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Report On

FCC Testing of the Sharp CDMA SHL21 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) and Dual Band UMTS (FDD I and V) and Dual Band LTE (B11 and B18) Multi Mode Cellular Phone with Bluetooth, WLAN, NFC (FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 24

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00178

Document 75918726 Report 18 Issue 1

October 2012



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COMMERCIAL-IN-CONFIDENCE

REPORT ON

FCC Testing of the Sharp CDMA SHL21 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) and Dual Band UMTS (FDD I and V) and Dual Band LTE (B11 and B18) Multi Mode Cellular Phone with Bluetooth, WLAN, NFC (FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 24

Document 75918726 Report 18 Issue 1

October 2012

PREPARED FOR

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Bracknell
RG12 7QY

PREPARED BY

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APPROVED BY

Mark Jenkins
Authorised Signatory

DATED

02 October 2012

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);

B. H. S.

T. Guy



G. Lawler



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SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp CDMA SHL21 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900
MHz) and Dual Band UMTS (FDD I and V) and Dual Band LTE (B11 and B18) Multi Mode
Cellular Phone with Bluetooth, WLAN, 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 SHL21 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) and Dual Band UMTS (FDD I and V) and Dual Band LTE (B11 and B18) Multi Mode Cellular Phone with Bluetooth, WLAN, 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 SHL21
Serial Number(s)	IMEI 004401114094507 IMEI 004401114094549
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 30 July 2012
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	9290 03 August 2012
Start of Test	13 August 2012
Finish of Test	18 September 2012
Name of Engineer(s)	B Airs T Guy G Lawler
Related Document(s)	ANSI C63.4: 2003



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	Pt 24			
PCS 1900					
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	



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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 SHL21	Identification number	APYHRO00178
<u>Supply Voltage:</u>			
[]	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 ...3.7 V	and Battery type...Li-Ion.
<u>Frequency characteristics:</u>			
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		
<u>Power characteristics:</u>			
Maximum transmitter power	1.58W(32dBm)	Minimum transmitter power (if variable)	 W
[X]	Continuous transmission	State duty cycle	
[]	Intermittent transmission	If intermittent, can transmitter be set to continuous transmit test mode? Y/N	
<u>Antenna characteristics:</u>			
[X]	Antenna connector	State impedance 50 ohm	
[]	Temporary antenna connector	State impedance ohm	
[]	Integral antenna	State gain dBi	
<u>Modulation characteristics:</u>			
[]	Amplitude	[]	Other
[]	Frequency	Details:	
[X]	Phase		
Can the transmitter operate un-modulated?		Y/N	
ITU Class of emission:			
<u>Extreme conditions:</u>			
Maximum temperature	55 °C	Minimum temperature	-10 °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 :

Name : Masahiko Kishino

Position held : Manager

Date : 30 July 2012



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1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp CDMA SHL21 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) and Dual Band UMTS (FDD I and V) and Dual Band LTE (B11 and B18) Multi Mode Cellular Phone with Bluetooth, WLAN, 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.



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SECTION 2

TEST DETAILS

FCC Testing of the
Sharp CDMA SHL21 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900
MHz) and Dual Band UMTS (FDD I and V) and Dual Band LTE (B11 and B18) Multi Mode
Cellular Phone with Bluetooth, WLAN, 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, Clause 2.1055
FCC CFR 47 Part 24, Clause 24.135(a)

2.1.2 Equipment Under Test and Modification State

CDMA SHL21 S/N: IMEI 004401114094507 - Modification State 0

2.1.3 Date of Test

23 August 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 WCDMA modulation. An FSQ Signal Analyser, 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	25.6°C
Relative Humidity	35.9%



2.1.7 Test Results

4.0 V DC Supply

Under Temperature Variations

1880.00 MHz

Temperature Interval (°C)	Mode	Deviation (ppm)
-30	GMSK	-0.009
-20	GMSK	-0.011
-10	GMSK	-0.008
0	GMSK	-0.007
+10	GMSK	-0.005
+20	GMSK	-0.008
+30	GMSK	-0.007
+40	GMSK	-0.004
+50	GMSK	-0.006

Limit Clause

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

Under Voltage Variations

1880.00 MHz

DC Voltage (V)	Mode	Deviation (ppm)
4.0	GMSK	-0.008
3.7	GMSK	-0.004
4.0	GMSK	-0.008

Limit Clause

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



Product Service

2.2 SPURIOUS EMISSIONS AT BAND EDGE

2.2.1 Specification Reference

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

2.2.2 Equipment Under Test and Modification State

CDMA SHL21 S/N: IMEI 004401114094507 - Modification State 0

2.2.3 Date of Test

13 August 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 $-13 \text{ dBm} (43 + 10 \log (P))$, limit.

2.2.6 Environmental Conditions

Ambient Temperature	25.1°C
Relative Humidity	46.1%



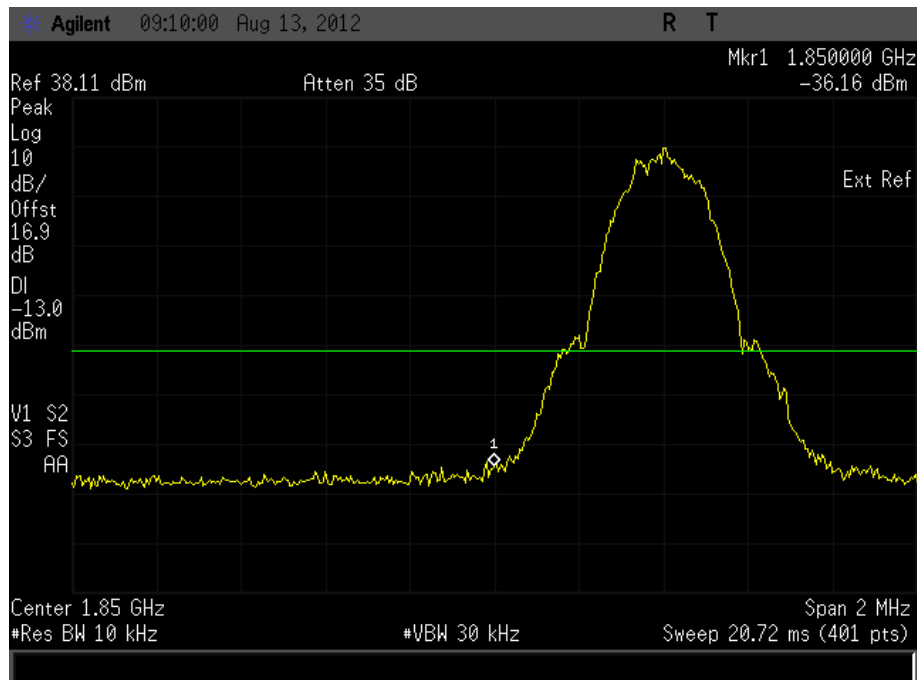
Product Service

2.2.7 Test Results

4.0 V DC Supply

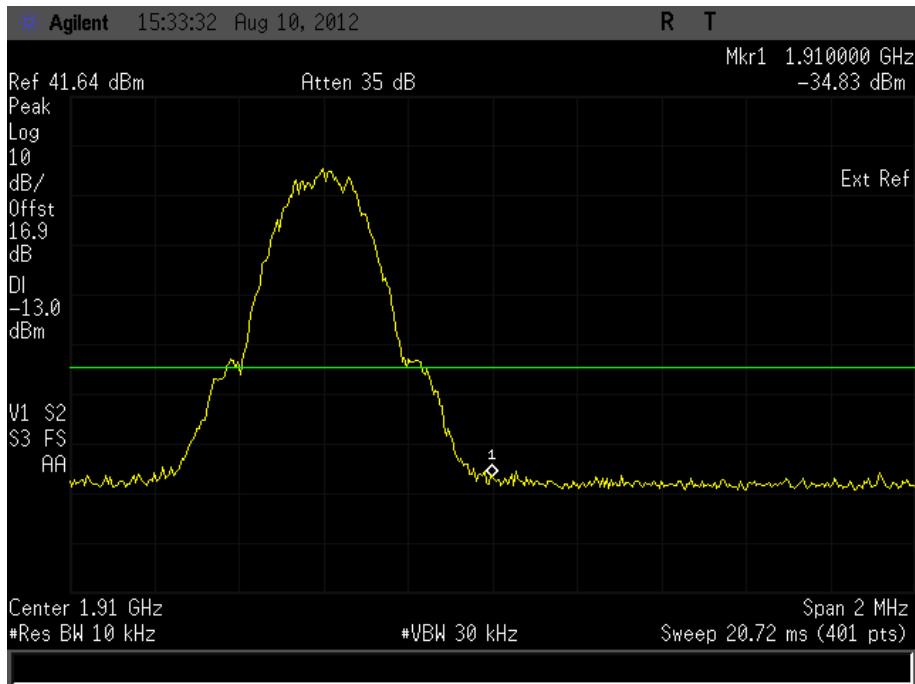
Frequency Block (MHz)	Mode	Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
A : (1930.0 – 1945.0)	GMSK	Channel : 513 Frequency : 1850.4 MHz	N/A
B : (1975.0 – 1990.0)	GMSK	N/A	Channel : 809 Frequency : 1909.6 MHz

Frequency Block A





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Frequency Block B

Please note that channel 512 and 810 do not meet the specification requirements. Therefore, the operating frequency range of the equipment must be reduced to between channel 513 and 809. This is 1850.4 MHz to 1909.6 MHz.

Limit Clause

-13 dBm at block edge.



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2.3 EFFECTIVE ISOTROPIC RADIATED POWER

2.3.1 Specification Reference

FCC CFR 47 Part 24, Clause 24.232(c)

2.3.2 Equipment Under Test and Modification State

CDMA SHL21 S/N: IMEI 004401114094549 - Modification State 0

2.3.3 Date of Test

13 September 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	21.8°C
Relative Humidity	38.0%

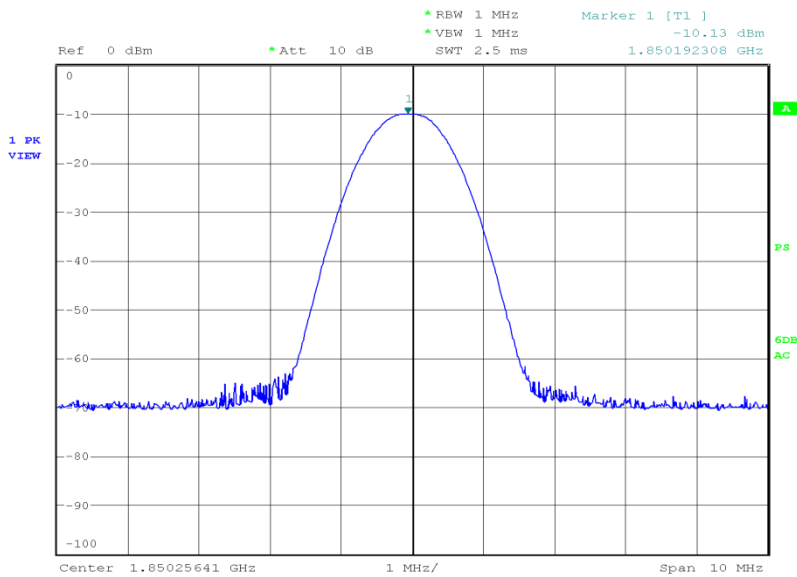


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2.3.7 Test Results

1850.20 MHz

Result (dBm)	Result (W)
29.97	0.993



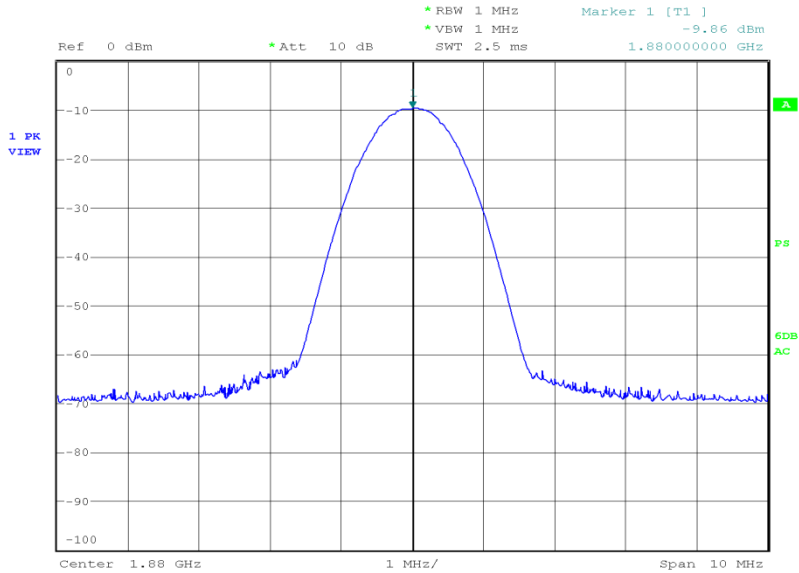
Date: 13.SEP.2012 12:53:38



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1880.00 MHz

Result (dBm)	Result (W)
30.73	1.183



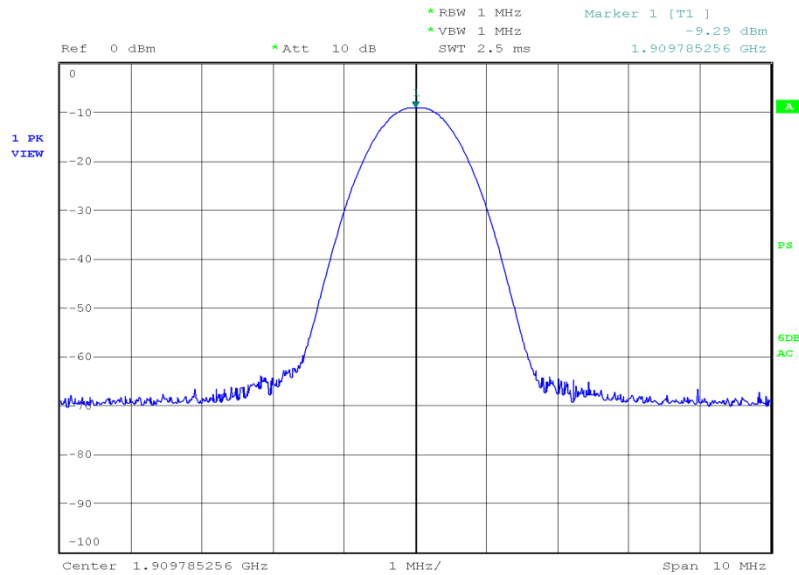
Date: 13.SEP.2012 13:41:30



Product Service

1909.80 MHz

Result (dBm)	Result (W)
32.8	1.905



Date: 13.SEP.2012 12:35:08

Limit Clause

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



2.4 MODULATION CHARACTERISTICS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047(d)

2.4.2 Equipment Under Test

CDMA SHL21

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

$\text{bit rate} / \text{Channel bandwidth} = 270.83333 \text{ kbit/s} / 200 \text{ kHz} = 1.354 \text{ bit/s/Hz}.$

The bandwidth product $BT = \text{Bandwidth} \times \text{bit duration} = 81.25 \text{ kHz} \times 3.6923 \text{ micros} = 0.3$

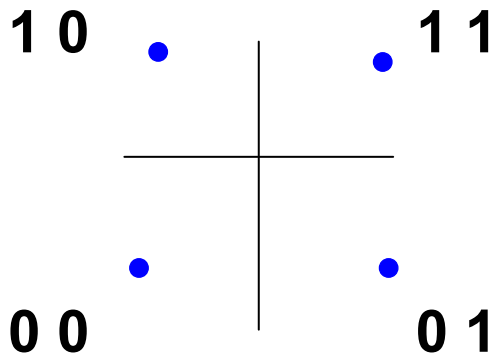
GMSK OVERVIEW

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	0 1
PHASE	225°	45°	135°	315°

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 $\pm 90^\circ$

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 $\pi/2$, 0 = -90° or $-\pi/2$ phase shift)

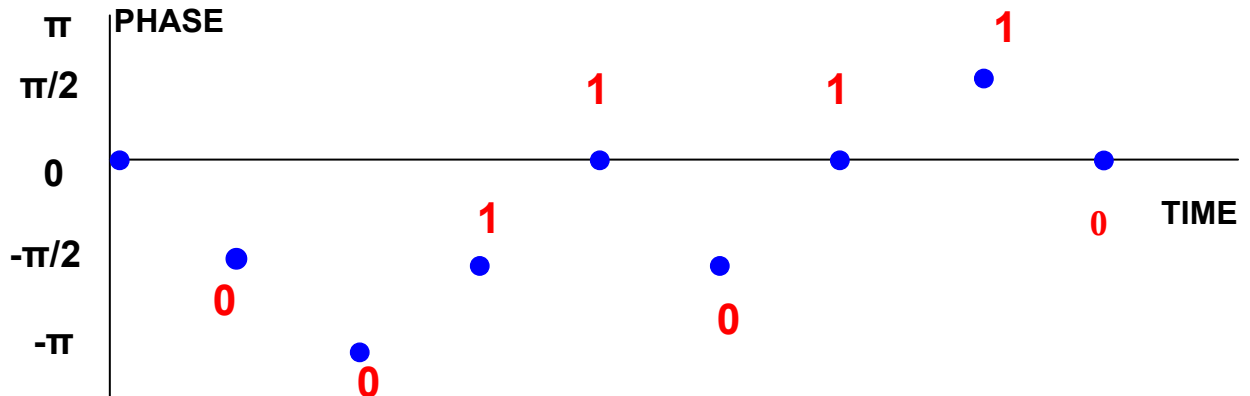
I Stream	0		1		0		1	
	$-\pi/2$		$-\pi/2$		$-\pi/2$		$\pi/2$	
Q stream		0		1		1		0
		$-\pi/2$		$\pi/2$		$\pi/2$		$-\pi/2$



3. Combine (add) the two PSK signals:

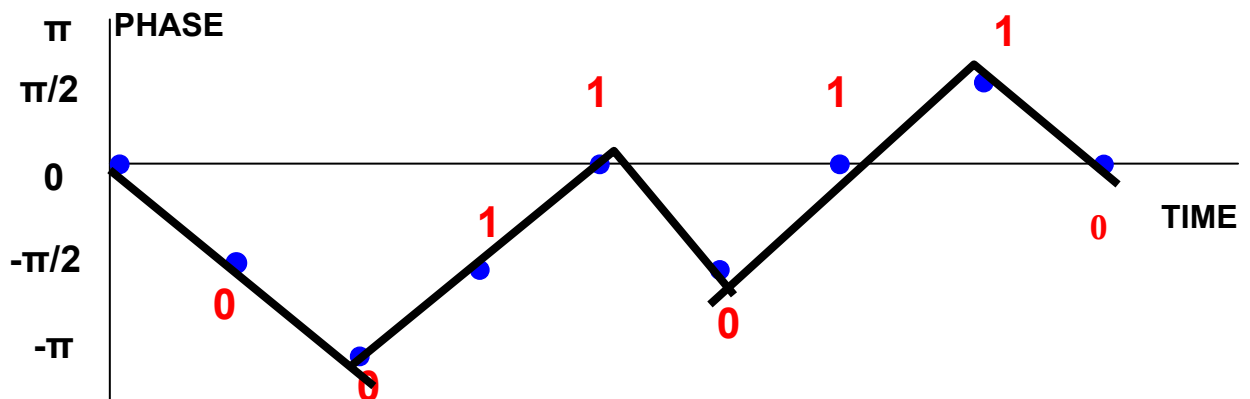
Combined Phase	$-\pi/2$	$-\pi$	$-\pi/2$	0	$-\pi/2$	0	$\pi/2$	0
----------------	----------	--------	----------	---	----------	---	---------	---

Result: offset - QPSK, phase change is restricted to $\pm \pi/2$ radians:



It would be preferable to have "gradual" changes in phase 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 filtered 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.



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2.5 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.5.1 Specification Reference

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

2.5.2 Equipment Under Test and Modification State

CDMA SHL21 S/N: IMEI 004401114094507 - Modification State 0

2.5.3 Date of Test

13 August 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 EUT supports WCDMA and was tested in this mode of operation.

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	25.1°C
Relative Humidity	46.1%



Product Service

2.5.7 Test Results

4.0 V DC Supply

1850.20 MHz

Mode	Result (dBm)	Result (W)
GMSK	30.05	1.011

1880.00 MHz

Mode	Result (dBm)	Result (W)
GMSK	29.60	0.912

1909.80 MHz

Mode	Result (dBm)	Result (W)
GMSK	29.75	0.944

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, Clause 2.1051
FCC CFR 47 Part 24, Clause 24.238

2.6.2 Equipment Under Test and Modification State

CDMA SHL21 S/N: IMEI 004401114094549 - Modification State 0

2.6.3 Date of Test

15 September 2012 & 18 September 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 GMSK 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.

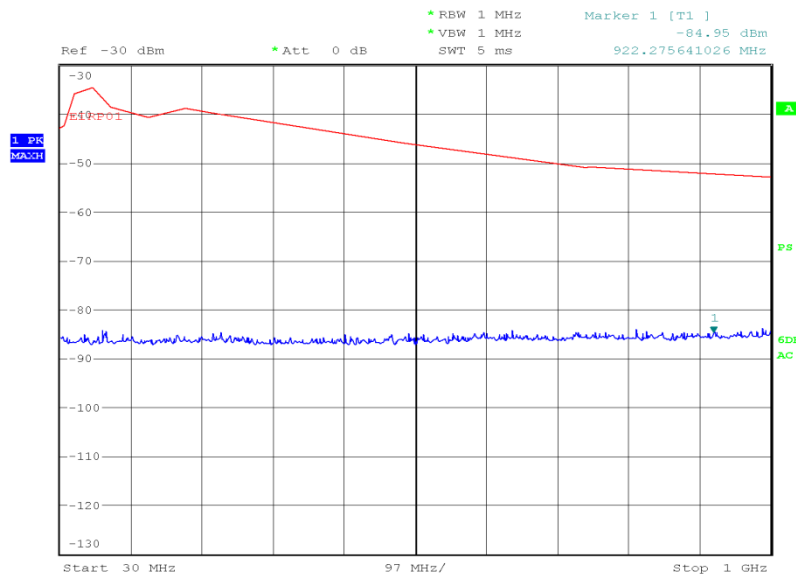
2.6.6 Environmental Conditions

Ambient Temperature	19.3 - 23.4°C
Relative Humidity	40.0%

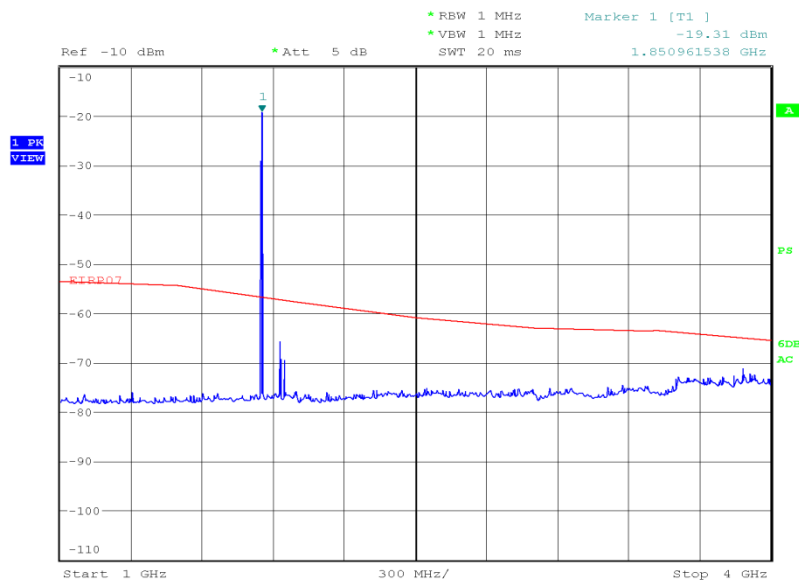


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2.6.7 Test Results

1850.20 MHz30 MHz to 1 GHz

Date: 18.SEP.2012 17:36:42

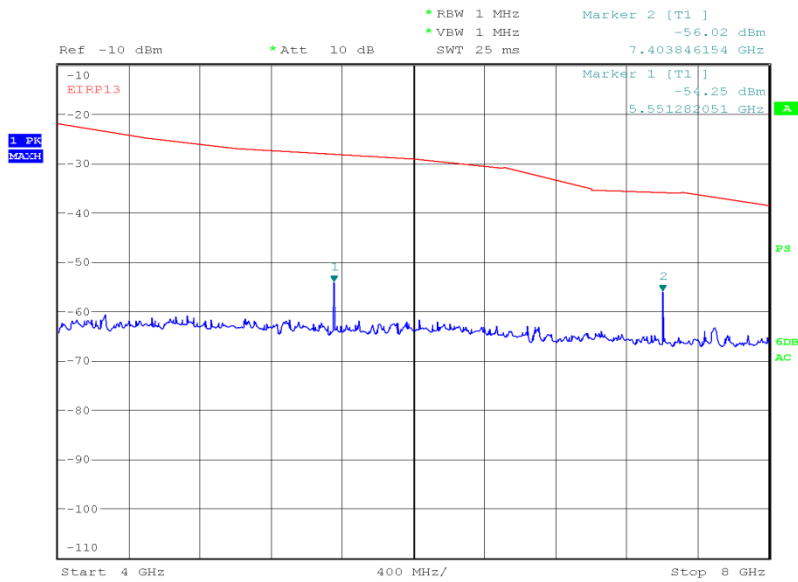
1 GHz to 4 GHz

Date: 15.SEP.2012 11:16:41



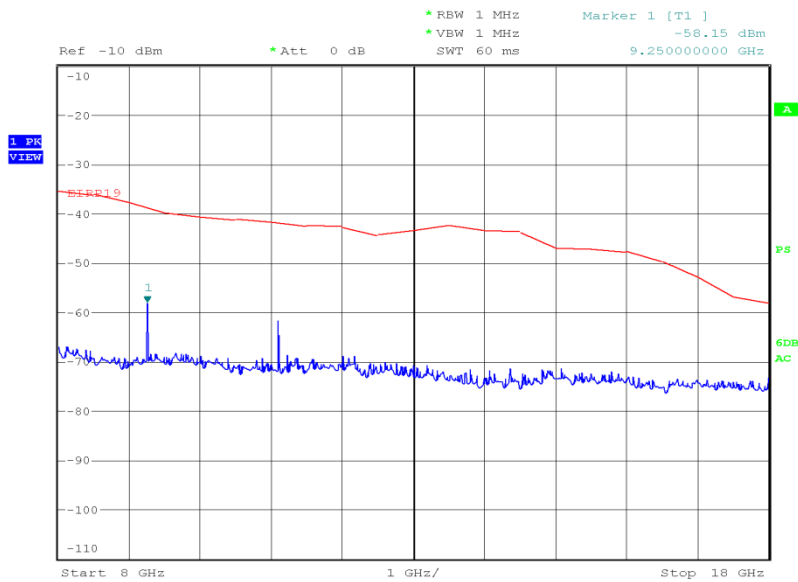
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4 GHz to 8 GHz



Date: 15.SEP.2012 12:56:17

8 GHz to 18 GHz

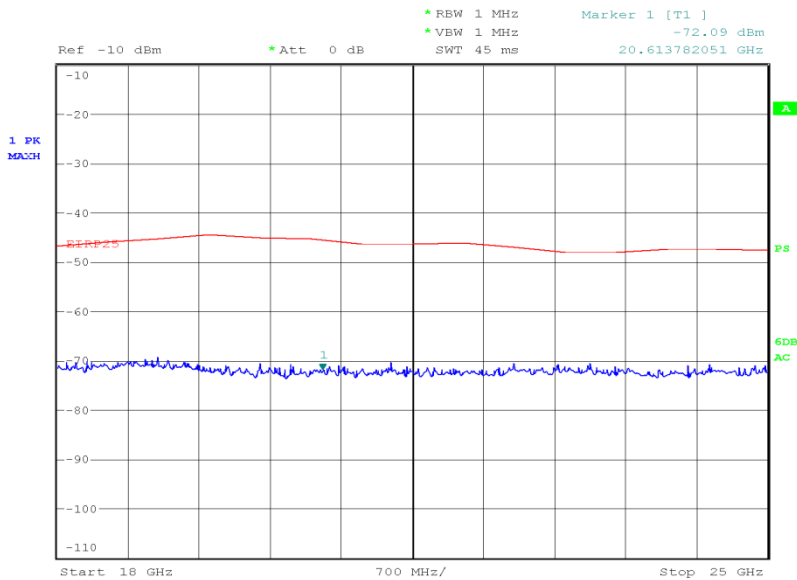


Date: 15.SEP.2012 14:17:01



Product Service

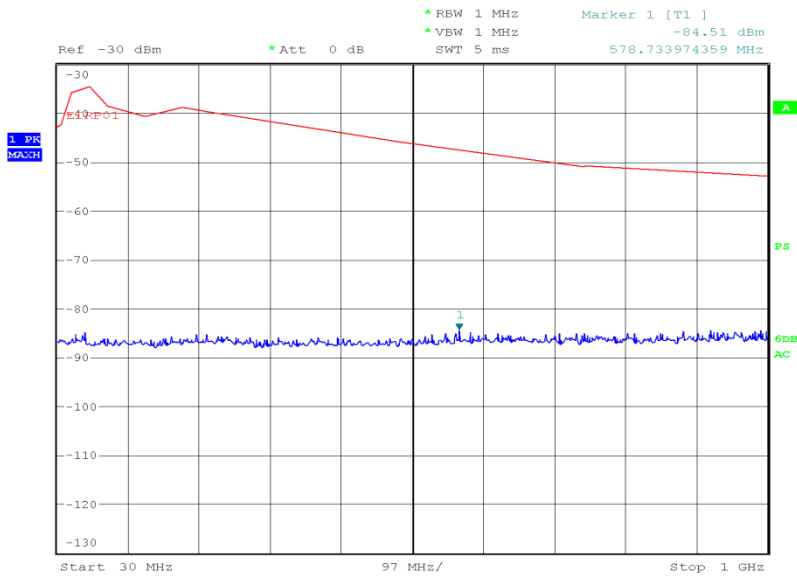
18 GHz to 25 GHz



Date: 15.SEP.2012 14:53:08

1880.00 MHz

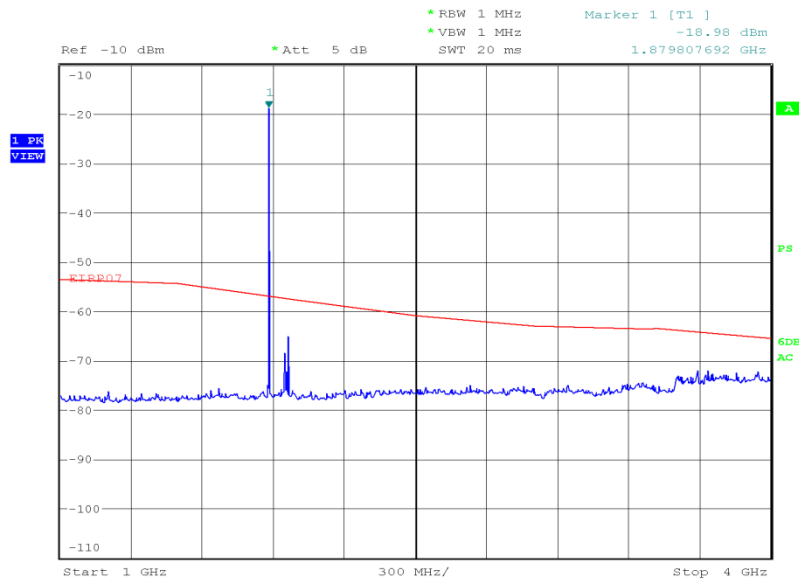
30 MHz to 1 GHz



Date: 18.SEP.2012 17:38:29

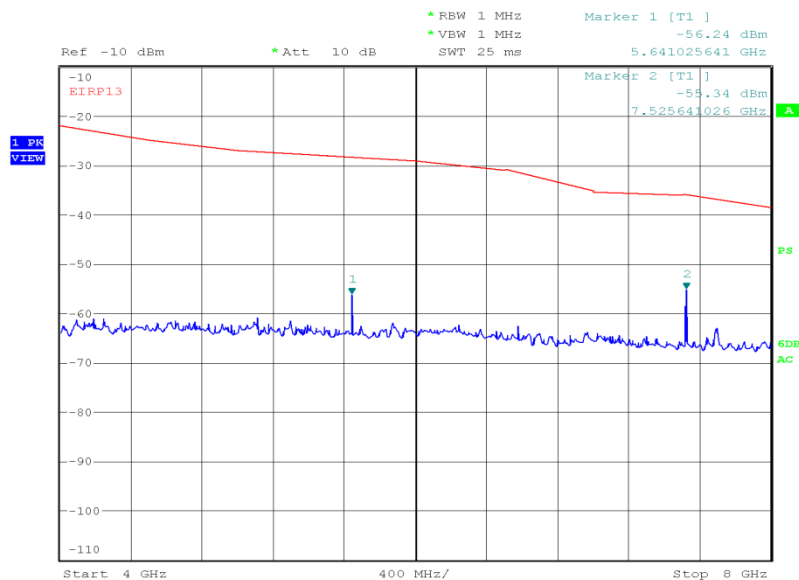


1 GHz to 4 GHz



Date: 15.SEP.2012 11:19:39

4 GHz to 8 GHz

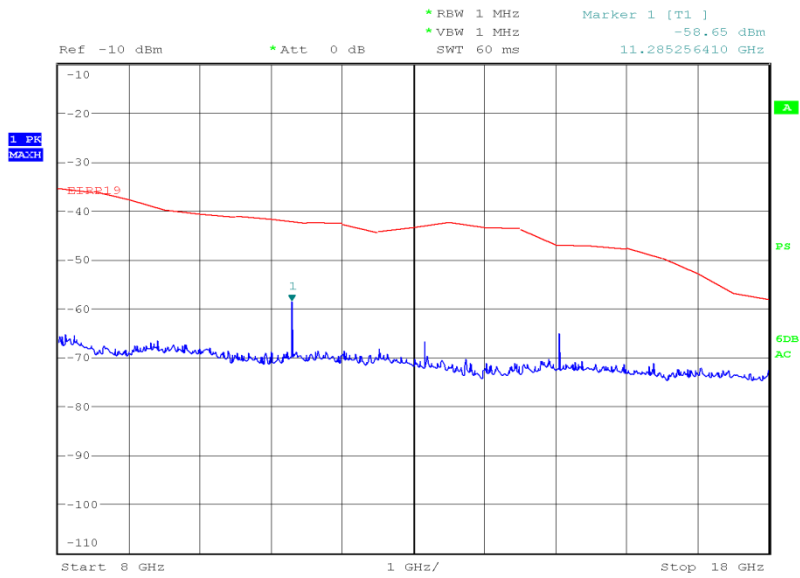


Date: 15.SEP.2012 12:36:01



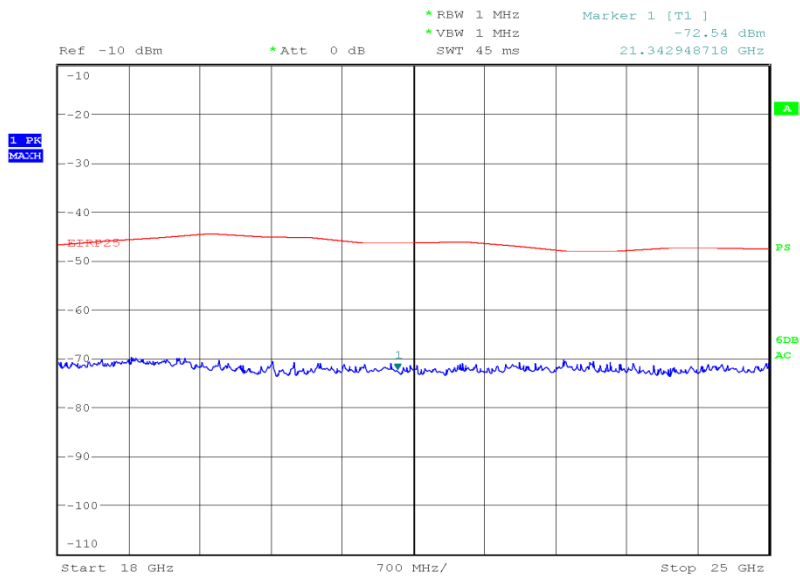
Product Service

8 GHz to 18 GHz



Date: 15.SEP.2012 14:05:32

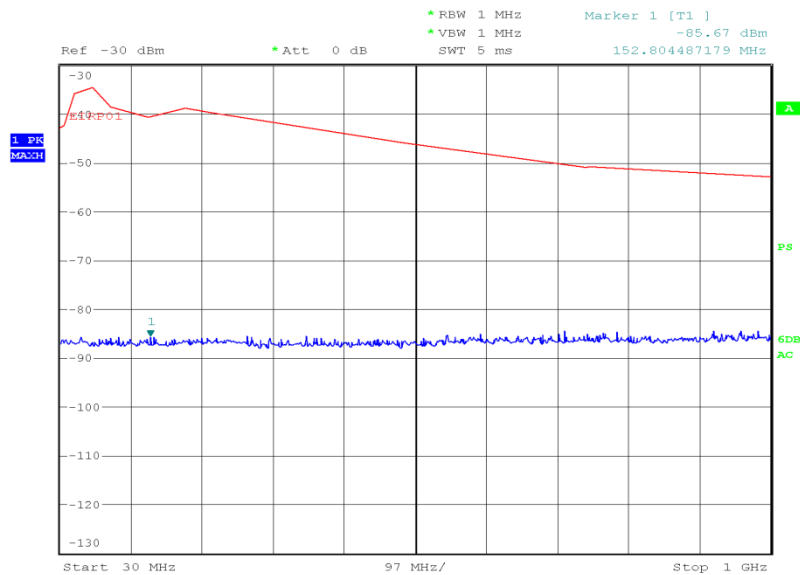
18 GHz to 25 GHz



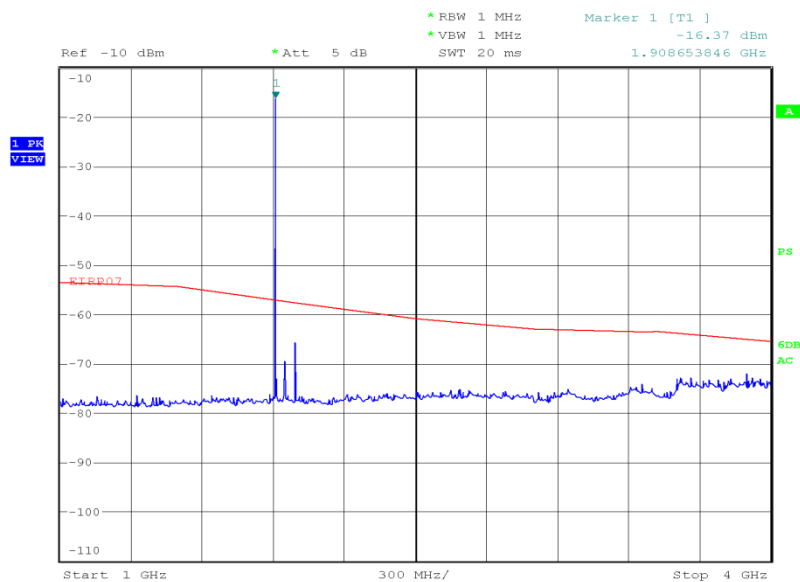
Date: 15.SEP.2012 14:55:31



Product Service

1909.80 MHz30 MHz to 1 GHz

Date: 18.SEP.2012 17:39:58

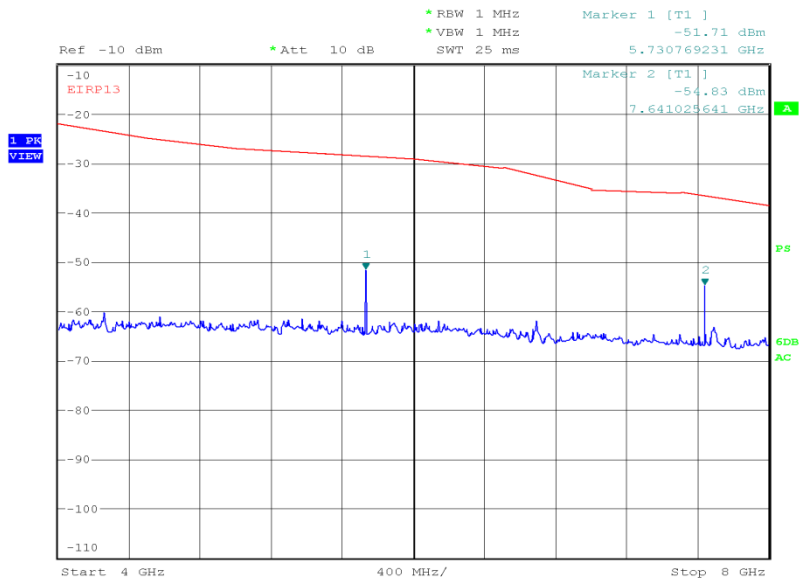
1 GHz to 4 GHz

Date: 15.SEP.2012 11:21:05



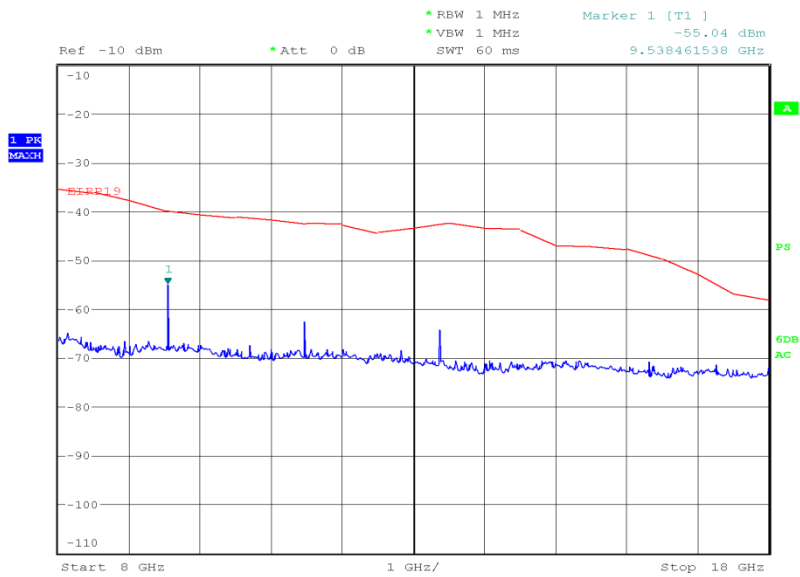
Product Service

4 GHz to 8 GHz



Date: 15.SEP.2012 12:31:41

8 GHz to 18 GHz

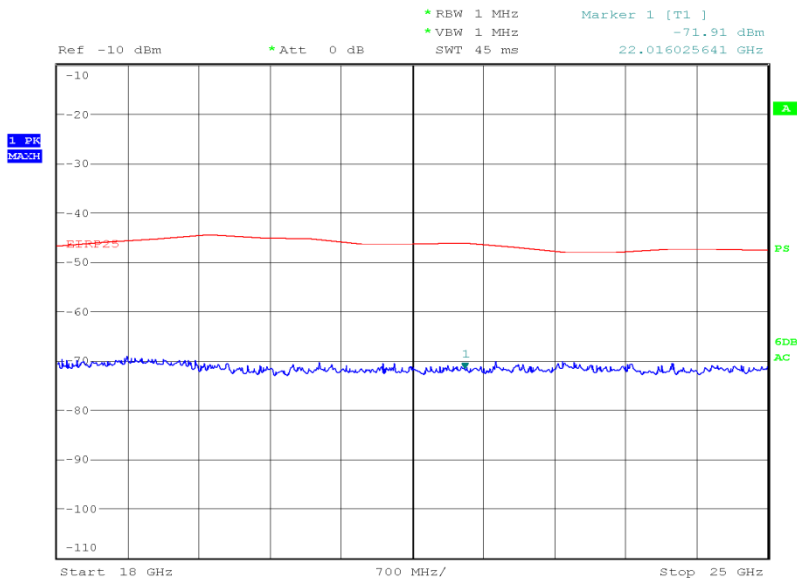


Date: 15.SEP.2012 13:43:02



Product Service

18 GHz to 25 GHz



Date: 15.SEP.2012 15:03:45

Limit Clause

43+10log(P) or -13 dBm



Product Service

2.7 CONDUCTED SPURIOUS EMISSIONS

2.7.1 Specification Reference

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

2.7.2 Equipment Under Test and Modification State

CDMA SHL21 S/N: IMEI 004401114094507 - Modification State 0

2.7.3 Date of Test

13 August 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

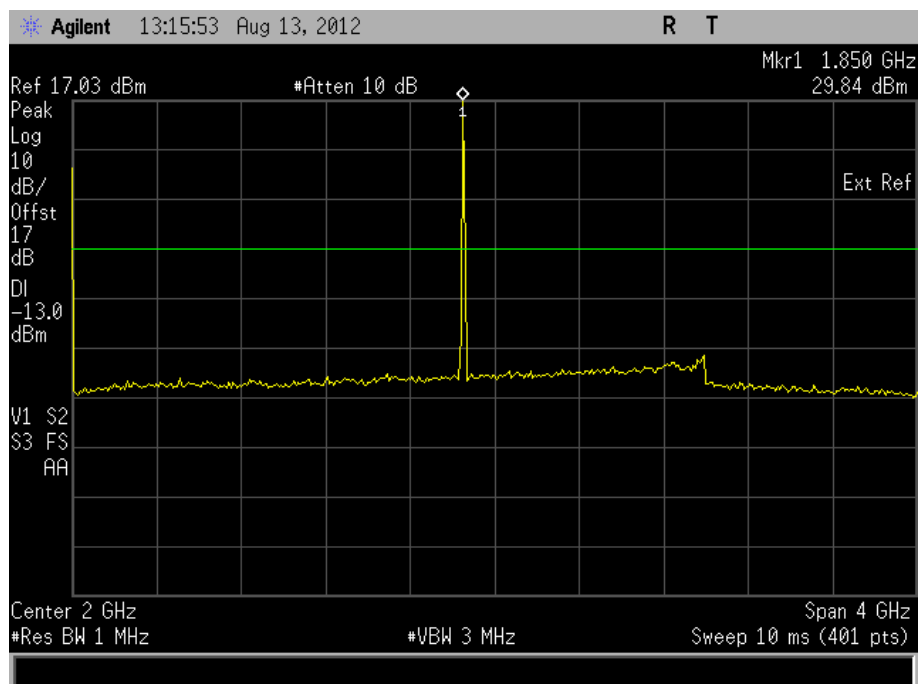
Ambient Temperature	25.1°C
Relative Humidity	46.1%



Product Service

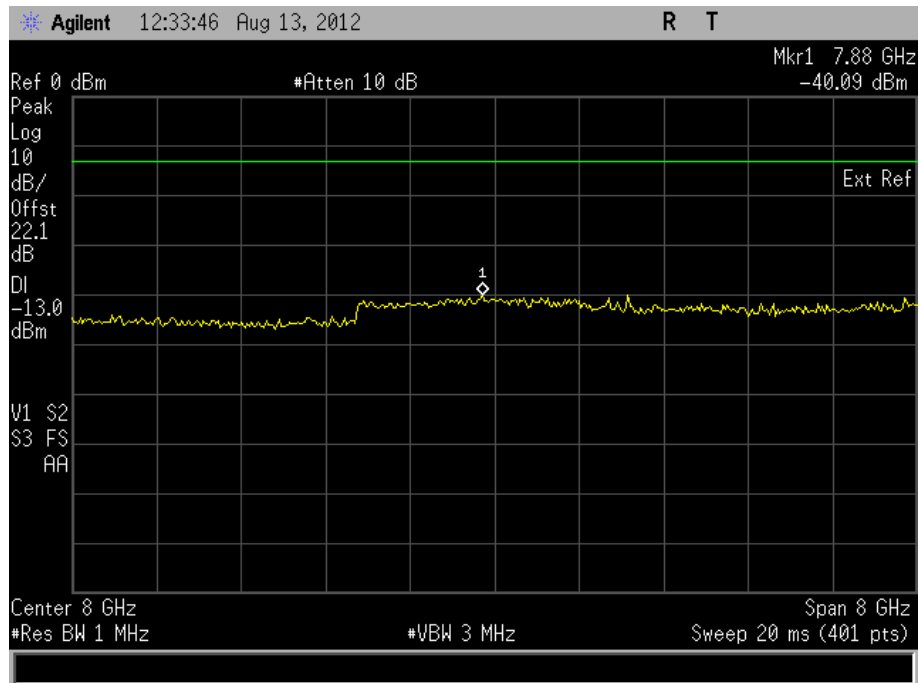
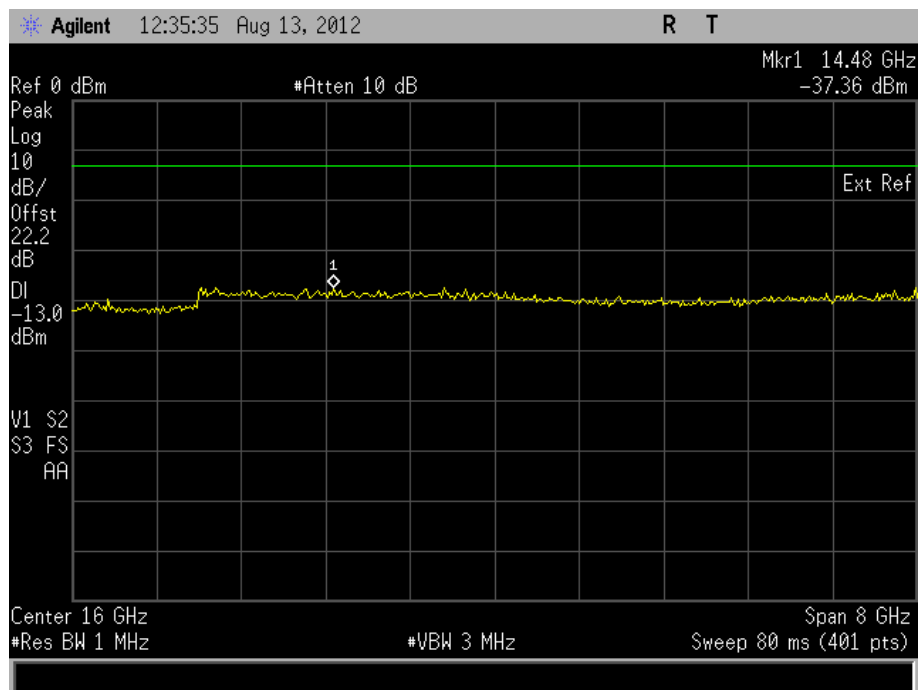
2.7.7 Test Results

4.0 V DC Supply

1850.20 MHz9kHz to 4 GHz

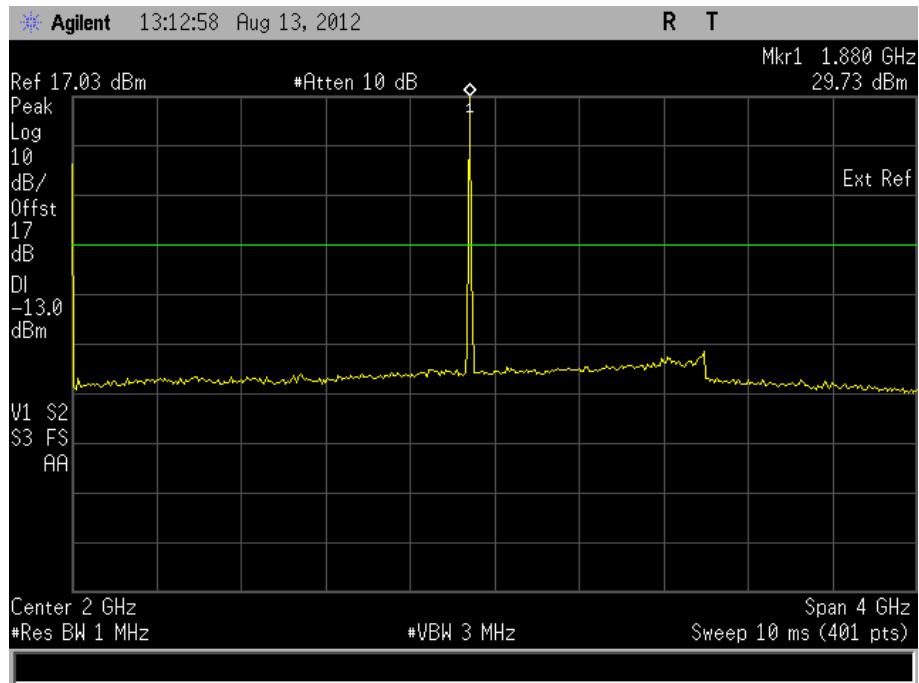
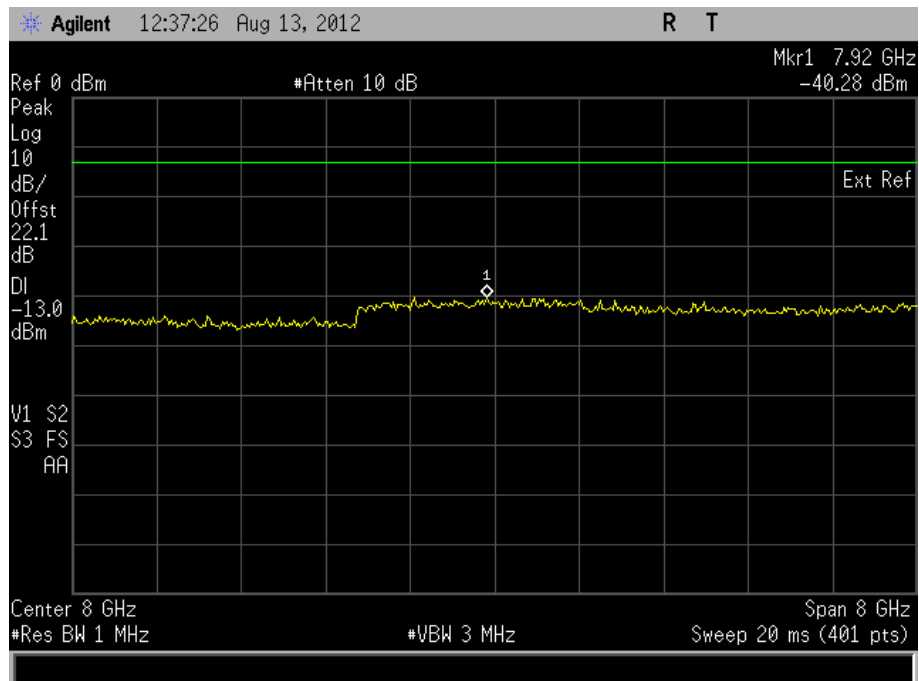


Product Service

4 GHz to 12 GHz12 GHz to 20 GHz

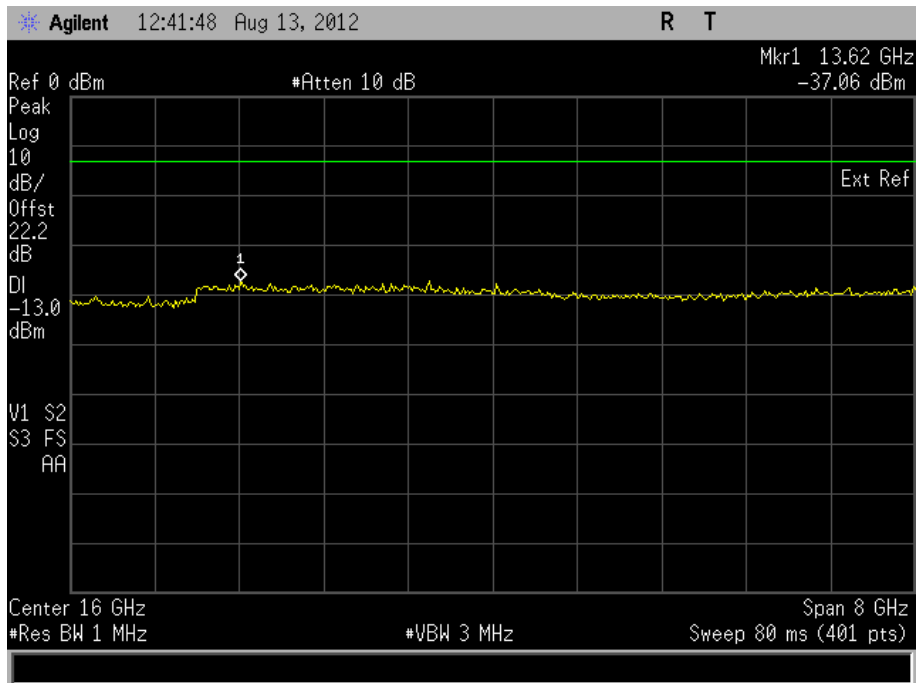
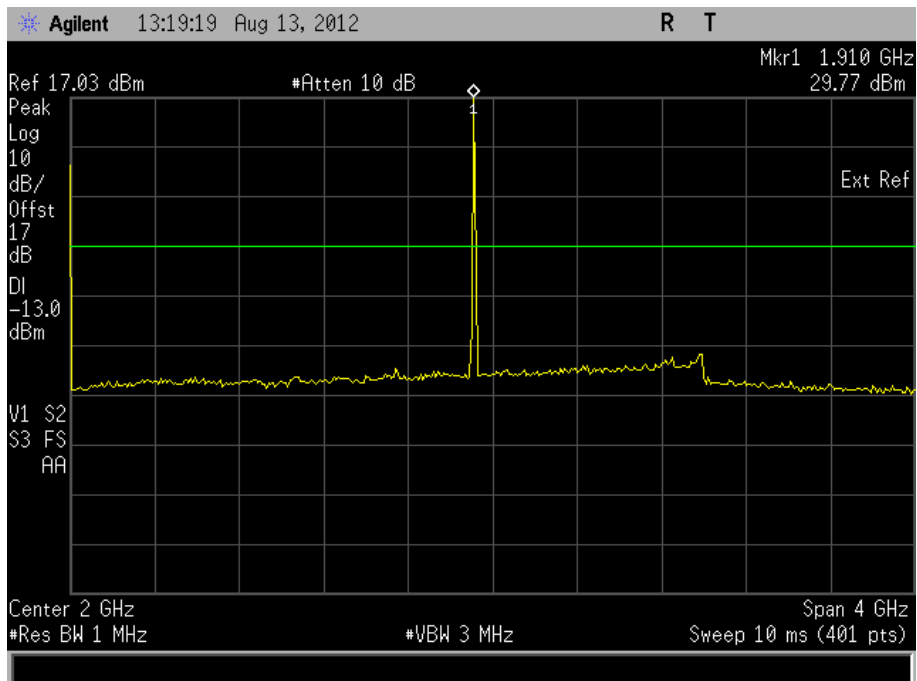


Product Service

1880.00 MHz9kHz to 4 GHz4 GHz to 12 GHz

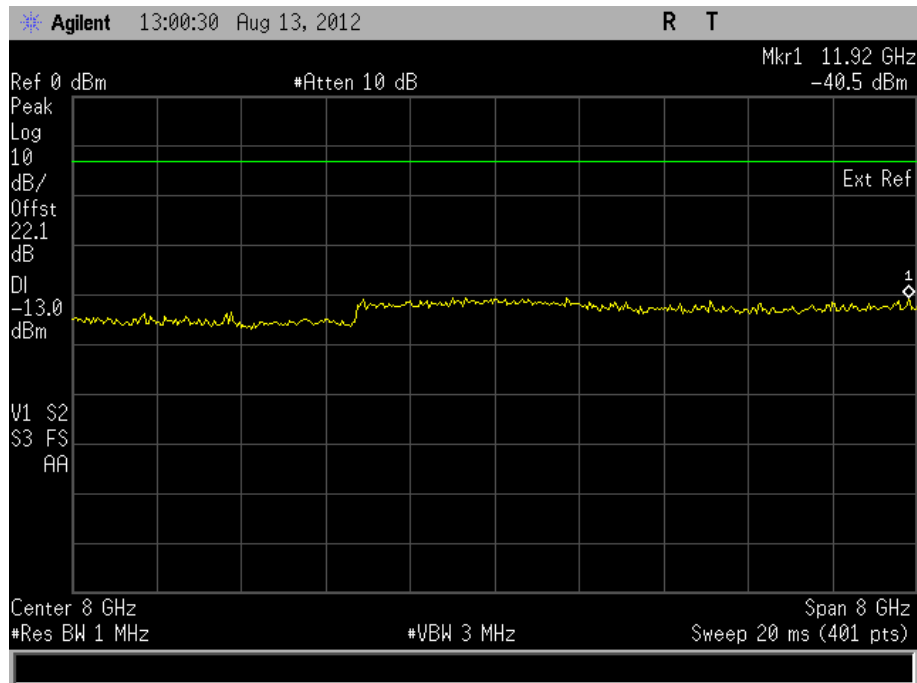
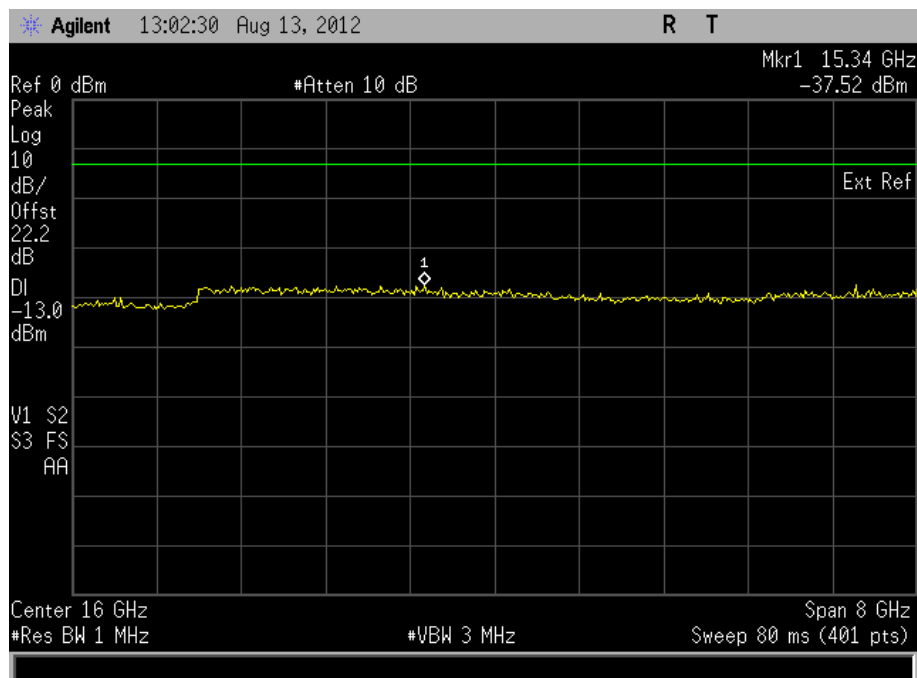


Product Service

12 GHz to 20 GHz1909.80 MHz9kHz to 4 GHz



Product Service

4 GHz to 12 GHz12 GHz to 20 GHzLimit Clause

43+10log(P) or -13 dBm



Product Service

2.8 OCCUPIED BANDWIDTH**2.8.1 Specification Reference**

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

2.8.2 Equipment Under Test and Modification State

CDMA SHL21 S/N: IMEI 004401114094507 - Modification State 0

2.8.3 Date of Test

13 August 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	25.1°C
Relative Humidity	46.1%



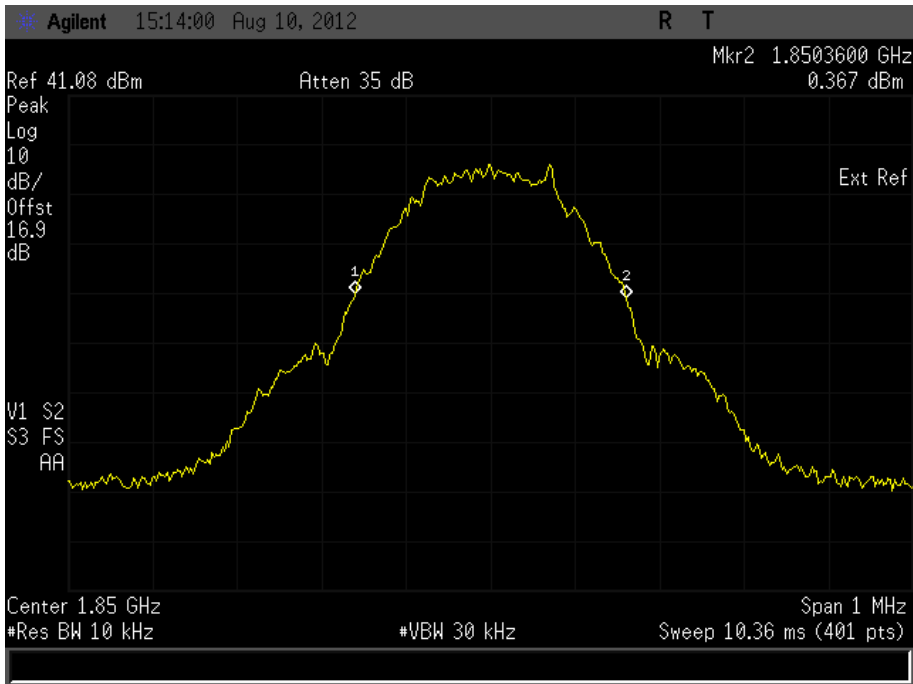
Product Service

2.8.7 Test Results

4.0 V DC Supply

1850.20 MHz

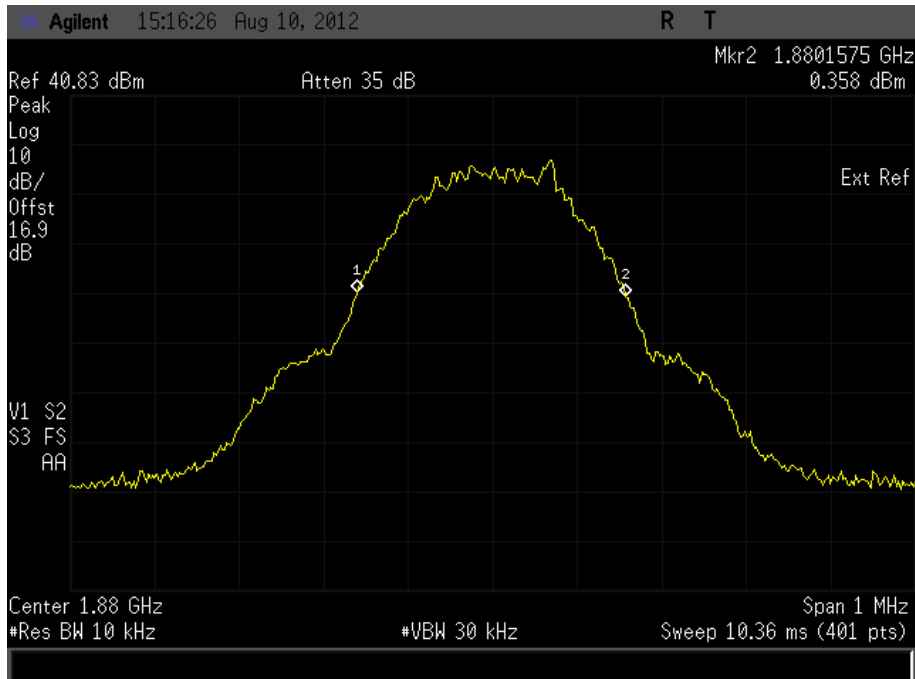
Mode	Occupied Bandwidth (kHz)
GMSK	320



Product Service

1880.00 MHz

Mode	Occupied Bandwidth (kHz)
GMSK	317.5

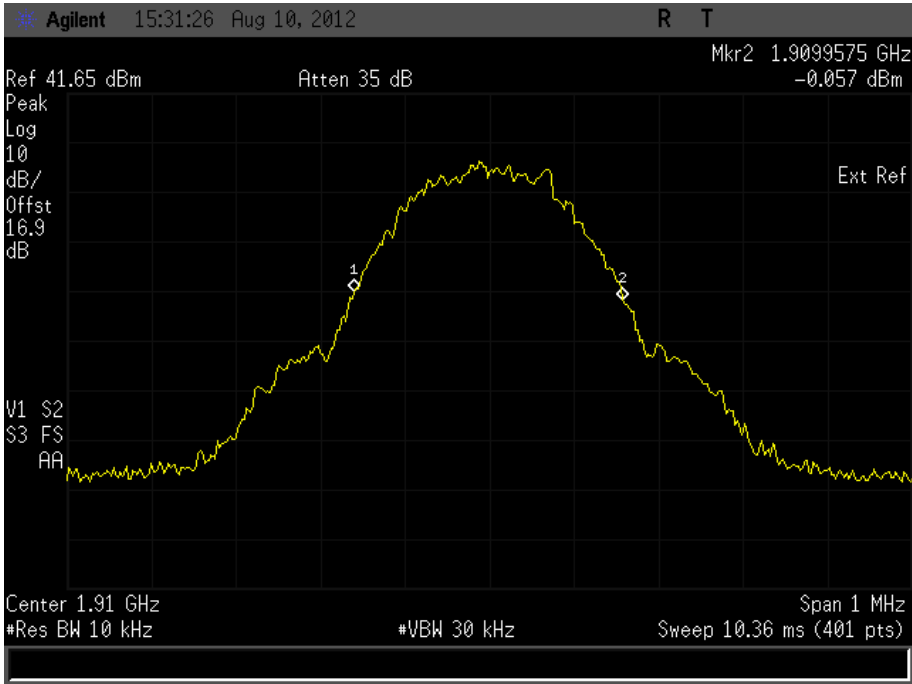




Product Service

1909.80 MHz

Mode	Occupied Bandwidth (kHz)
GMSK	317.5



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

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 - Frequency Stability					
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
30V/5A Power Supply	Farnell	L30-5	191	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	16-Jan-2013
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	27-Jun-2013
Broadband Resistive Power Divider	Weinschel	1506A	605	12	6-Sep-2012
Power Splitter	Weinschel	1506A	606	12	19-Dec-2012
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	18-Nov-2012
GSM Test Set	Rohde & Schwarz	CMU 200	2809	12	8-Jun-2013
Hygrometer	Rotronic	I-1000	2891	12	21-May-2013
Attenuator (10dB, 2W)	Weinschel	1	3030	-	TU
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	12	13-Jun-2013
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	13-Jun-2013
Thermocouple Thermometer	Fluke	51	3172	12	30-Jul-2013
Hygrometer	Rotronic	I-1000	3220	12	13-Jun-2013
Termination	Diamond Antenna	DL-30N	3400	12	TU
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	24-Aug-2013
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	9-May-2013
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	27-Jan-2013
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	12-Jan-2013
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	27-Jan-2013
True RMS Multimeter	Fluke	179	4007	12	16-Feb-2013
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4144	-	01-May-2013
Section 2.2 – Spurious Emissions at Band Edge					
Multimeter	Fluke	75 Mk3	455	12	16-Jan-2013
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	27-Jun-2013
Power Splitter	Weinschel	1506A	606	12	19-Dec-2012
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Hygrometer	Rotronic	I-1000	2891	12	21-May-2013
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	14-Jun-2013
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	24-Aug-2013
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	27-Jan-2013
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	12-Jan-2013
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



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 - Effective Isotropic Radiated Power					
Standard Gain Horn Antenna (20dB)	Flann	1624-20	28	-	TU
Antenna (Double Ridge Guide)	EMCO	3115	34	-	TU
Spectrum Analyser	Rohde & Schwarz	FSEM	37	12	17-May-2013
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
Antenna (Bilog)	Schaffner	CBL6143	287	24	18-Jan-2014
Horn Antenna (12GHz - 18GHz)	Flann	1824-20	434	-	TU
Filter (High Pass)	Lorch	SHP7-7000-SR	566	12	20-Feb-2013
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Antenna (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	-	O/P Mon
Pre-Amplifier	Phase One	PS04-0086	1533	12	20-Sep-2012
Pre-Amplifier	Phase One	PS04-0087	1534	12	26-Sep-2012
Screened Room (8)	Rainford	Rainford	1548	-	TU
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	20-Sep-2012
Hygrometer	Rotronic	I-1000	2882	12	30-Aug-2013
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Antenna (Biconnical)	Schaffner	VBA6106A	3107	-	O/P Mon
Antenna (Log Periodic)	Schaffner	UPA6108	3109	12	5-Apr-2013
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-03-34	3161	12	13-Jun-2013
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	30-Aug-2013
Amplifier (1 - 8GHz)	Phase One	PS06-0060	3175	12	10-Jul-2013
Amplifier (8 - 18GHz)	Phase One	PS06-0061	3176	12	10-Jul-2013
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
'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
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	-	TU
1 metre, SMA to SMA	Suhner	Sucoflex armoured cable	4048	-	O/P Mon
Broadband Amplifier	Mini-Circuits	ZHL-1042J	4050	12	25-May-2013
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4144	-	01-May-2013



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 - Maximum Peak Output Power - Conducted					
Signal Generator	Marconi	2031	53	12	TU
True RMS Multimeter	Fluke	79 Series III	411	12	25-Jul-2013
Multimeter	Fluke	75 Mk3	455	12	16-Jan-2013
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	27-Jun-2013
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	21-Sep-2012
Power Splitter	Weinschel	1506A	606	12	19-Dec-2012
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Programmable Power Supply	Iso-tech	IPS 2010	2438	-	O/P Mon
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	18-Nov-2012
Hygrometer	Rotronic	I-1000	2891	12	21-May-2013
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	14-Jun-2013
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	19-Aug-2012
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	27-Jan-2013
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	12-Jan-2013
Combiner/Splitter	Weinschel	1506A	3879	12	19-Mar-2013
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	27-Jun-2013
P-Series Power Meter	Agilent	N1911A	3980	12	12-Sep-2012
P-Series Power Meter	Agilent	N1911A	3981	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3982	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3983	12	12-Sep-2012



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.6 - Emission for Broadband PCS Equipment					
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	13-Sep-2013
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
Filter (High Pass)	Lorch	SHP7-7000-SR	566	12	20-Feb-2013
Antenna (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	-	TU
Pre-Amplifier	Phase One	PS04-0086	1533	12	20-Sep-2012
Pre-Amplifier	Phase One	PS04-0087	1534	12	26-Sep-2012
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
Signal Generator (1GHz to 40GHz)	Rohde & Schwarz	SMR40	1589	12	11-Nov-2012
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	20-Sep-2012
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	30-Aug-2013
High Pass Filter (3GHz)	RLC Electronics	F-100-3000-5-R	3349	12	29-May-2013
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
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
Low Noise Amplifier	Wright Technologies	APS04-0085	3969	-	TU
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4144	-	01-May-2013



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.7 - Conducted Spurious Emissions					
Signal Generator	Rohde & Schwarz	SMX	185	12	TU
True RMS Multimeter	Fluke	79 Series III	411	12	25-Jul-2013
Multimeter	Fluke	75 Mk3	455	12	16-Jan-2013
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	27-Jun-2013
Broadband Resistive Power Divider	Weinschel	1506A	605	12	6-Sep-2012
Power Splitter	Weinschel	1506A	606	12	19-Dec-2012
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Signal Generator (1GHz to 40GHz)	Rohde & Schwarz	SMR40	1589	12	11-Nov-2012
Programmable Power Supply	Iso-tech	IPS 2010	2438	-	O/P Mon
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	18-Nov-2012
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
Hygrometer	Rotronic	I-1000	2891	12	21-May-2013
Attenuator (10dB, 2W)	Weinschel	1	3030	-	TU
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	27-Jun-2013
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	14-Jun-2013
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	24-Aug-2013
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
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	27-Jan-2013
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	12-Jan-2013
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	27-Jan-2013
Combiner/Splitter	Weinschel	1506A	3879	12	19-Mar-2013
P-Series Power Meter	Agilent	N1911A	3980	12	12-Sep-2012
P-Series Power Meter	Agilent	N1911A	3981	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3982	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3983	12	12-Sep-2012



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.8 - Occupied Bandwidth					
Multimeter	Fluke	75 Mk3	455	12	16-Jan-2013
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	27-Jun-2013
Broadband Resistive Power Divider	Weinschel	1506A	605	12	6-Sep-2012
Power Splitter	Weinschel	1506A	606	12	19-Dec-2012
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Signal Generator (1GHz to 40GHz)	Rohde & Schwarz	SMR40	1589	12	11-Nov-2012
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	18-Nov-2012
Hygrometer	Rotronic	I-1000	2891	12	21-May-2013
Attenuator (10dB, 2W)	Weinschel	1	3030	-	TU
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	14-Jun-2013
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	24-Aug-2013
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	27-Jan-2013
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	12-Jan-2013
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	27-Jan-2013
P-Series Power Meter	Agilent	N1911A	3980	12	12-Sep-2012
P-Series Power Meter	Agilent	N1911A	3981	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3982	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3983	12	12-Sep-2012

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



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



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

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

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