Product Service

Choose certainty.
Add value.

Report On

FCC Testing of the Sharp CDMA SHI16 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) and Dual Band UMTS (FDD I and V) Multi Mode Cellular Phone with Bluetooth, WLAN, WiMAX, NFC (FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 24

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00172

Document 75917214 Report 13 Issue 2 June 2012

Product Service

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

REPORT ON

FCC Testing of the
Sharp CDMA SHI16 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) and Dual Band UMTS (FDD I and V) Multi Mode Cellular Phone with Bluetooth, WLAN, WiMAX, NFC (FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 24

Document 75917214 Report 13 Issue 2

June 2012

PREPARED FOR

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

PREPARED BY

Natalie Bennett
Senior Administrator (Technical)

APPROVED BY

Mark Jenkins
Authorised Signatory

DATED 15 June 2012

This report has been up issued to Issue to to correct some typographical errors

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 24. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

S Bennett G Lawler

UKAS TESTING 0141

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp CDMA SHI16 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) and Dual Band UMTS (FDD I and V) Multi Mode Cellular Phone with Bluetooth, WLAN, WiMAX, NFC (FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 24

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC Testing of the Sharp CDMA SHI16 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) and Dual Band UMTS (FDD I and V) Multi Mode Cellular Phone with Bluetooth, WLAN, WiMAX, NFC (FeliCa) and GPS to the requirements of FCC CFR 47 Part 2 and FCC CFR 47 Part 24.

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 SHI16
Serial Number(s)	004401113852533 IMEI 004401113862912
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 2 (2011) FCC CFR 47 Part 24 (2011)
Incoming Release Date	Application Form 29 March 2012
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	9096 29 March 2012
Start of Test	9 May 2012
Finish of Test	13 June 2012
Name of Engineer(s)	S Bennett G Lawler
Related Document(s)	ANSI C63.4: 2003

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 24 is shown below.

Section	Spec Clause		Test Description	Result	Comments/Base Standard
	Pt 2	Pt24			
PCS 1900 - GMSK					
2.1	2.1055	24.135(a)	Frequency Stability	Pass	
2.2	2.1051	24.229	Spurious Emissions at Band Edge	Pass	
2.3	-	24.232(c)	Effective Isotropic Radiated Power	Pass	
2.4	2.1047(d)	-	Modulation Characteristics	-	Customer Declaration
2.5	2.1046	24.232	Maximum Peak Output Power - Conducted	Pass	
2.6	2.1051	24.238	Emission for Broadband PCS Equipment	Pass	
2.7	2.1051	24.238(a)	Conducted Spurious Emissions	Pass	
2.8	2.1049(h)	24.238(b)	Occupied Bandwidth	Pass	

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

Equipment designator:
Model name/number CDMA SHI16 Identification number APYHRO00172

Supply Voltage:

[ ]	AC mains	State AC voltage …… V	and AC frequency …… Hz
[ ]	DC (external)	State DC voltage …… V	and DC current …… A
[X]	DC (internal)	State DC voltage …3.8 V	and Battery type…Li-Ion.

Frequency characteristics:
Frequency range 1850.2MHz to 1909.8 MHz Channel spacing ……
(if channelized)

Designated test frequencies:
Bottom: 1850.2 MHz Middle: 1880.0MHz Top: 1909.8MHz

Power characteristics:
Maximum transmitter power 1.58W(32dBm) Minimum transmitter power …… W
(if variable)

[X] Continuous transmission
[ ] Intermittent transmission State duty cycle ……
If intermittent, can transmitter be set to continuous transmit test mode? Y/N

Antenna characteristics:

[X]	Antenna connector	State impedance 50 ohm
[ ]	Temporary antenna connector	State impedance …… ohm
[ ]	Integral antenna	State gain …… dBi

Modulation characteristics:

[ ]	Amplitude	[ ]	Other
[ ]	Frequency	Details: ……..	
[X]	Phase		

Can the transmitter operate un-modulated? ~~Y~~/N
ITU Class of emission: ……

Extreme conditions:
Maximum temperature 60 ºC Minimum temperature -20 ºC
Maximum supply voltage 4.0 V Minimum supply voltage 3.8 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 : Toshiro Shiomi
Name : Toshiroh Shiomi
Position held : Manager
Date : 29th March, 2011

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp CDMA SHI16 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) and Dual Band UMTS (FDD I and V) Multi Mode Cellular Phone with Bluetooth, WLAN, WiMAX, 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 Accreditation
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 CDMA SHI16 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) and Dual Band UMTS (FDD I and V) Multi Mode Cellular Phone with Bluetooth, WLAN, WiMAX, NFC (FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 24

Product Service

2.1 FREQUENCY STABILITY

2.1.1 Specification Reference

FCC CFR 47 Part 2 and FCC CFR 47 Part 24, Clause 2.1055 and 24.135(a)

2.1.2 Equipment Under Test and Modification State

CDMA SHI16 S/N: 004401113852533 - Modification State 0

2.1.3 Date of Test

13 June 2012

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 EUT was set to transmit on maximum power with GMSK modulation. A Radio Communication Tester, 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.

2.1.6 Environmental Conditions

Ambient Temperature	22.6°C
Relative Humidity	39.4%

Product Service

2.1.7 Test Results

4.0 V DC Supply

Under Temperature Variations

1880.0 MHz

Temperature Interval (ºC)	Mode	Deviation (ppm)
-30	GMSK	0.0164
-20	GMSK	0.0163
-10	GMSK	0.0163
0	GMSK	0.0159
+10	GMSK	0.0159
+20	GMSK	0.0153
+30	GMSK	0.0149
+40	GMSK	0.0146
+50	GMSK	0.0142

Limit Clause

The frequency stability of the transmitter shall be maintained within ± 0.0001 % (± 1 ppm).

Under Voltage Variations

1880.0 MHz

DC Voltage (V)	Mode	Deviation (ppm)
4.0	GMSK	0.0153
3.8	GMSK	0.0152
-	GMSK	-

Limit Clause

The frequency stability of the transmitter shall be maintained within ± 0.0001 % (± 1 ppm).

2.2 SPURIOUS EMISSIONS AT BAND EDGE

2.2.1 Specification Reference

FCC CFR 47 Part 2 and FCC CFR 47 Part 24, Clause 2.1051 and 24.229

2.2.2 Equipment Under Test and Modification State

CDMA SHI16 S/N: IMEI 004401113862912 - Modification State 0

2.2.3 Date of Test

12 June 2012

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

In accordance with 24.238, 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 20 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.

2.2.6 Environmental Conditions

Ambient Temperature	22.6°C
Relative Humidity	39.4%

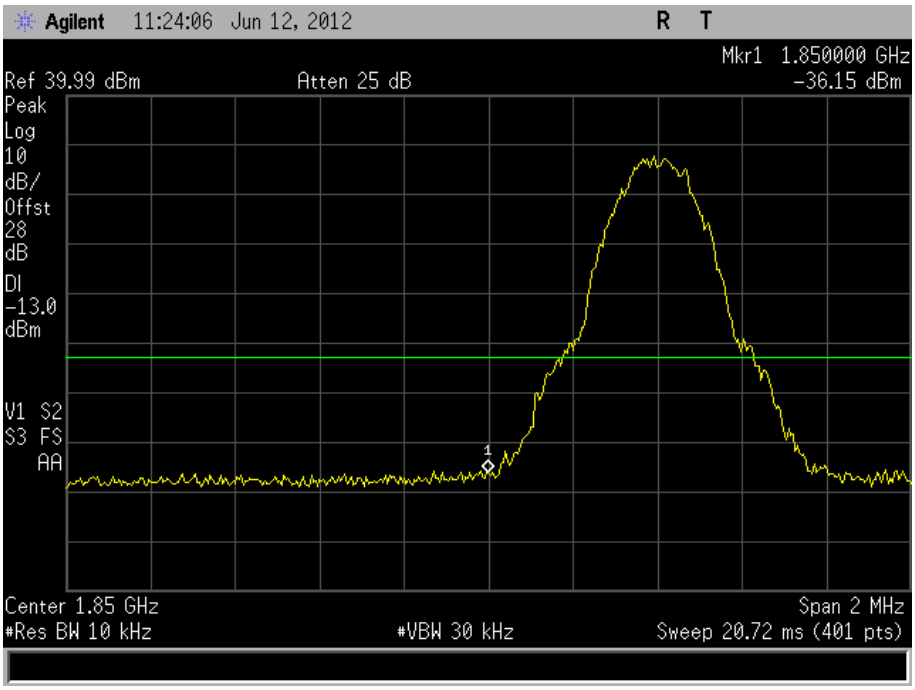
Product Service

2.2.7 Test Results

4.0 V DC Supply

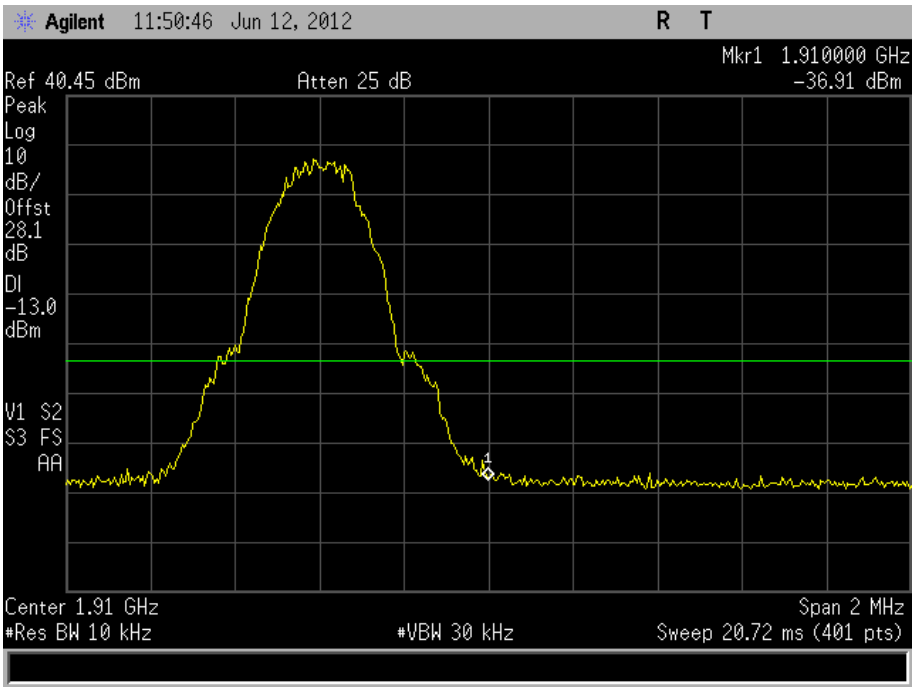
Frequency Block (MHz)	Mode	Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
A :(1930.0 – 1945.0)	GMSK	Channel : 513 Frequency : 1850.4 MHz	N/A
B :(1975.0 – 1990.0)	GMSK	N/A	Channel : 809 Frequency : 1909.6 MHz

Frequency Block A



Product Service

Frequency Block B



Limit Clause

-13 dBm at block edge.

2.3 EFFECTIVE ISOTROPIC RADIATED POWER

2.3.1 Specification Reference

FCC CFR 47 Part 2 and FCC CFR 47 Part 24, Clause 24.232(c)

2.3.2 Equipment Under Test and Modification State

CDMA SHI16 S/N: IMEI 004401113862912 - Modification State 0

2.3.3 Date of Test

9 May 2012

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

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.

2.3.6 Environmental Conditions

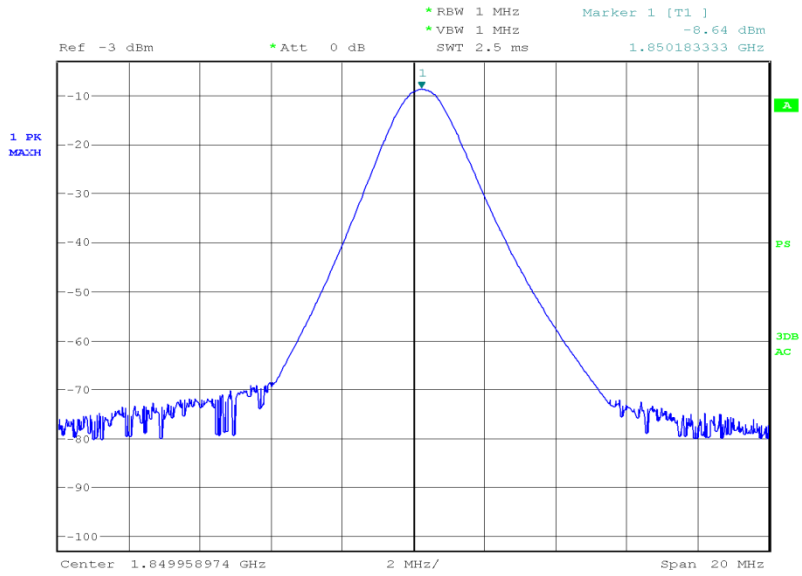
Ambient Temperature	18.3°C
Relative Humidity	64.0%

Product Service

2.3.7 Test Results

1850.2 MHz

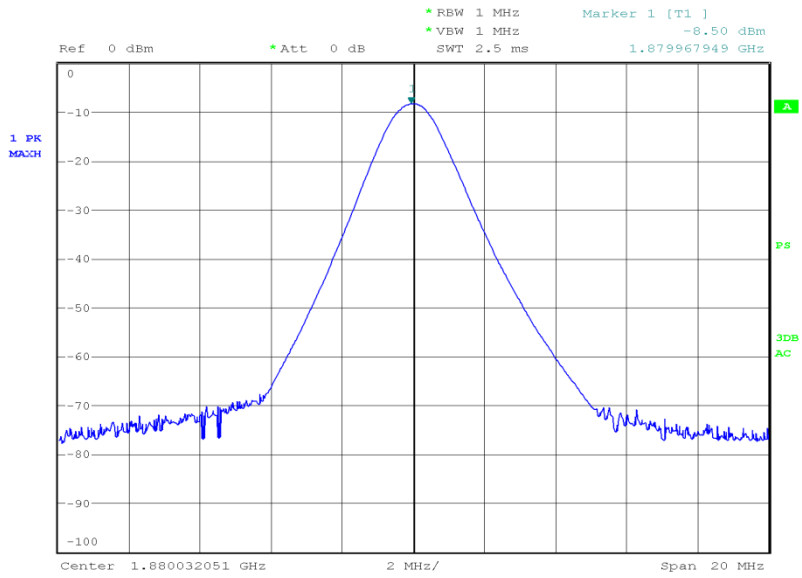
Result (dBm)	Result (W)
31.52	1.42



Date: 9.MAY.2012 18:12:20

1880.0 MHz

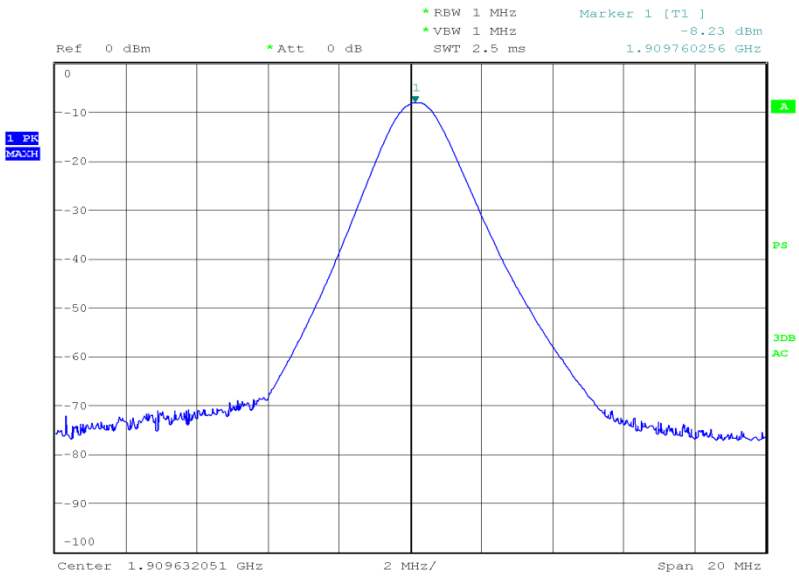
Result (dBm)	Result (W)
31.71	1.48



Date: 9.MAY.2012 18:42:47

1909.8 MHz

Result (dBm)	Result (W)
31.92	1.56



Date: 9.MAY.2012 18:49:54

Limit Clause

Mobile – 7 W or 38.45 dBm
Base Stations – 500 W or 57 dBm

Product Service

2.4 MODULATION CHARACTERISTICS

2.4.1 Specification Reference

FCC CFR 47 Part 2 and FCC CFR 47 Part 24, Clause 2.1047(d)

2.4.2 Equipment Under Test

CDMA SHI16

2.4.3 Test Results

Customer Description

-

Description Of Modulation Technique

The modulation scheme used in GSM is called Gaussian Minimum Shift Keying (GMSK). GMSK facilitates the use of narrow bandwidth and allows for both coherent and non coherent detection capabilities. It is a scheme in which the transitions from One to Zero or Zero to One do not occur quickly, but over a period of time. If pulses are transmitted quickly harmonics are transmitted. The power spectrum for a square wave is rich in harmonics, and the power within the side lobes is wasted, and can be a cause of potential interference.

A method to reduce the harmonics is to round off the edges of the pulses thus lowering the spectral components of the signal. In GSM this is done by using a Gaussian pre-filter which typically has a bandwidth of 81.25kHz. The output from the Gaussian filter then phase modulates the carrier. As there are no dramatic phase transitions of the carrier this gives a constant envelope and low spectral component output from the transmitter.

The spectral efficiency is calculated by

bit rate / Channel bandwidth = 270.83333 kbit/s / 200 kHz = 1.354 bit/s/Hz.

The bandwidth product BT = Bandwidth x bit duration = 81.25 kHz x 3.6923 micros = 0.3

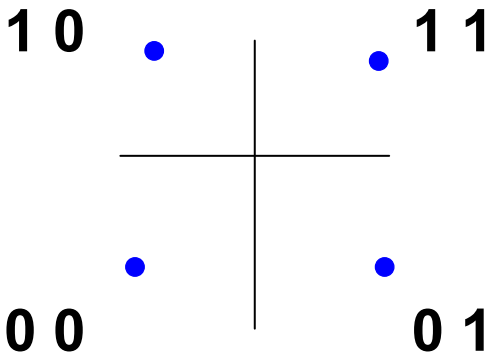
GMSK OVERVIEW

The modulation scheme used for the EUT is GMSK.

A brief overview of how GMSK works is shown below.

GMSK (Gaussian Minimum Shift Keying)

The fundamental principal behind GMSK is Phase shift keying. This splits a data stream into a series of 2-digit phase shifts, using the following phase shifts to represent data pairs.



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

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

This is called QPSK (Quadratic Phase Shift Keying)

However

There is a problem with QPSK: transition from e.g. 00 to 11 gives phase shift of 180° (π radians). This has the effect of inverting the carrier waveform and this can lead to detection errors at the receiver.

Solution: restrict phase changes to ± 90°

1. Split bitstream into 2 streams e.g.

	0 0		1 1		0 1		1 0	
I Stream	0		1		0		1	
Q stream		0		1		1		0

2. Modulate each stream with PSK (1 = 90° or π/2, 0 = -90° or - π/2 phase shift)

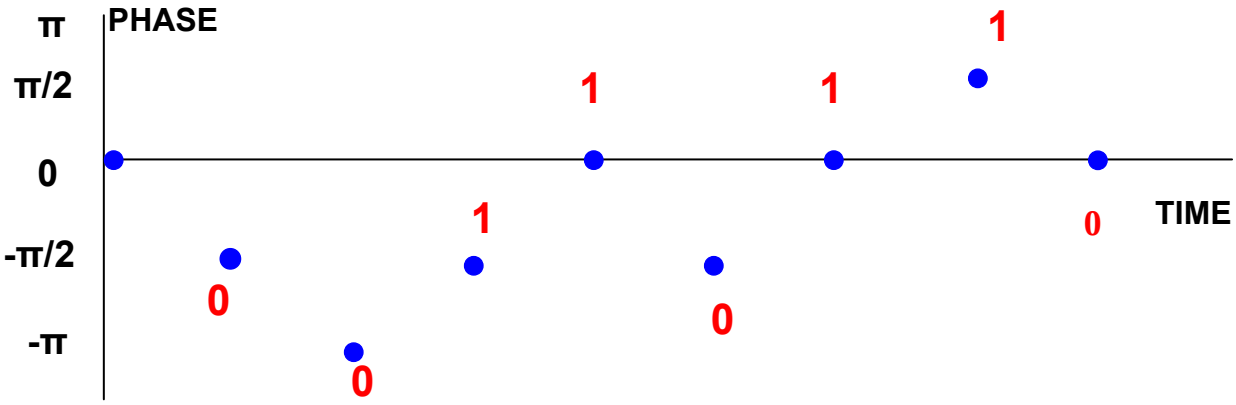
I Stream	0		1		0		1	
	-π/2		-π/2		-π/2		π/2	
Q stream		0		1		1		0
		-π/2		π/2		π/2		-π/2

Product Service

3. Combine (add) the two PSK signals:

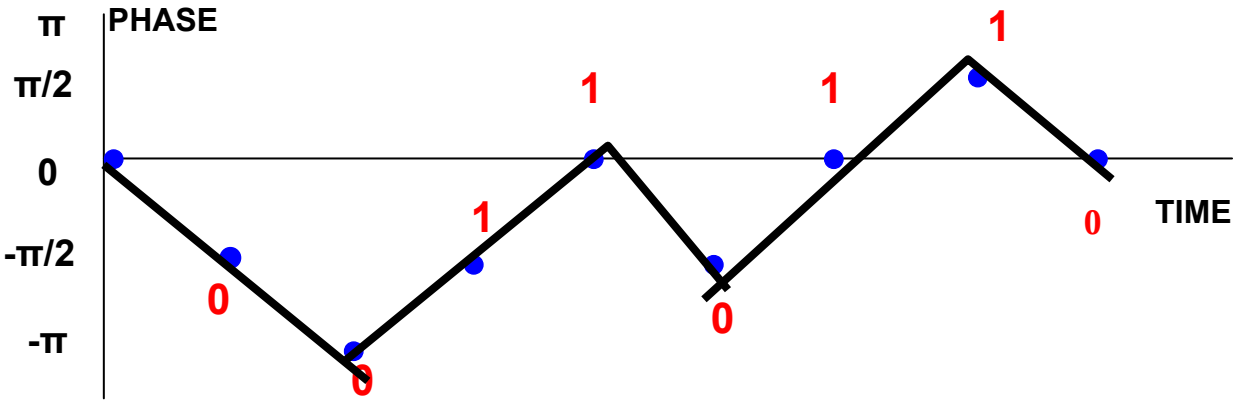
Combined Phase	-π/2	-π	-π/2	0	-π/2	0	π/2	0

Result: offset - QPSK, phase change is restricted to ± π/2 radians:



It would be preferable to have "gradual" changes in place between each pair of bits (Continuous-phase modulation). Replacing each “rectangular” shaped pulse (for 1 or 0) with a sinusoidal pulse can do this:

Result: Minimum Shift Keying (MSK):



Gaussian Minimum Shift Keying

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

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

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.

2.5 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.5.1 Specification Reference

FCC CFR 47 Part 2 and FCC CFR 47 Part 24, Clause 2.1046 and 24.232

2.5.2 Equipment Under Test and Modification State

CDMA SHI16 S/N: IMEI 004401113862912 - Modification State 0

2.5.3 Date of Test

12 June 2012

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

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

The EUTwas tested with GMSK modulation in Circuit Switched mode as this yielded the highest output power.

The spectrum analyser RBW and VBW were set to 1 MHz and the path loss measured and entered as a reference offset level.

2.5.6 Environmental Conditions

Ambient Temperature	22.6°C
Relative Humidity	39.4%

2.5.7 Test Results

4.0 V DC Supply

1850.2 MHz

Mode	Result (dBm)	Result (W)
GMSK	30.39	1.09

1880.0 MHz

Mode	Result (dBm)	Result (W)
GMSK	30.26	1.06

1909.8 MHz

Mode	Result (dBm)	Result (W)
GMSK	30.58	1.14

Limit Clause

Mobile – 7 W or 38.45 dBm
Base Stations – 500 W or 57 dBm

Product Service

2.6 EMISSION FOR BROADBAND PCS EQUIPMENT

2.6.1 Specification Reference

FCC CFR 47 Part 2 and FCC CFR 47 Part 24, Clause 2.1051 and 24.238

2.6.2 Equipment Under Test and Modification State

CDMA SHI16 S/N: IMEI 004401113862912 - Modification State 0

2.6.3 Date of Test

9 May 2012

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

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 WCDMA 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.

2.6.6 Environmental Conditions

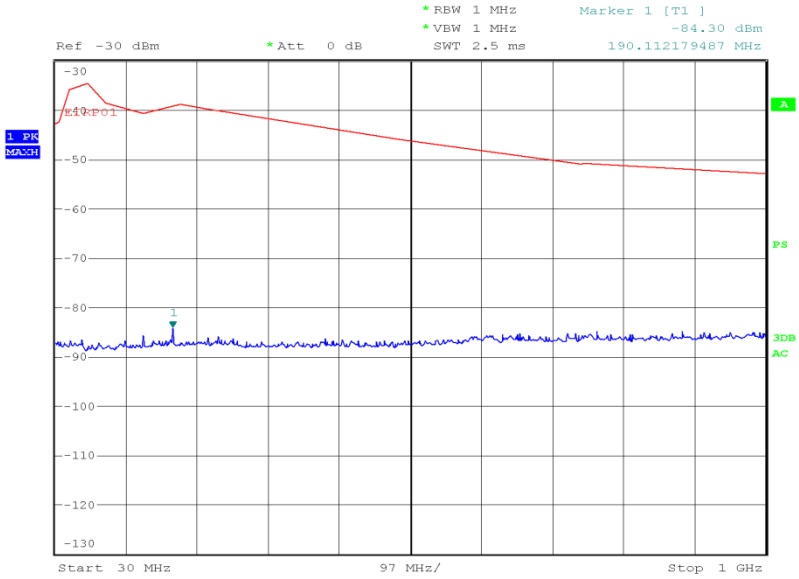
Ambient Temperature	18.3°C
Relative Humidity	64.0%

Product Service

2.6.7 Test Results

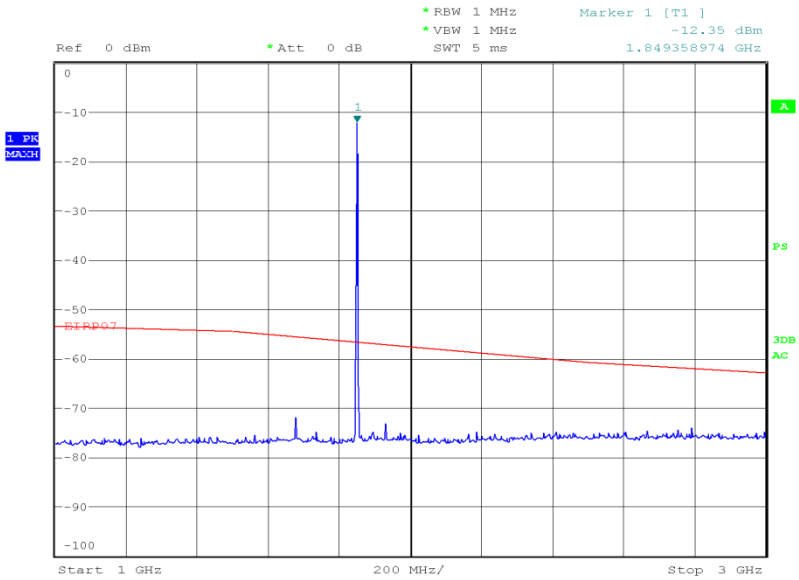
1850.2 MHz

30 MHz to 1 GHz



Date: 9.MAY.2012 22:27:11

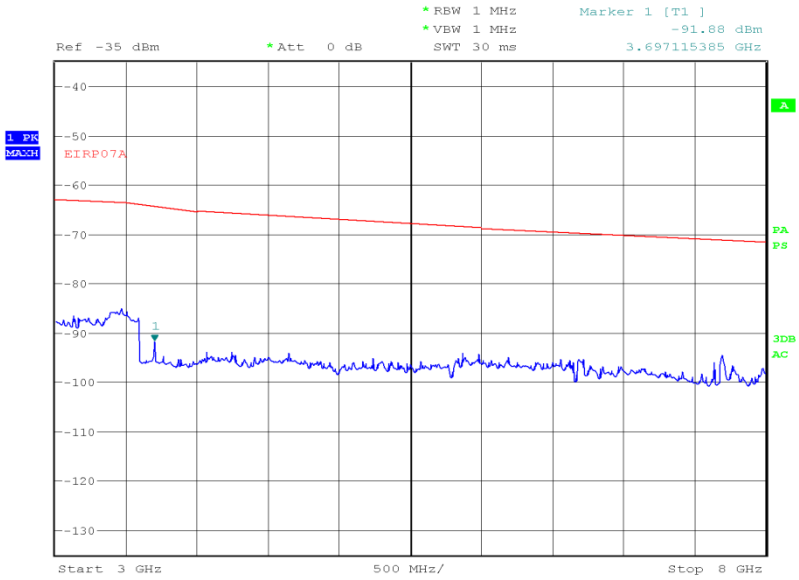
1 GHz to 3 GHz



Date: 9.MAY.2012 18:29:21

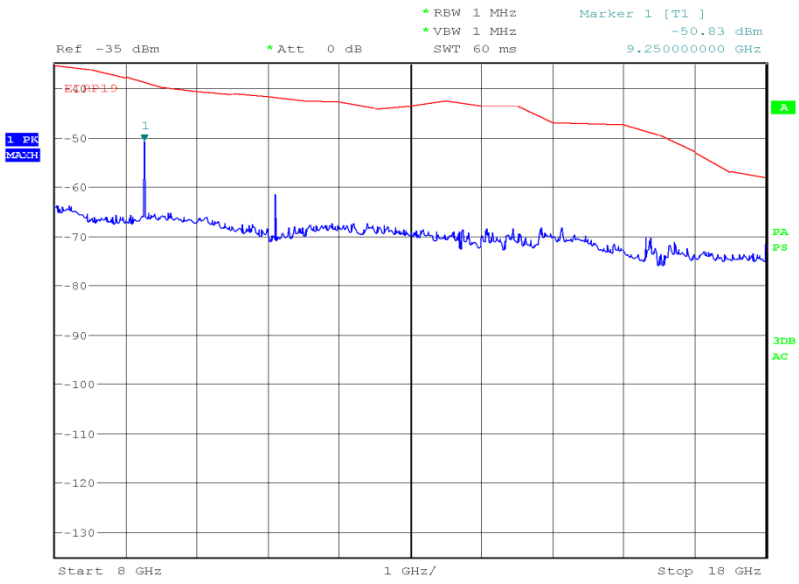
Product Service

3 GHz to 8 GHz



Date: 9.MAY.2012 20:13:15

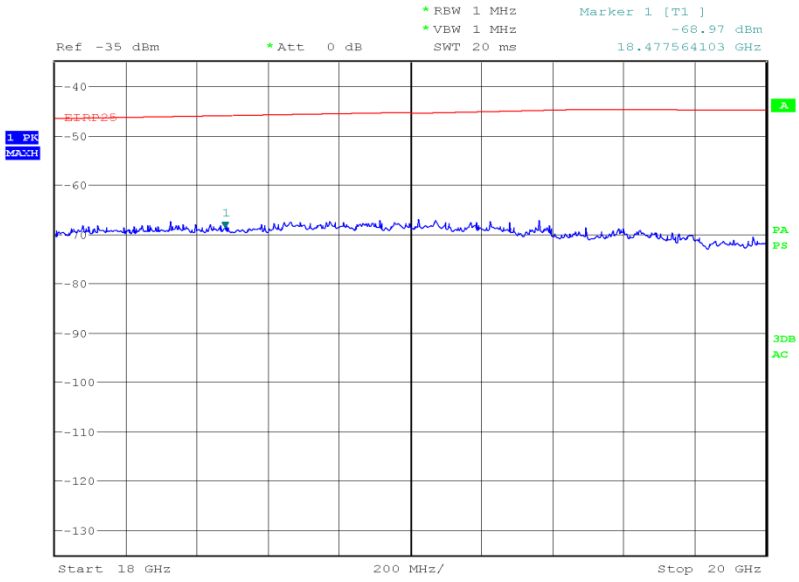
8 GHz to 18 GHz



Date: 9.MAY.2012 20:59:46

Product Service

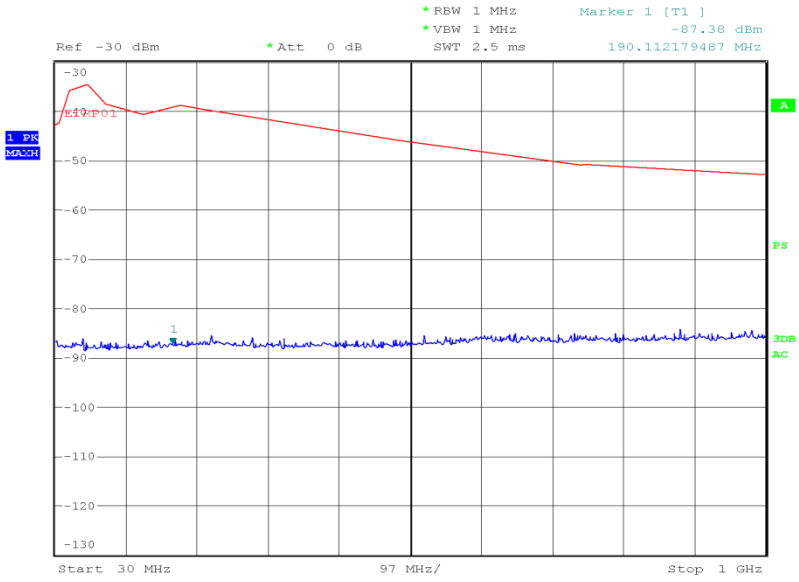
18 GHz to 20 GHz



Date: 9.MAY.2012 21:55:11

1880.0 MHz

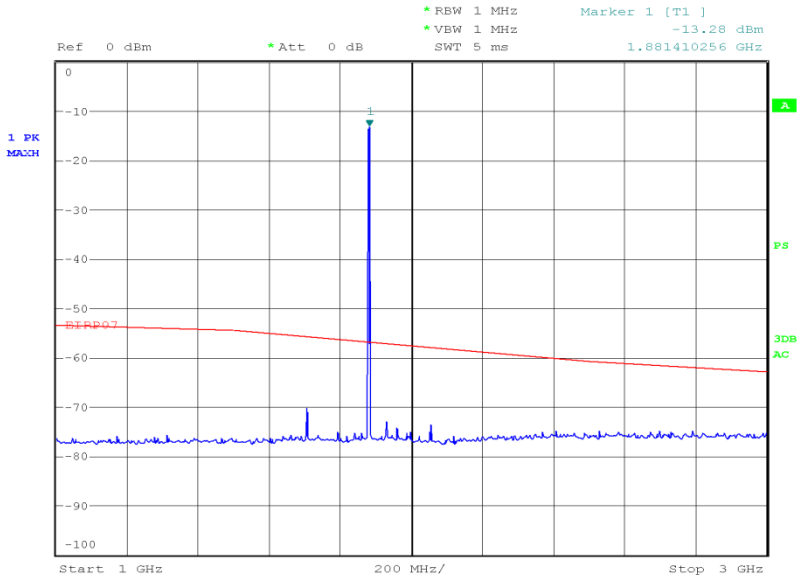
30 MHz to 1 GHz



Date: 9.MAY.2012 22:29:43

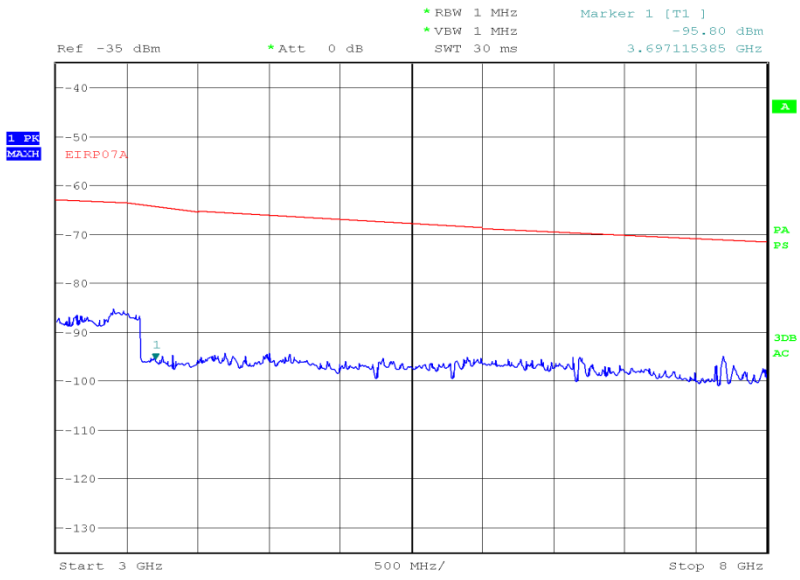
Product Service

1 GHz to 3 GHz



Date: 9.MAY.2012 18:35:12

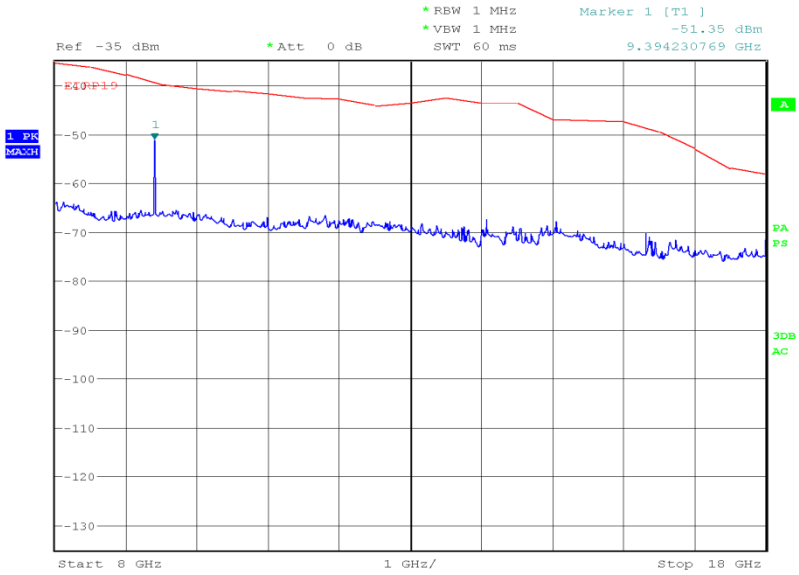
3 GHz to 8 GHz



Date: 9.MAY.2012 20:17:36

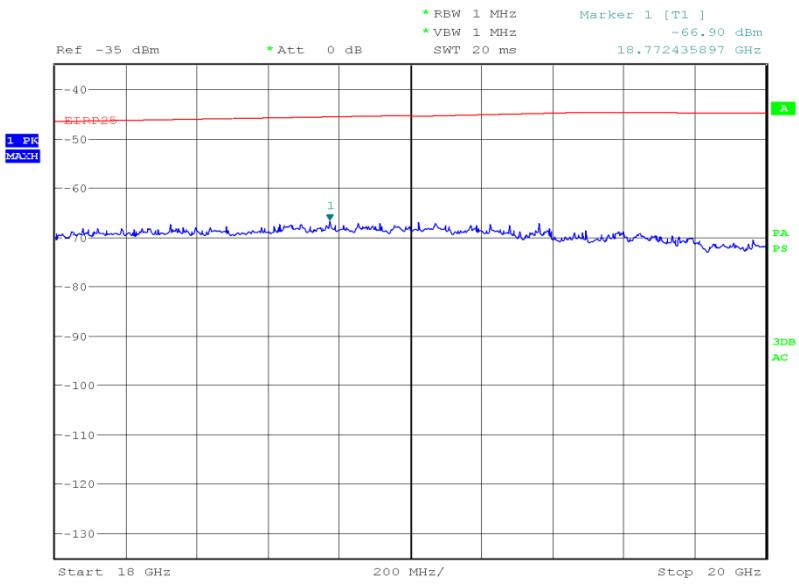
Product Service

8 GHz to 18 GHz



Date: 9.MAY.2012 20:55:04

18 GHz to 20 GHz

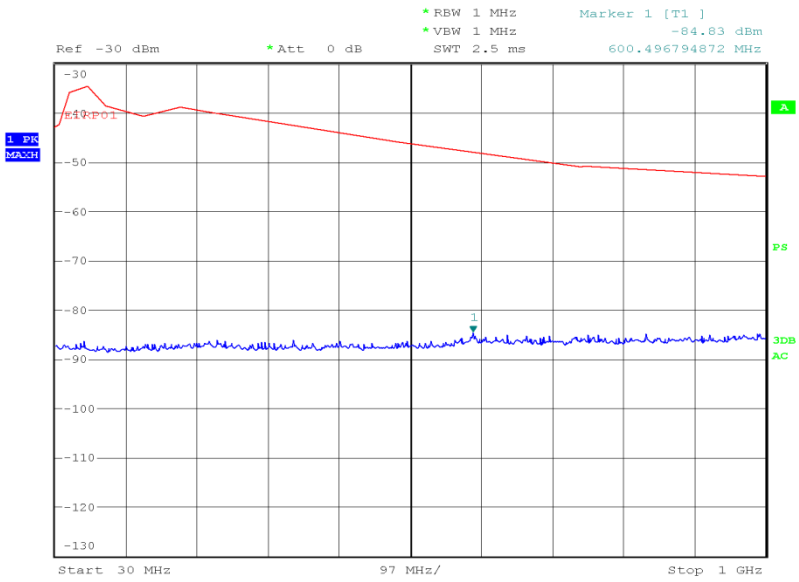


Date: 9.MAY.2012 21:57:10

Product Service

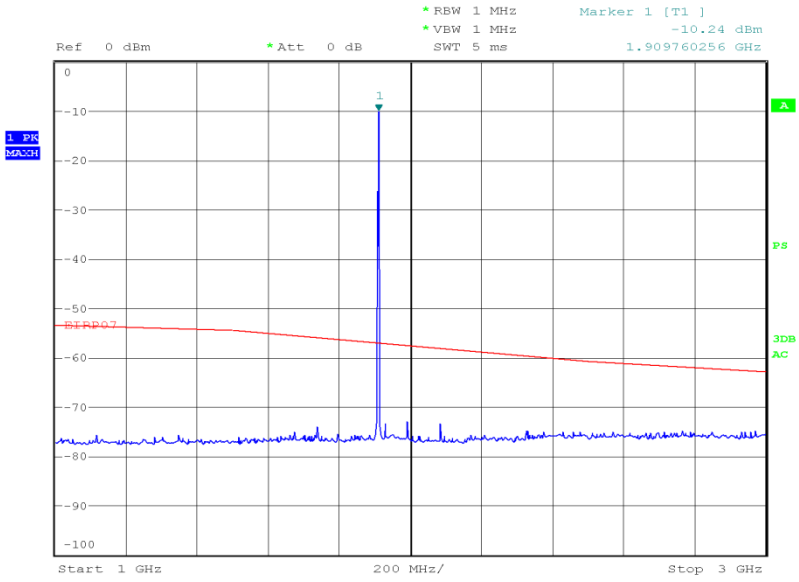
1909.8 MHz

30 MHz to 1 GHz



Date: 9.MAY.2012 22:31:34

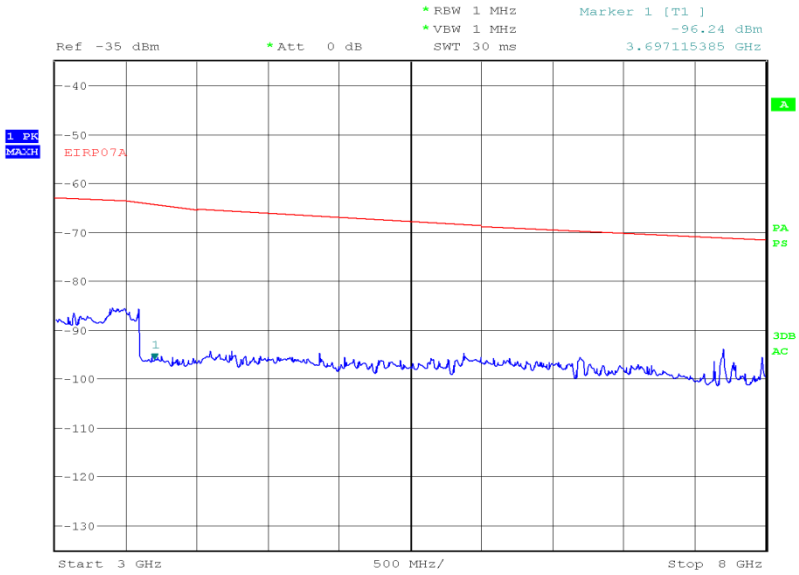
1 GHz to 3 GHz



Date: 9.MAY.2012 18:51:42

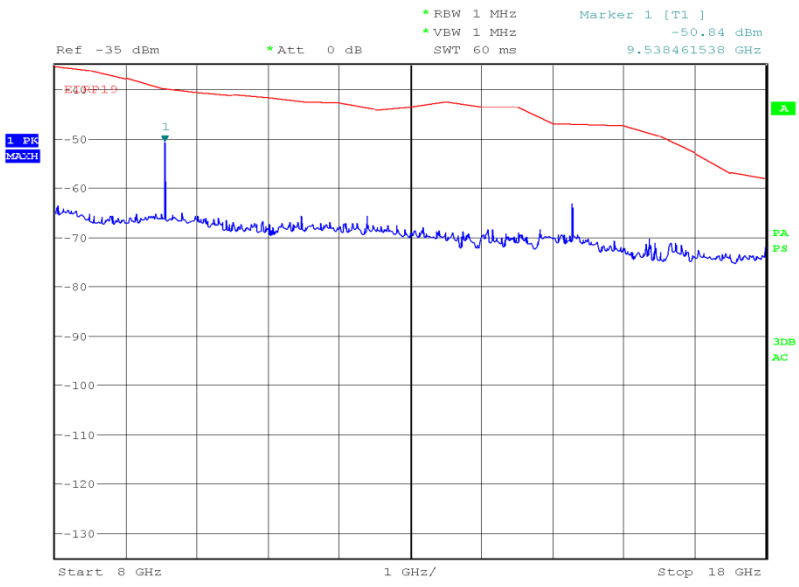
Product Service

3 GHz to 8 GHz



Date: 9.MAY.2012 20:15:13

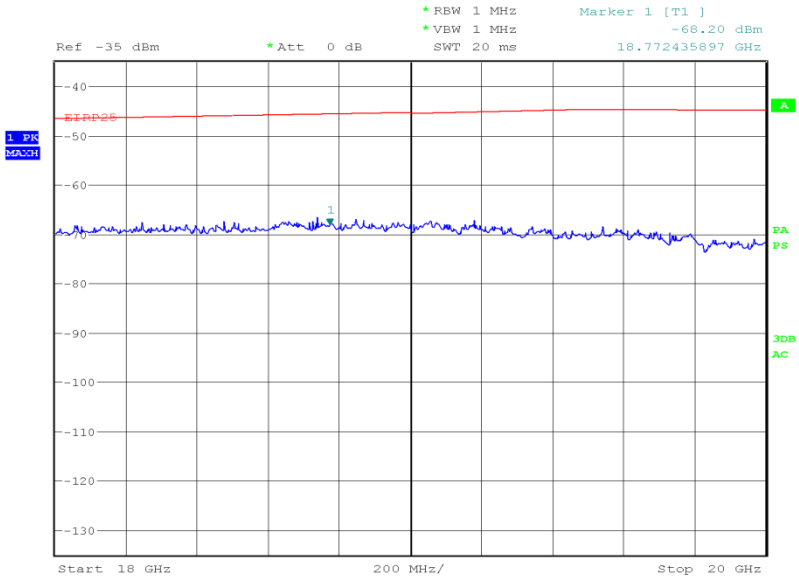
8 GHz to 18 GHz



Date: 9.MAY.2012 20:36:12

Product Service

18 GHz to 20 GHz



Date: 9.MAY.2012 22:06:09

Limit Clause

43+10log(P) or -13 dBm

2.7 CONDUCTED SPURIOUS EMISSIONS

2.7.1 Specification Reference

FCC CFR 47 Part 2 and FCC CFR 47 Part 24, Clause 2.1051 and 24.238(a)

2.7.2 Equipment Under Test and Modification State

CDMA SHI16 S/N: IMEI 004401113862912 - Modification State 0

2.7.3 Date of Test

12 June 2012

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 Procedure

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 with WCDMA modulation. 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 24.238(a). The spectrum analyser detector was set to max hold.

From 9 kHz to 4 GHz, an attenuator was used. For measuring the range 4 GHz to 20 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 bands were used as reference level offsets to ensure worst case.

2.7.6 Environmental Conditions

Ambient Temperature	22.6°C
Relative Humidity	39.4%

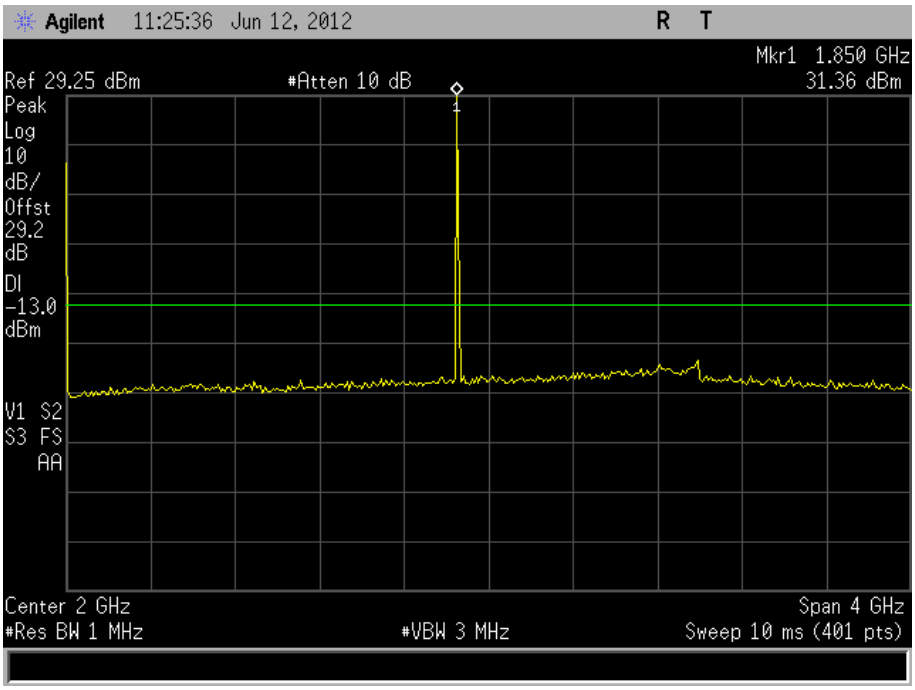
Product Service

2.7.7 Test Results

4.0 V DC Supply

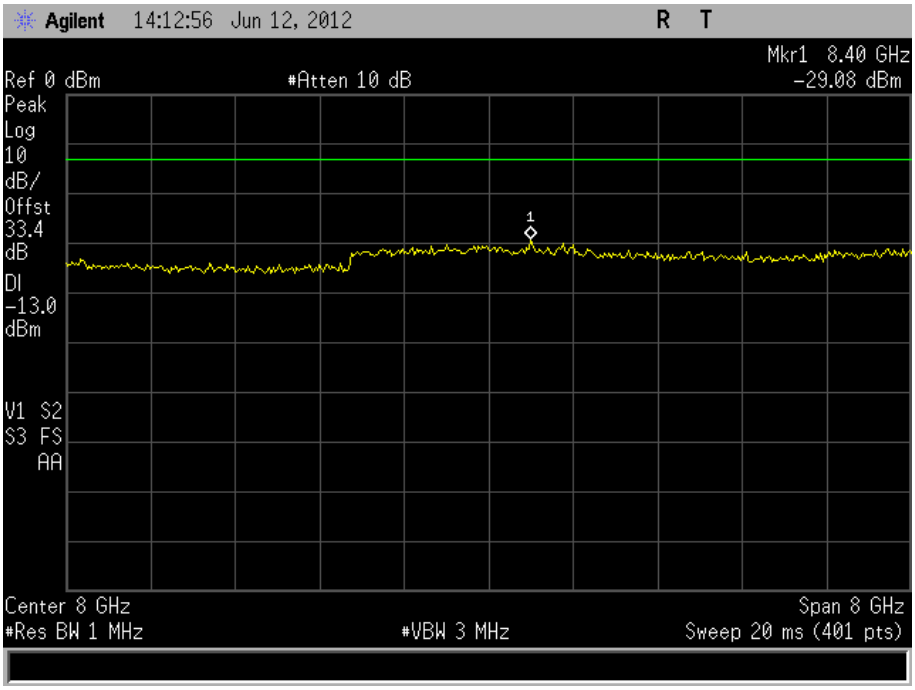
1850.2 MHz

9kHz to 4 GHz

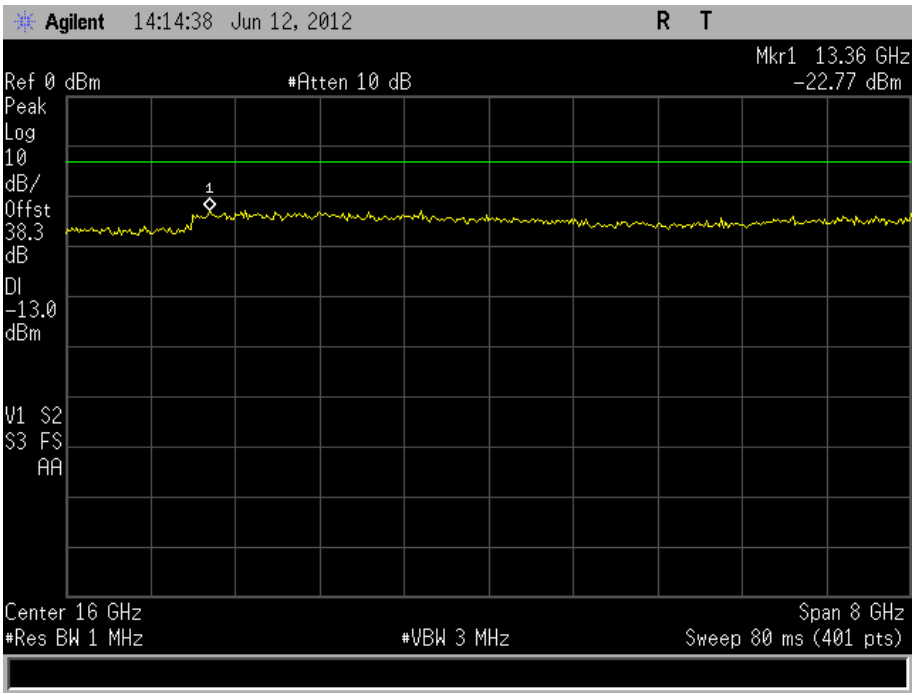


Product Service

4 GHz to 12 GHz



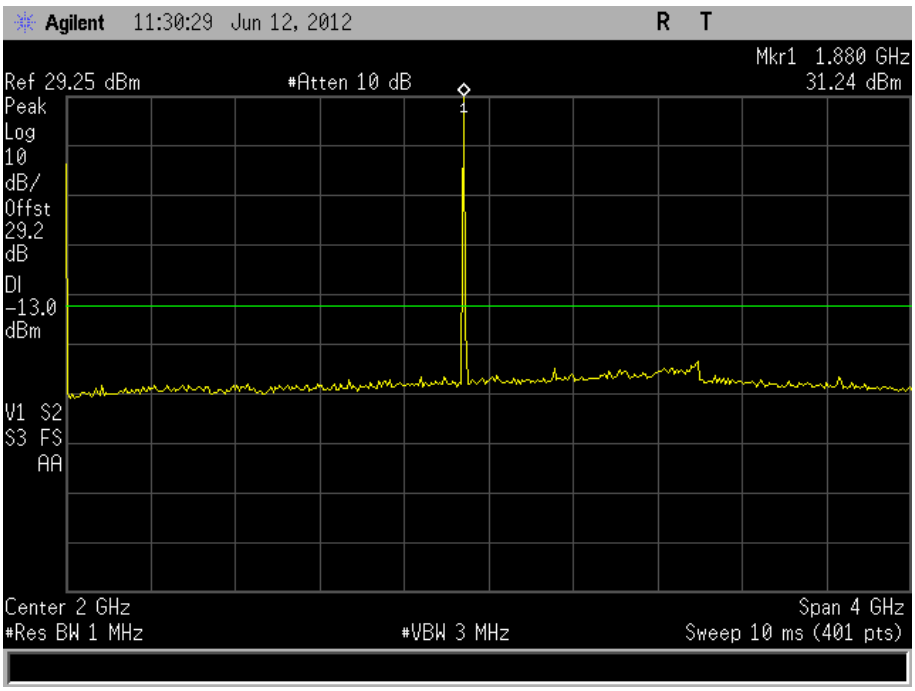
12 GHz to 20 GHz



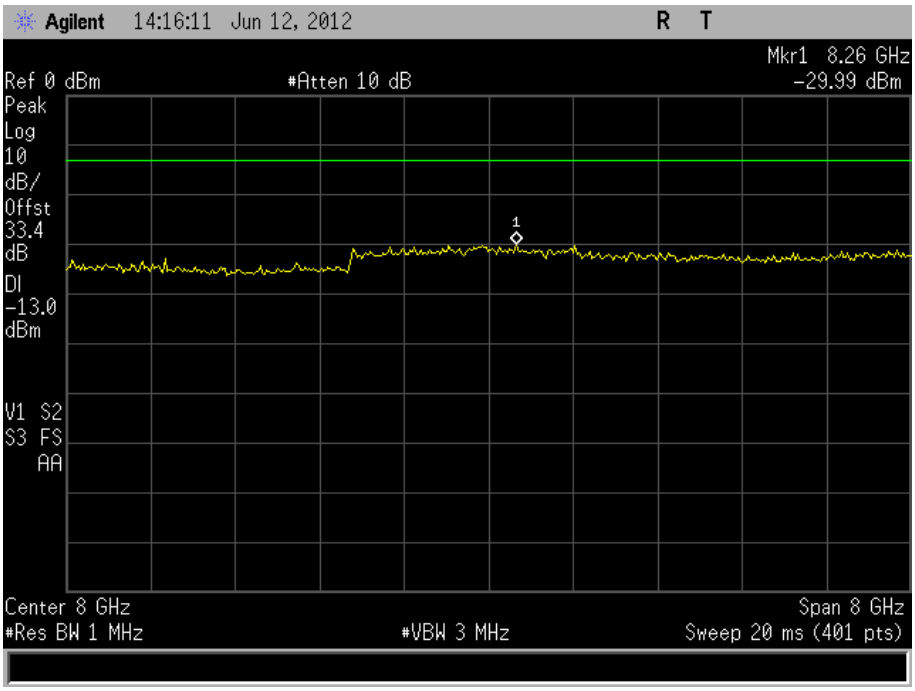
Product Service

1880.0 MHz

9kHz to 4 GHz

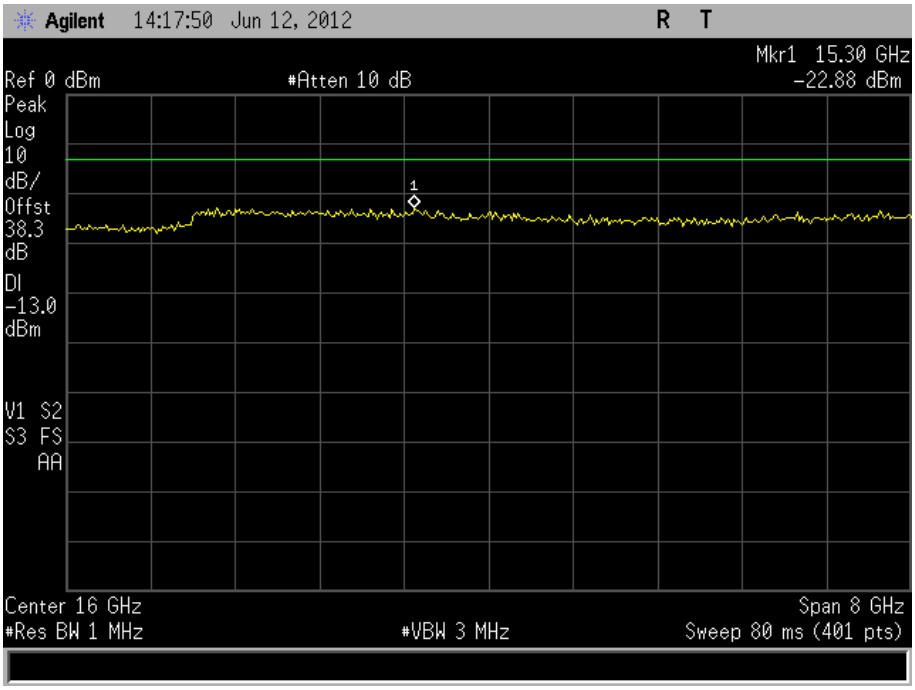


4 GHz to 12 GHz



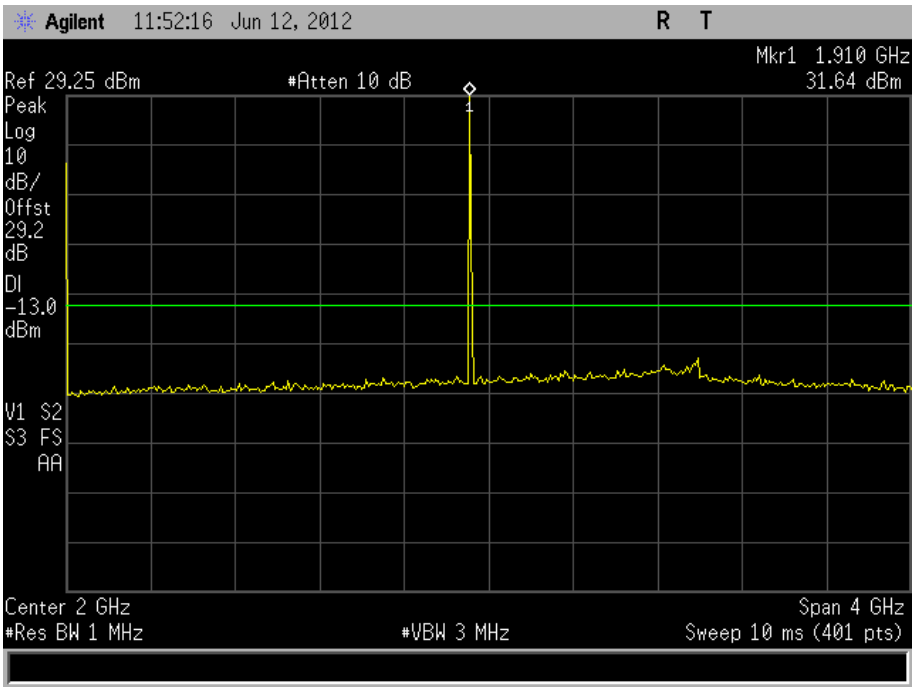
Product Service

12 GHz to 20 GHz



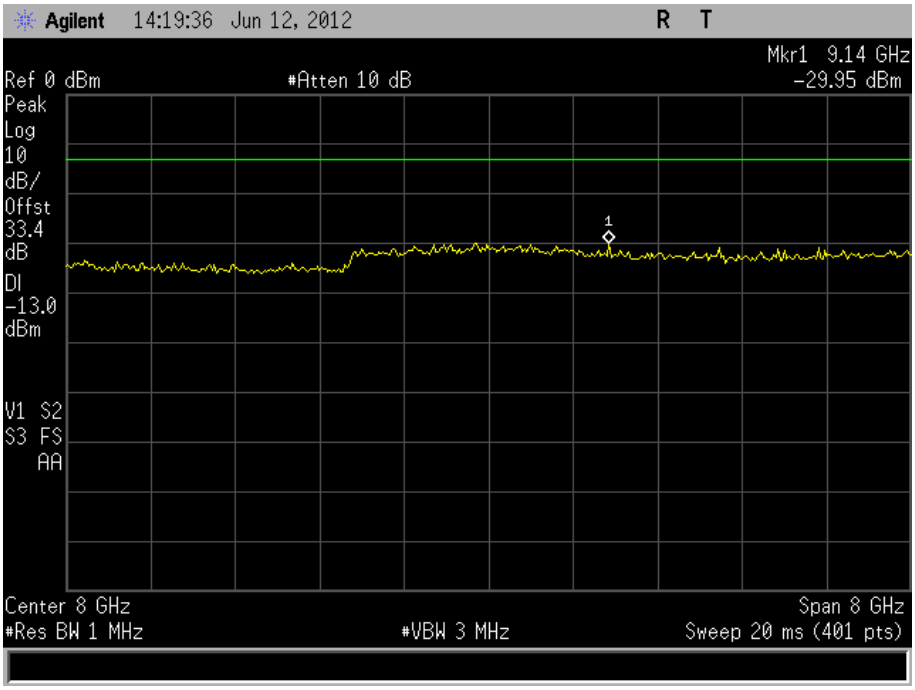
1909.8 MHz

9kHz to 4 GHz

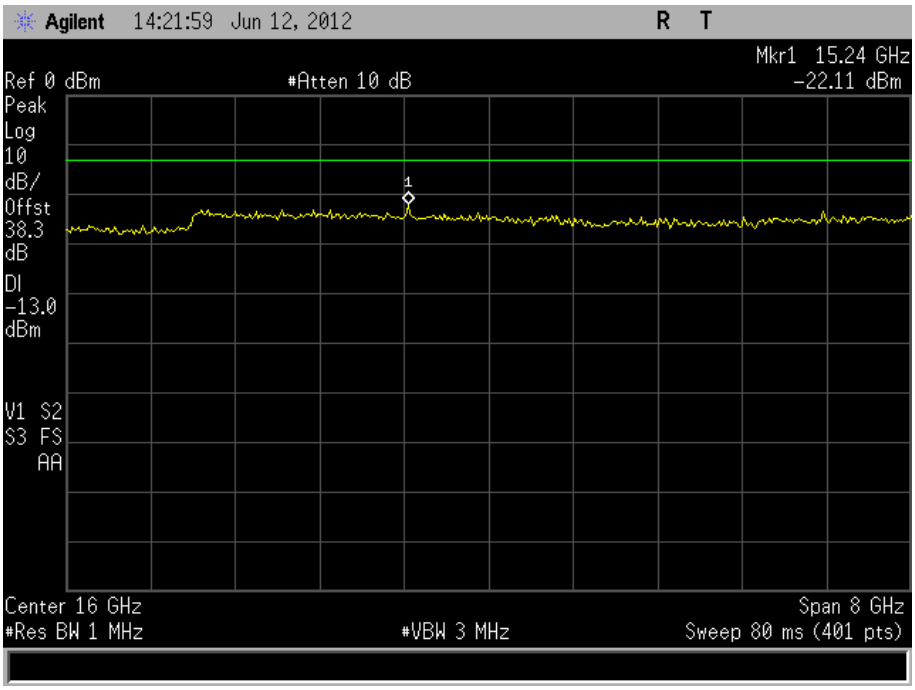


Product Service

4 GHz to 12 GHz



12 GHz to 20 GHz



Limit Clause

43+10log(P) or -13 dBm

2.8 OCCUPIED BANDWIDTH

2.8.1 Specification Reference

FCC CFR 47 Part 2 and FCC CFR 47 Part 24, Clause 2.1049(h) and 24.238(b)

2.8.2 Equipment Under Test and Modification State

CDMA SHI16 S/N: IMEI 004401113862912 - Modification State 0

2.8.3 Date of Test

12 June 2012

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 EUT was transmitting at maximum power, with WCDMA modulation. 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.

2.8.6 Environmental Conditions

Ambient Temperature	22.6°C
Relative Humidity	39.4%

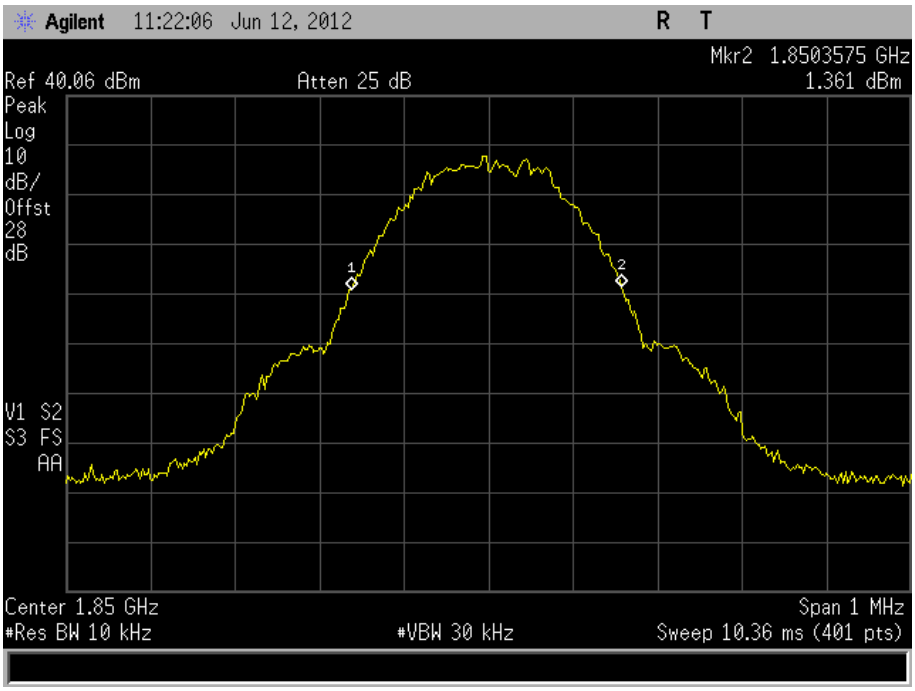
Product Service

2.8.7 Test Results

4.0 V DC Supply

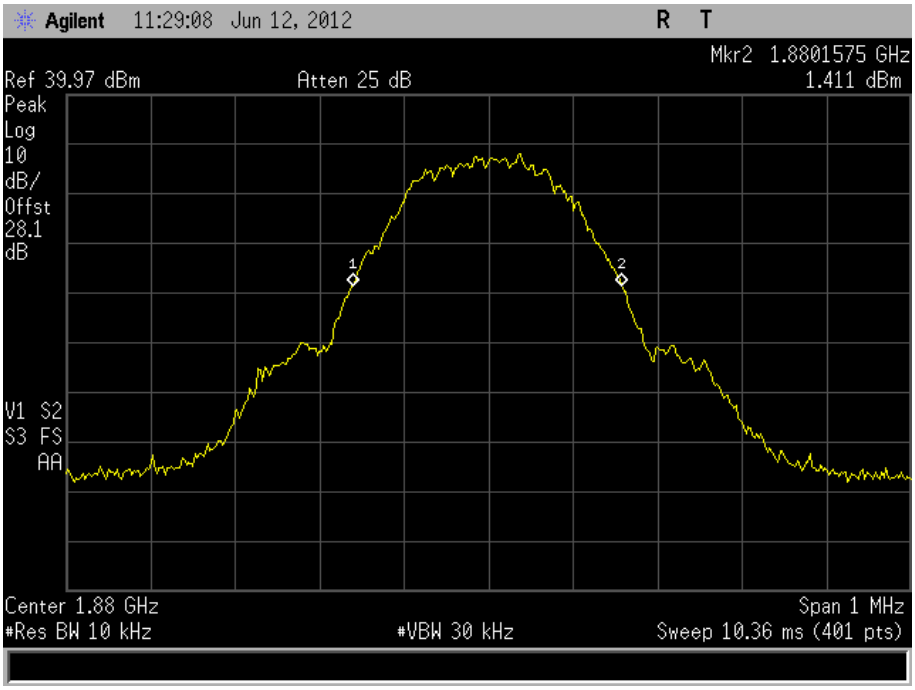
1850.2 MHz

Mode	Occupied Bandwidth (kHz)
GMSK	320



1880.0 MHz

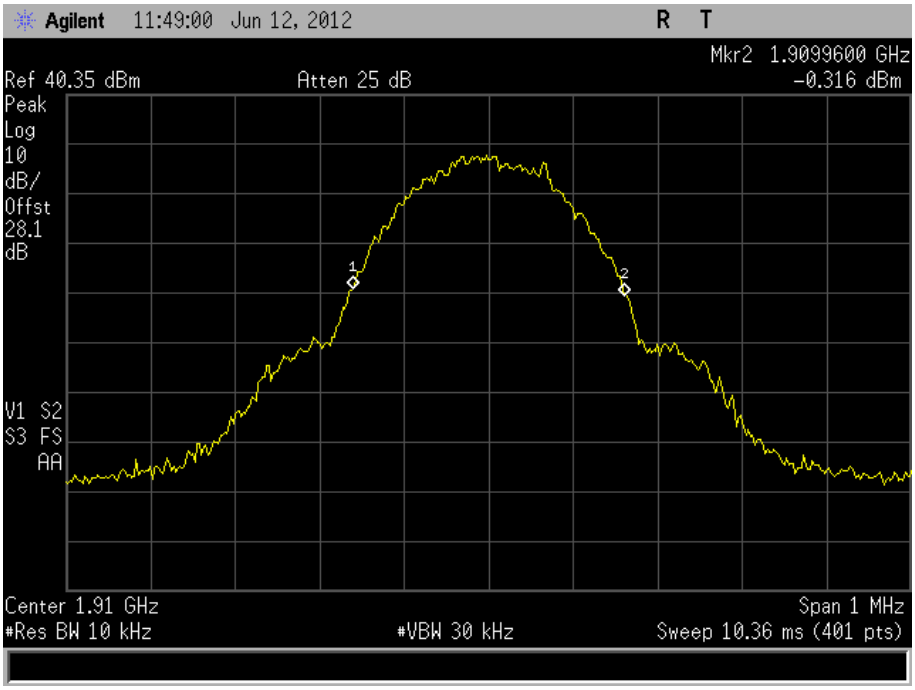
Mode	Occupied Bandwidth (kHz)
GMSK	317.5



Product Service

1909.8 MHz

Mode	Occupied Bandwidth (kHz)
GMSK	320



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

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 - Frequency Stability					
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Digital Temperature Indicator + T/C	Fluke	51	412	12	6-Jan-2013
Dual programable power supply	Thurlby	T-1000	418	-	TU
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Attenuator: 10dB/20W	Narda	766-10	480	12	21-Jul-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	13-Sep-2012
Rubidium Standard	Rohde & Schwarz	XSRM	1316	12	13-Sep-2012
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	18-Nov-2012
GSM Test Set	Rohde & Schwarz	CMU 200	2809	12	8-Jun-2013
Multimeter	Fluke	79 Series II	3057	-	TU
Thermocouple Thermometer	Fluke	51	3172	12	23-Jul-2012
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	24-Jun-2012
True RMS Multimeter	Fluke	179	4007	12	16-Feb-2013
Temperature Humidy Meter	Radio Spares	1260	4020	12	23-Nov-2012
Section 2.2 – Spurious Emissions at Band Edge					
Dual programable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	75 Mk3	455	12	16-Jan-2013
Multimeter	Iso-tech	IDM-101	466	12	5-Mar-2013
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	23-Jun-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	27-Mar-2013
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	21-Sep-2012
Broadband Resistive Power Divider	Weinschel	1506A	601	12	2-Dec-2012
Power Divider	Weinschel	1506A	604	12	19-Mar-2013
Power Splitter	Weinschel	1506A	606	12	19-Dec-2012
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	28-Jun-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	13-Sep-2012
Hygromer	Rotronic	A1	2677	12	7-Feb-2013
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	7-Oct-2012
Power Supply	Farnell	ET30/2	3423	-	TU
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
Power Meter	Rohde & Schwarz	NRP	3491	12	19-Apr-2013
Wideband Power Sensor, 50MHz - 18GHz	Rohde & Schwarz	NRP-Z81	3492	12	19-Apr-2013
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	20-Sep-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Mar-2013
Turntable	EMCO	1060-04	3693	-	TU
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3696	12	27-Jan-2013
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	12-Jan-2013
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	12-Jan-2013
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	24-Jun-2012
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	24-Jun-2012
True RMS Multimeter	Fluke	179	4007	12	16-Feb-2013
Temperature Humidy Meter	Radio Spares	1260	4020	12	23-Nov-2012

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 – Effective Isotropic Radiated Power					
Radiocommunications Tester	Rohde & Schwarz	CMU 200	39	12	9-Dec-2012
Peak Power Analyser	Hewlett Packard	8990A	107	12	10-Feb-2013
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	8-Dec-2012
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	1002	12	29-Jul-2012
Test Receiver	Rohde & Schwarz	ESIB40	1006	12	23-Feb-2013
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Power Sensor	Hewlett Packard	84812A	2743	-	TU
Antenna (DRG Horn)	ETS-LINDGREN	3115	3125	12	24-May-2013
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	22-Aug-2012
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	27-Jan-2013
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Section 2.5- Maximum Peak Output Power - Conducted					
Dual programable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	75 Mk3	455	12	16-Jan-2013
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	23-Jun-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	27-Mar-2013
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	21-Sep-2012
Power Divider	Weinschel	1506A	604	12	19-Mar-2013
Power Splitter	Weinschel	1506A	606	12	19-Dec-2012
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	28-Jun-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	13-Sep-2012
Hygromer	Rotronic	A1	2677	12	7-Feb-2013
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	7-Oct-2012
Power Meter	Rohde & Schwarz	NRP	3491	12	19-Apr-2013
Wideband Power Sensor, 50MHz - 18GHz	Rohde & Schwarz	NRP-Z81	3492	12	19-Apr-2013
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	20-Sep-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Mar-2013
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3696	12	27-Jan-2013
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	24-Jun-2012
P-Series Power Meter	Agilent	N1911A	3981	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3983	12	12-Sep-2012
True RMS Multimeter	Fluke	179	4007	12	16-Feb-2013
Temperature Humidy Meter	Radio Spares	1260	4020	12	23-Nov-2012

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.6 – Emission for Broadband PCS Equipment					
Radiocommunications Tester	Rohde & Schwarz	CMU 200	39	12	9-Dec-2012
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	13-Sep-2013
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	8-Dec-2012
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
Attenuator 20dB 5W	Marconi	56534-904H	377	12	8-May-2013
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	1002	12	29-Jul-2012
Antenna (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	2-Aug-2012
Pre-Amplifier	Phase One	PS04-0086	1533	12	20-Sep-2012
Pre-Amplifier	Phase One	PSO4-0087	1534	12	26-Sep-2012
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Attenuator (20dB, 20W)	Weinschel	1	3032	-	TU
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	22-Aug-2012
High Pass Filter (3GHz)	RLC Electronics	F-100-3000-5-R	3349	12	27-May-2012
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
3 GHz High Pass Filter	K&L Microwave	11SH10-3000/X18000-O/O	3552	12	16-Apr-2013
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
'2.92mm' - '2.92mm' RF Cable (2m)	Rhophase	KPS-1503-2000-KPS	3694	-	TU
'2.92mm' - '2.92mm' RF Cable (2m)	Rhophase	KPS-1503-2000-KPS	3695	-	TU
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	27-Jan-2013
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Low Noise Amplifier	Wright Technologies	APS04-0085	3969	12	8-Jul-2012

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.7 - Conducted Spurious Emissions					
Dual programable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	75 Mk3	455	12	16-Jan-2013
Multimeter	Iso-tech	IDM-101	466	12	5-Mar-2013
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	23-Jun-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	27-Mar-2013
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	21-Sep-2012
Broadband Resistive Power Divider	Weinschel	1506A	601	12	2-Dec-2012
Power Divider	Weinschel	1506A	604	12	19-Mar-2013
Power Splitter	Weinschel	1506A	606	12	19-Dec-2012
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	28-Jun-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	13-Sep-2012
Rubidium Standard	Rohde & Schwarz	XSRM	1316	12	13-Sep-2012
Hygromer	Rotronic	A1	2677	12	7-Feb-2013
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	20-Sep-2012
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	21-Dec-2012
Attenuator (20dB, 20W)	Weinschel	1	3032	-	TU
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	7-Oct-2012
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	22-Aug-2012
Power Supply	Farnell	ET30/2	3423	-	TU
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
Charge Amplifier	Endevco	133	3478	12	15-Jul-2012
Power Meter	Rohde & Schwarz	NRP	3491	12	19-Apr-2013
Wideband Power Sensor, 50MHz - 18GHz	Rohde & Schwarz	NRP-Z81	3492	12	19-Apr-2013
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	20-Sep-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Mar-2013
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3696	12	27-Jan-2013
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	12-Jan-2013
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	12-Jan-2013
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	24-Jun-2012
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	24-Jun-2012
True RMS Multimeter	Fluke	179	4007	12	16-Feb-2013
Temperature Humidy Meter	Radio Spares	1260	4020	12	23-Nov-2012

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.8 - Occupied Bandwidth					
Dual programable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	75 Mk3	455	12	16-Jan-2013
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	23-Jun-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	27-Mar-2013
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	21-Sep-2012
Power Divider	Weinschel	1506A	604	12	19-Mar-2013
Power Splitter	Weinschel	1506A	606	12	19-Dec-2012
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	28-Jun-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	13-Sep-2012
Hygromer	Rotronic	A1	2677	12	7-Feb-2013
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	18-Nov-2012
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	7-Oct-2012
Thermocouple Thermometer	Fluke	51	3174	12	6-Sep-2012
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	20-Sep-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Mar-2013
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3696	12	27-Jan-2013
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	24-Jun-2012
True RMS Multimeter	Fluke	179	4007	12	16-Feb-2013
Temperature Humidy Meter	Radio Spares	1260	4020	12	23-Nov-2012

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
Maximum Peak Output Power - Conducted	± 0.70 dB
Emission for Broadband PCS Equipment	± 3.08 dB
Conducted Spurious Emissions	± 3.454 dB
Effective Isotropic Radiated Power	± 3.08 dB
Spurious Emissions at Band Edge	± 2.20 dB
Occupied Bandwidth	± 10.14 kHz
Modulation Characteristics	-
Frequency Stability	± 99.54 Hz

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

UKAS TESTING 0141

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

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

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