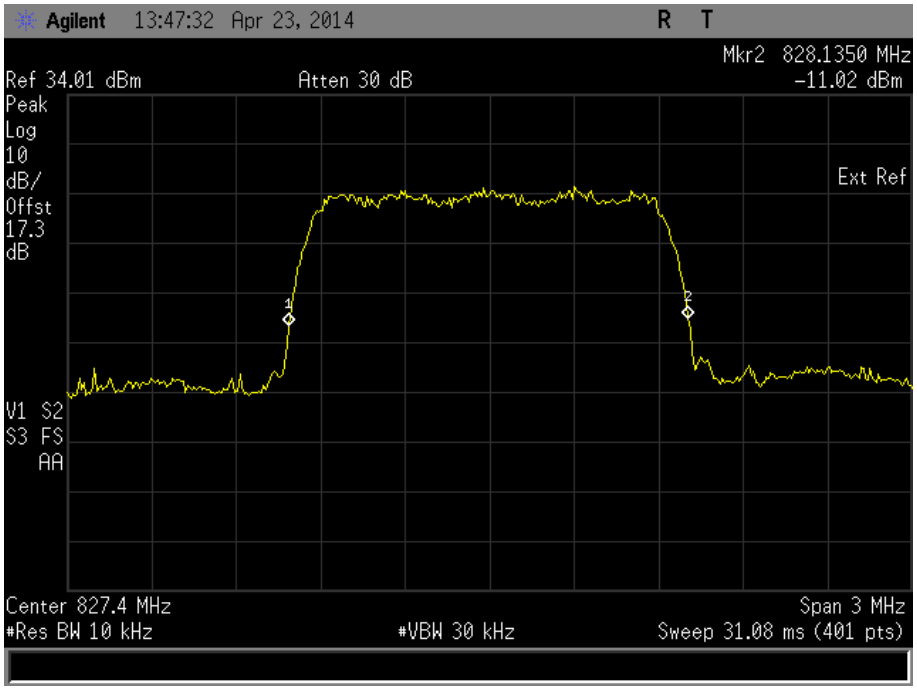
825.78 MHz

Mode	Occupied Bandwidth (kHz)
TDSO32 +FCH, RC3	1425.0



827.43 MHz

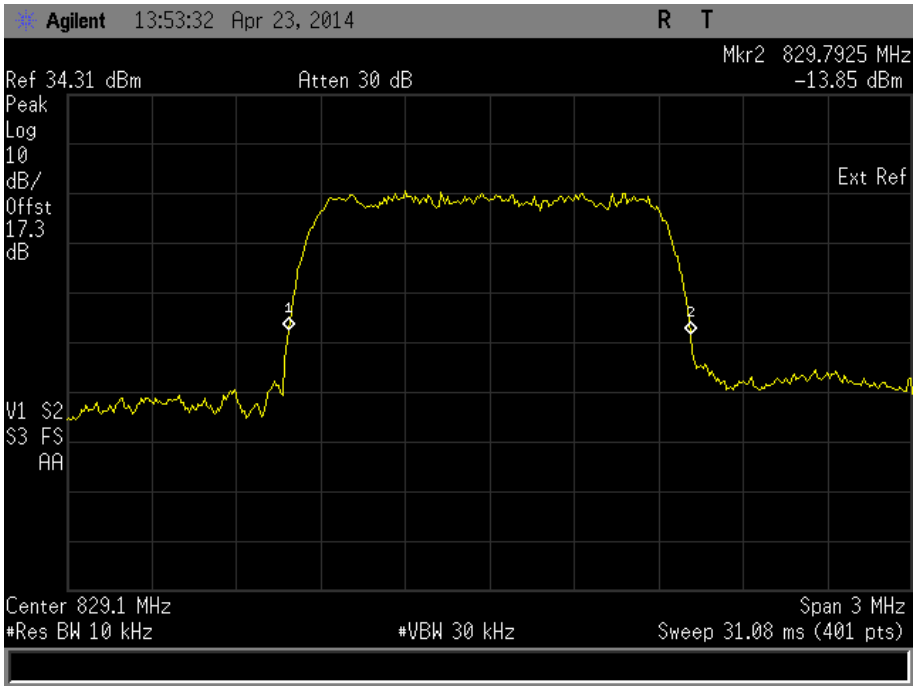
Mode	Occupied Bandwidth (kHz)
TDSO32 +FCH, RC3	1417.5



Product Service

829.08 MHz

Mode	Occupied Bandwidth (kHz)
TDSO32 +FCH, RC3	1425.0



Limit 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 MODULATION CHARACTERISTICS

2.7.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047 (d)

2.7.2 Equipment Under Test

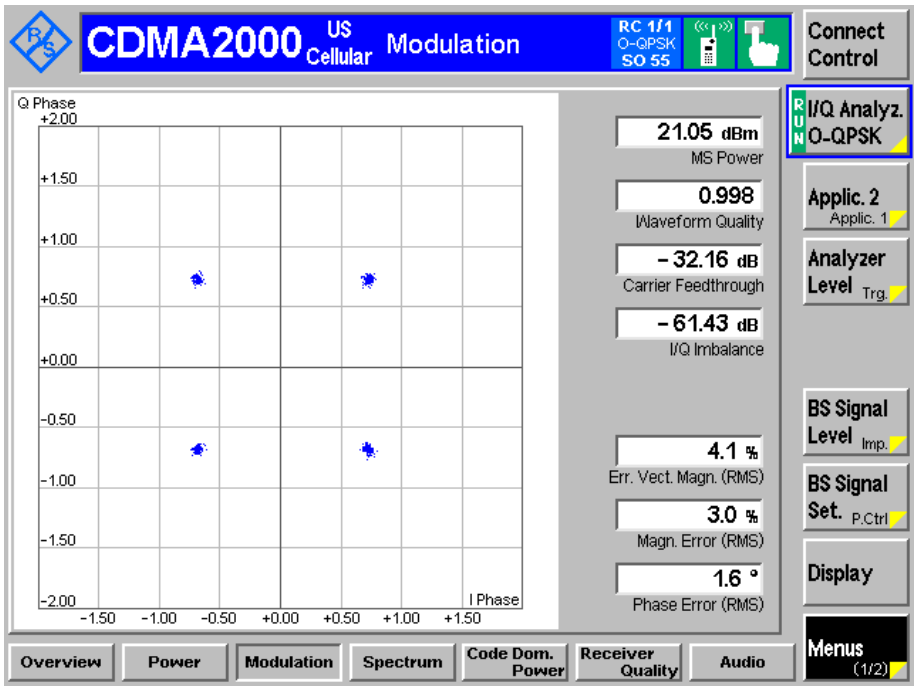
SHL25

2.7.3 Test Results

4.0 V DC Supply

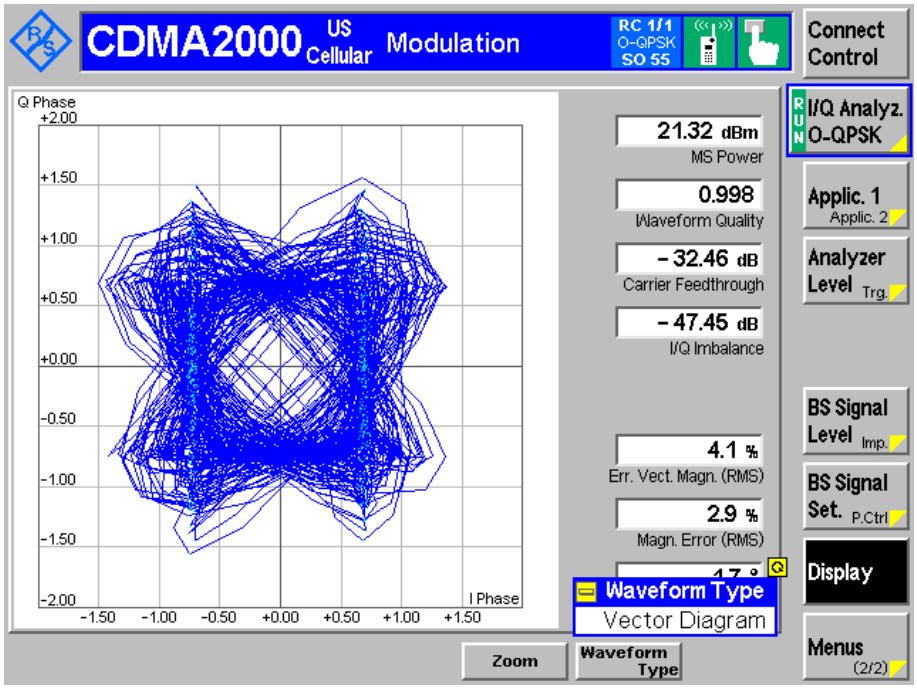
64-Ray Orthogonal

Constellation Diagram

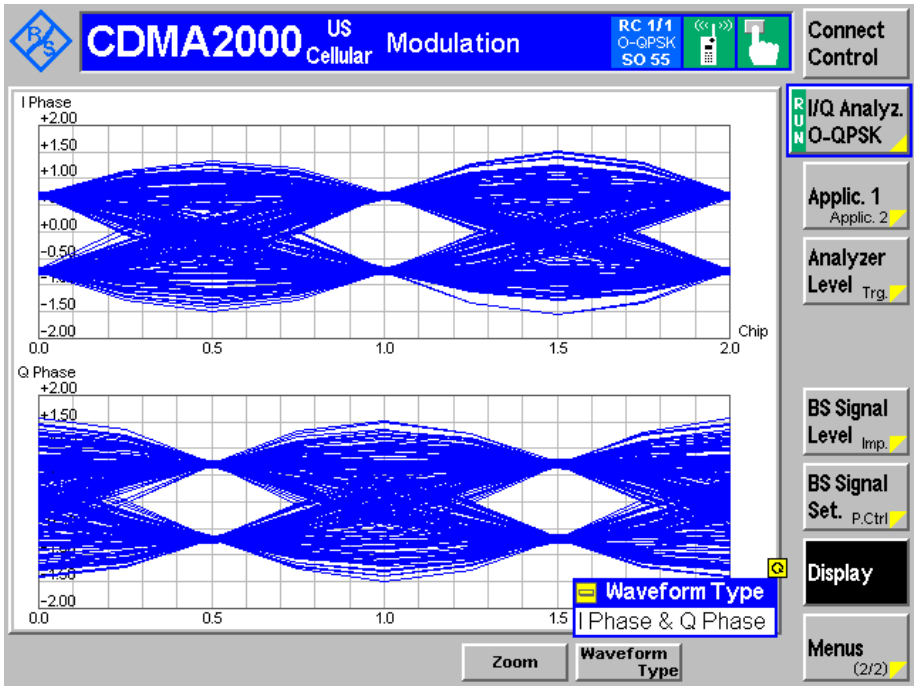


Product Service

Vector Diagram

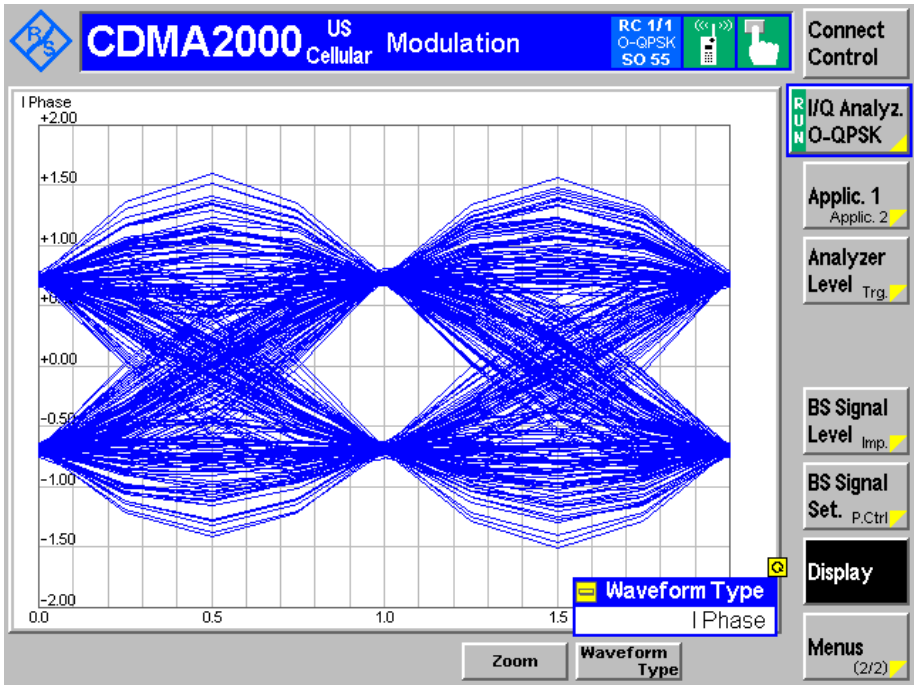


I and Q Phase Diagram

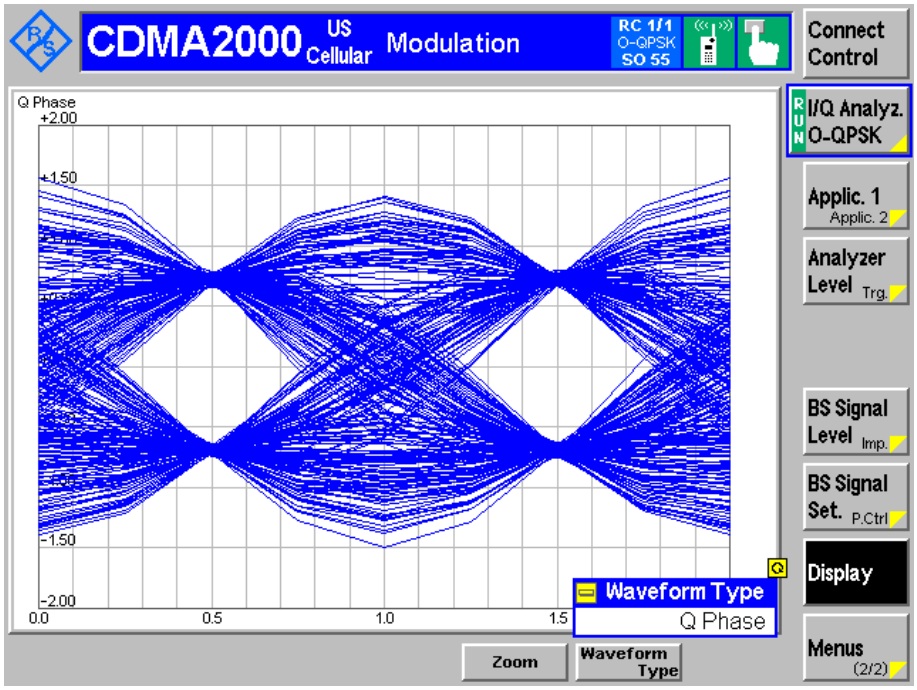


Product Service

I Phase Diagram



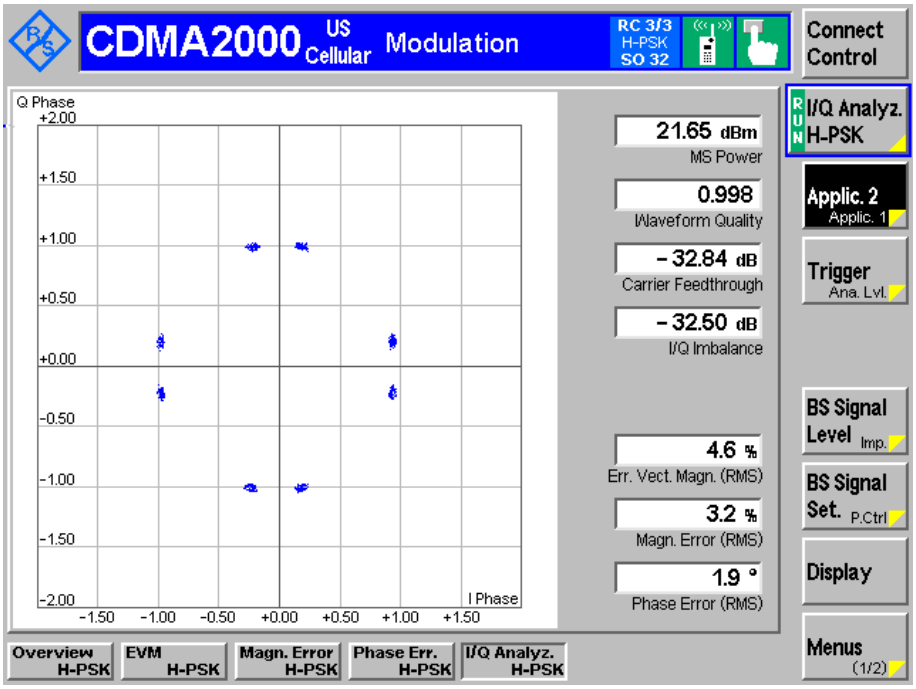
Q Phase Diagram



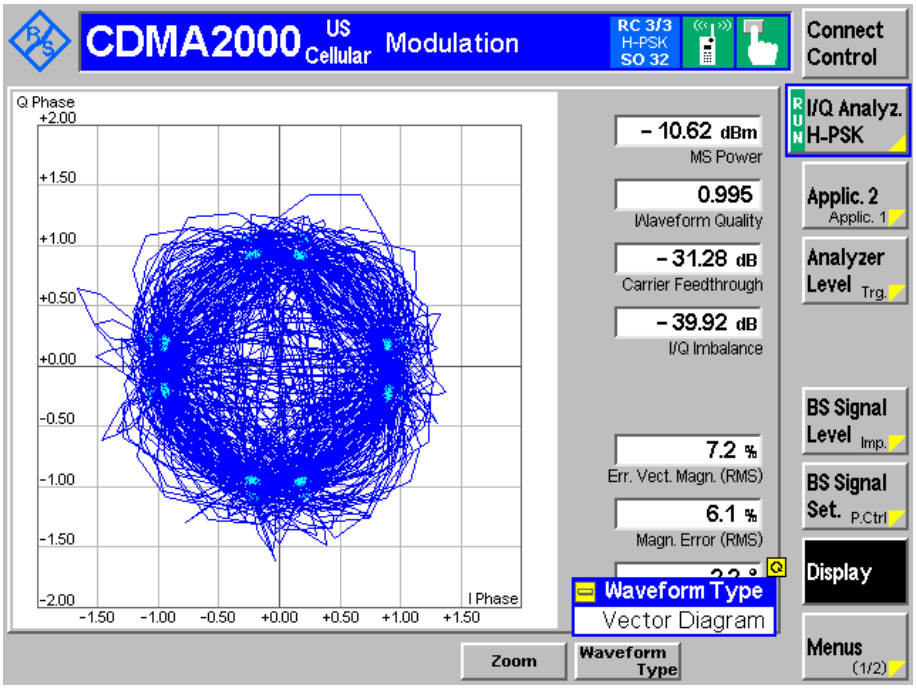
Product Service

BPSK

Constellation Diagram

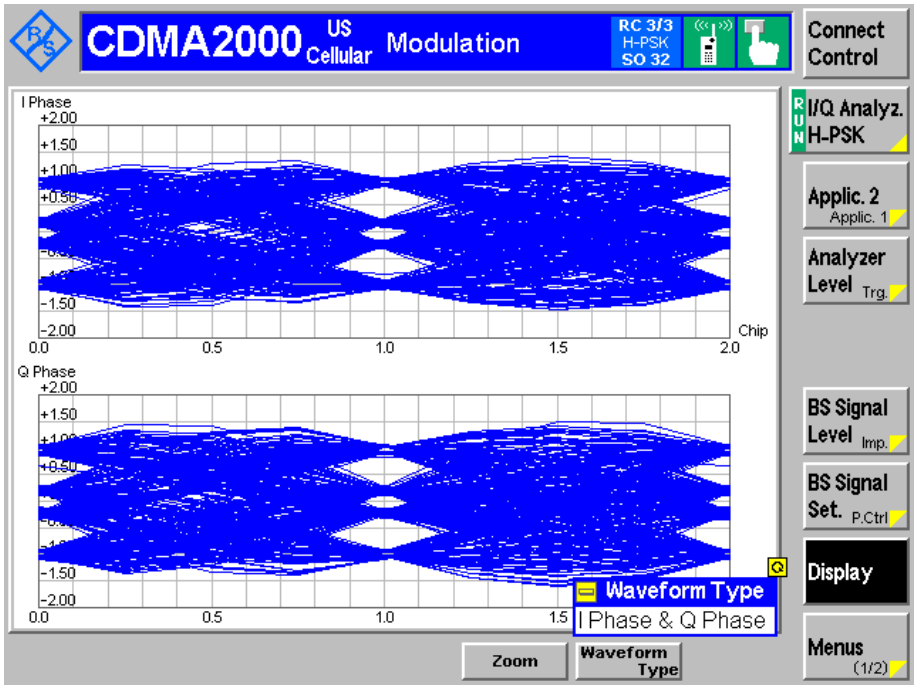


Vector Diagram

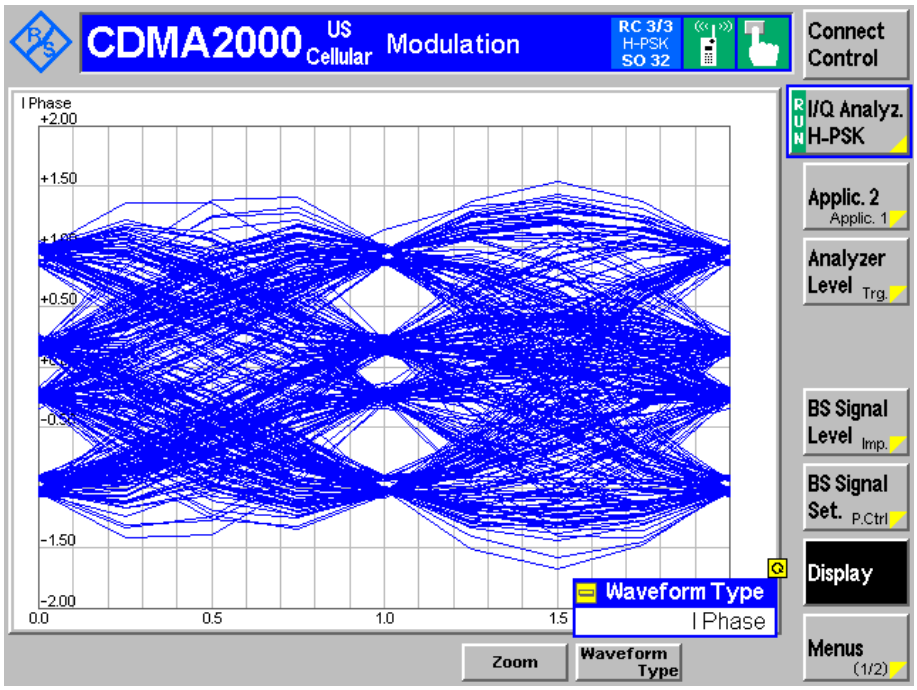


Product Service

I and Q Phase Diagram

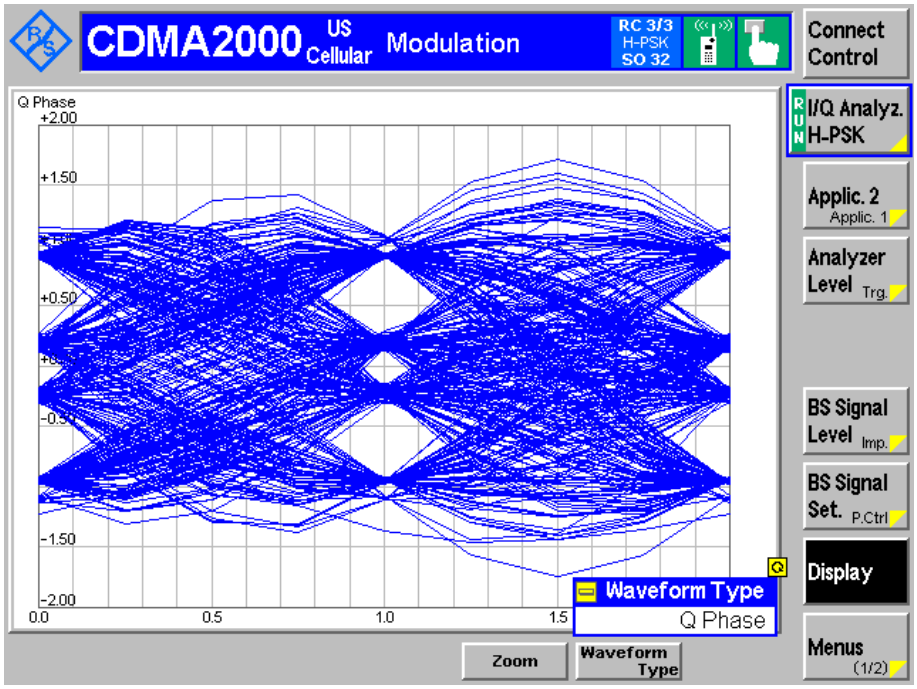


I Phase Diagram



Product Service

Q Phase Diagram



Limit Clause

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

Product Service

2.8 FREQUENCY STABILITY

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 and Modification State

SHL25 S/N: IMEI 004401115170793 - Modification State 0

2.8.3 Date of Test

30 April 2014 & 1 May 2014

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 Procedure

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 24.135(a) and FCC CFR 47 Part 2.1055.

The EUT was configured in a CDMA 2000 1xRTT connection using SO55, RC3 forward/reverse radio configuration and test data SO32 RC3 forward/reverse radio configuration transmitting full rate on FCH with all other code channels disabled at maximum output power using a communications test set. The communications test set was connected to an external 10 MHz rubidium frequency standard to increase accuracy of the measurement. The Tx measurement function of the communications tester was then used and the maximum frequency error was then recorded.

Measurements were repeated over the temperature range of $+50^0$C to -30^0C in 10^0C steps and at $+20^0$C the voltage was varied to the maximum and minimum end point voltages as declared by the manufacturer.

2.8.6 Environmental Conditions

Ambient Temperature	22.8 - 23.1°C
Relative Humidity	41.5 - 47.4%

Product Service

2.8.7 Test Results

CDMA 2000 - Loopback Service

4.0 V DC Supply

Under Temperature Variations

827.43 MHz

Temperature Interval (ºC)	Mode	Modulation	Deviation (ppm)
-30	SO55, RC3	H-PSK	-0.009
-20	SO55, RC3	H-PSK	0.008
-10	SO55, RC3	H-PSK	0.006
0	SO55, RC3	H-PSK	0.006
+10	SO55, RC3	H-PSK	0.009
+20	SO55, RC3	H-PSK	-0.008
+30	SO55, RC3	H-PSK	-0.007
+40	SO55, RC3	H-PSK	0.007
+50	SO55, RC3	H-PSK	0.008

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	-	-
929 to 960	1.5	-	-
2110 to 2220	10	-	-

Product Service

Under Voltage Variations

827.43 MHz

DC Voltage (V)	Mode	Modulation	Deviation (ppm)
4.0 V DC	SO55, RC3	H-PSK	-0.008
3.7 V DC	SO55, RC3	H-PSK	-0.006
4.0 V DC	SO55, RC3	H-PSK	-0.008

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

CDMA 2000 - Test Data Service

4.0 V DC Supply

Under Temperature Variations

827.43 MHz

Temperature Interval (ºC)	Mode	Modulation	Deviation (ppm)
-30	TDSO32 +FCH, RC3	H-PSK	-0.010
-20	TDSO32 +FCH, RC3	H-PSK	-0.008
-10	TDSO32 +FCH, RC3	H-PSK	0.007
0	TDSO32 +FCH, RC3	H-PSK	0.006
+10	TDSO32 +FCH, RC3	H-PSK	-0.007
+20	TDSO32 +FCH, RC3	H-PSK	0.007
+30	TDSO32 +FCH, RC3	H-PSK	0.006
+40	TDSO32 +FCH, RC3	H-PSK	-0.006
+50	TDSO32 +FCH, RC3	H-PSK	-0.008

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	-	-
929 to 960	1.5	-	-
2110 to 2220	10	-	-

Under Voltage Variations

827.43 MHz

DC Voltage (V)	Mode	Modulation	Deviation (ppm)
4.0 V DC	TDSO32 +FCH, RC3	H-PSK	0.007
3.7 V DC	TDSO32 +FCH, RC3	H-PSK	0.007
4.0 V DC	TDSO32 +FCH, RC3	H-PSK	0.007

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

Product Service

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	28-Oct-2014
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	13-Aug-2014
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Hygrometer	Rotronic	I-1000	2891	12	8-Jul-2014
Power Supply	Farnell	LT30-2	2903	-	TU
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	12-Dec-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	6-Mar-2015
Combiner/Splitter	Weinschel	1506A	3878	12	21-Mar-2015
2 Metre SMA Type Cable	Rhophase	3PS-1801A-2000-3PS	4111	12	5-Nov-2014
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	22-Jul-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	22-Jul-2014

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.2- Effective Radiated Power					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	3-May-2014
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	8-Nov-2014
Filter (High Pass)	Lorch	SHP7-7000-SR	566	12	24-Feb-2015
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	1002	12	18-Sep-2014
Pre-Amplifier	Phase One	PSO4-0087	1534	12	30-Sep-2014
Screened Room (5)	Rainford	Rainford	1545	24	10-Jan-2015
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	10-Jun-2015
Antenna (Log Periodic)	Schaffner	UPA6108	3108	12	15-May-2014
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	22-Jul-2014
Section 2.3 - Maximum Peak Output Power - Conducted					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Power Divider	Weinschel	1506A	604	12	23-May-2014
Power Supply	Farnell	LT30-2	2903	-	TU
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	12-Dec-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	6-Mar-2015
P-Series Power Meter	Agilent Technologies	N1911A	3981	12	18-Sep-2014
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3983	12	18-Sep-2014
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	22-Jul-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014

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	3-May-2014
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	1002	12	18-Sep-2014
Pre-Amplifier	Phase One	PS04-0086	1533	12	19-Dec-2014
Screened Room (5)	Rainford	Rainford	1545	24	10-Jan-2015
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	10-Jun-2015
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	22-Jul-2014
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	21-Mar-2015
Section 2.5 - Conducted Spurious Emissions					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Attenuator (10dB)	Weinschel	47-10-34	481	12	28-Mar-2015
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	13-Aug-2014
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	4-Feb-2015
Power Supply	Farnell	LT30-2	2903	-	TU
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	12-Dec-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	6-Mar-2015
Combiner/Splitter	Weinschel	1506A	3878	12	21-Mar-2015
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	22-Jul-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	22-Jul-2014

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.6 - Occupied Bandwidth					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Power Divider	Weinschel	1506A	604	12	23-May-2014
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	13-Aug-2014
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	15-Nov-2014
Power Supply	Farnell	LT30-2	2903	-	TU
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	12-Dec-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	6-Mar-2015
2 Metre SMA Type Cable	Rhophase	3PS-1801A-2000-3PS	4111	12	5-Nov-2014
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	22-Jul-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	22-Jul-2014

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.7- Frequency Stability					
Digital Temperature Indicator + T/C	Fluke	51	412	12	12-Feb-2015
20dB/2W Attenuator	Narda	4772-20	461	-	TU
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014
Power Supply	Farnell	LT30-2	2903	-	TU
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	12-Dec-2014
Attenuator (30dB, 150W)	Narda	769-30	3369	12	29-May-2014
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	22-Jul-2014
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	22-Jul-2014

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

Product Service

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	MU
Modulation Characteristics	-
Frequency Stability	± 46.70 Hz
Maximum Peak Output Power - Conducted	± 0.70 dB
Conducted Spurious Emissions	± 3.454 dB
Emission Limitations for Cellular Equipment	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Spurious Emissions at Band Edge	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Occupied Bandwidth	± 16.74 kHz
Effective Radiated Power	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB

Product Service

SECTION 4

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).