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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 24

COMMERCIAL-IN-CONFIDENCE
FCC ID: APYHRO00206

Document 75925936 Report 17 Issue 1 May 2014

Product Service

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COMMERCIAL-IN-CONFIDENCE

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 24

Document 75925936 Report 17 Issue 1

May 2014

PREPARED FOR

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PREPARED BY

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Senior Administrator, Technical Solutions

APPROVED BY

Simon Bennett
Authorised Signatory

DATED 14 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 24. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

S Milliken M Russell S Hau J Tuckwell

UKAS TESTING 0141

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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 24

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 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)	SHL25
Serial Number(s)	IMEI 004401115170785 IMEI 004401115170207 IMEI 004401115170652
Number of Samples Tested	3
Test Specification/Issue/Date	FCC CFR 47 Part 2 (2013) FCC CFR 47 Part 24 (2013)
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	10070 10 March 2014
Start of Test	3 April 2014
Finish of Test	19 April 2014
Name of Engineer(s)	S Milliken M Russell S Hau J Tuckwell
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	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	2.1046	24.232	Maximum Peak Output Power - Conducted	Pass	
2.5	2.1047(d)	-	Modulation Characteristics	-	Customer Declaration
2.6	2.1051	24.238	Emission Limitations 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	

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 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 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

SHL25 S/N: IMEI 004401115170785 - Modification State 0

2.1.3 Date of Test

16 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 24.135(a) and FCC CFR 47 Part 2.1055.

The EUT was configured in a GSM circuit switched voice call using GMSK modulation at maximum output power on the middle channel 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.

2.1.6 Environmental Conditions

Ambient Temperature	22.0°C
Relative Humidity	29.4%

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	0.031
-20	GMSK	0.028
-10	GMSK	0.029
0	GMSK	0.032
+10	GMSK	0.031
+20	GMSK	0.031
+30	GMSK	0.030
+40	GMSK	0.033
+50	GMSK	0.032

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	0.033
3.7	GMSK	0.032
4.0	GMSK	0.033

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

2.2.2 Equipment Under Test and Modification State

SHL25 S/N: IMEI 004401115170785 - Modification State 0

2.2.3 Date of Test

10 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 test was applied in accordance with the requirements of FCC CFR 47 Part 24.229 in conjunction with the test methods described in document 971168 D01 Power Meas License Digital Systems v02r01.

The EUT was configured in a GSM circuit switched voice call using GMSK modulation 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 an RMS detector and max hold trace. 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.

2.2.6 Environmental Conditions

Ambient Temperature	24.5°C
Relative Humidity	26.0%

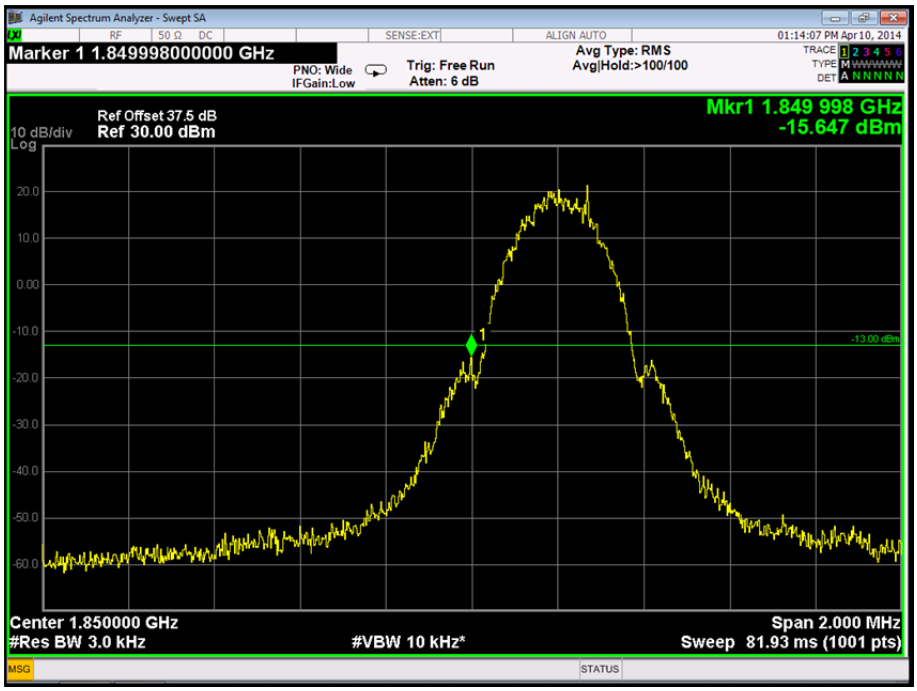
Product Service

2.2.7 Test Results

4.0 V DC Supply

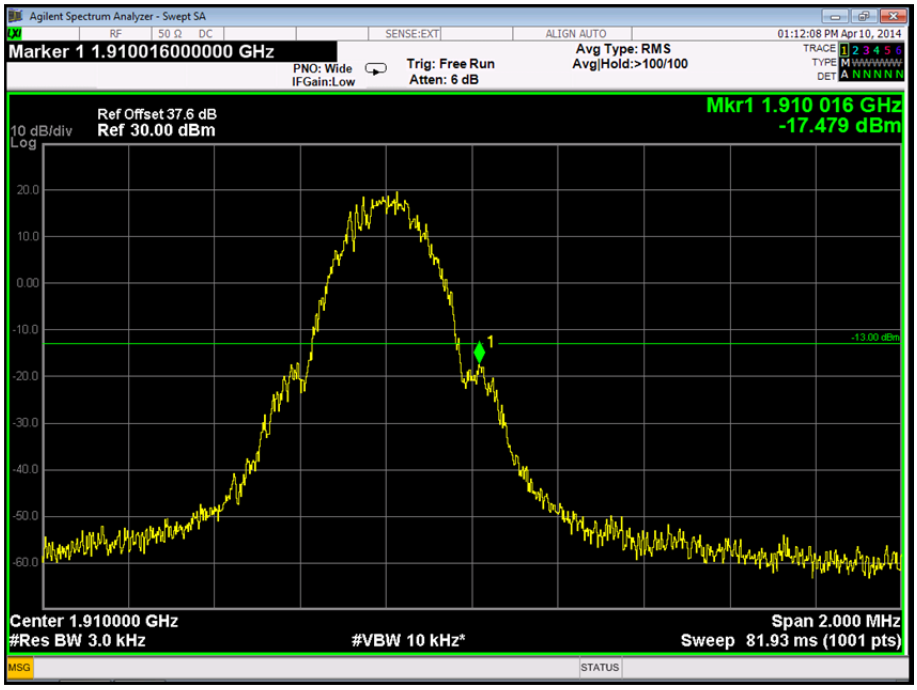
Frequency Block (MHz)	Mode	Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
A :(1850.0 – 1865.0)	GMSK	Channel : 512 Frequency : 1850.2 MHz	N/A
B :(1895.0 – 1910.0)	GMSK	N/A	Channel : 810 Frequency : 1909.8 MHz

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 24, Clause 24.232(c)

2.3.2 Equipment Under Test and Modification State

SHL25 S/N: IMEI 004401115170207 - 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

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 (EIRP) 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

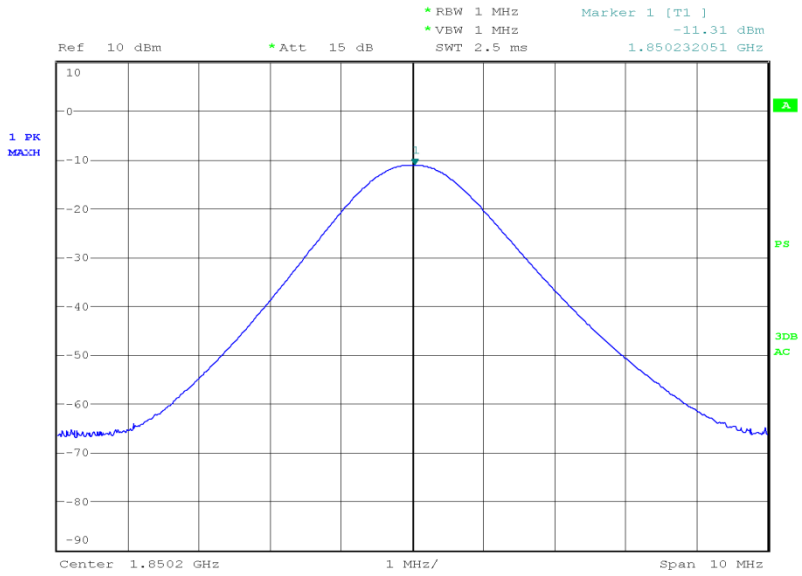
Ambient Temperature	20.9°C
Relative Humidity	39.0%

Product Service

2.3.7 Test Results

1850.2 MHz

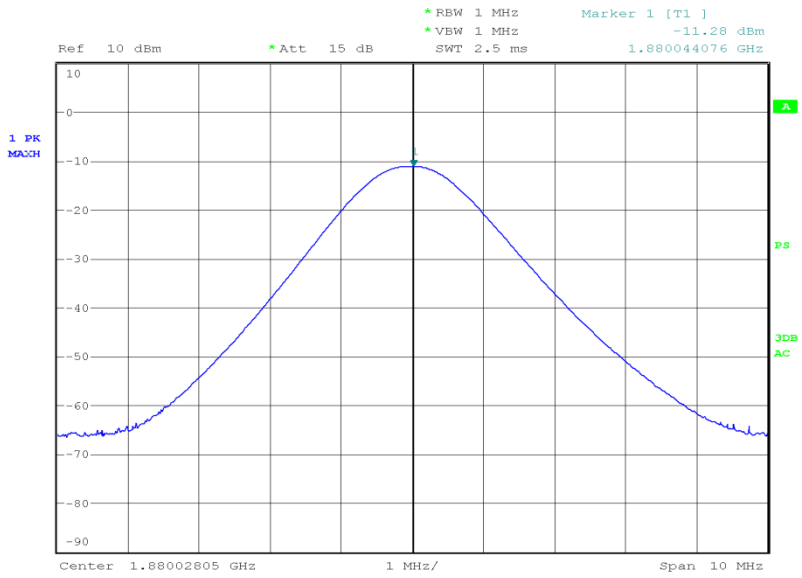
Result (dBm)	Result (W)
27.43	0.553



Date: 9.APR.2014 10:09:40

1880.0 MHz

Result (dBm)	Result (W)
27.67	0.585



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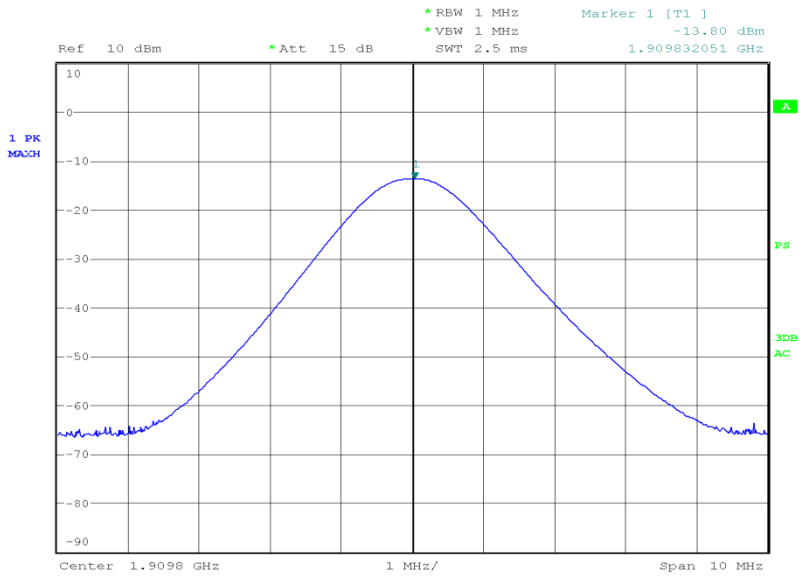
1909.8 MHz

Result (dBm)	Result (W)
27.62	0.578



Date: 9.APR.2014 10:19:01

Limit Clause

Mobile and Portable Stations – 2 W or 33 dBm

2.4 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test and Modification State

SHL25 S/N: IMEI 004401115170652 - Modification State 0

2.4.3 Date of Test

3 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

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 24.232, FCC CFR 47 Part 2.1046 and KDB 971168.

The EUT was configured in a GSM circuit switched voice call using GMSK modulation at maximum output power on bottom, middle or top channel using a communications test set. The EUT was connected to a wideband peak 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.

2.4.6 Environmental Conditions

Ambient Temperature	25.6°C
Relative Humidity	37.0%

2.4.7 Test Results

4.0 V DC Supply

1850.2 MHz

Mode	Result (dBm)	Result (W)
GMSK	30.28	1.07

1880.0 MHz

Mode	Result (dBm)	Result (W)
GMSK	30.44	1.11

1909.8 MHz

Mode	Result (dBm)	Result (W)
GMSK	30.55	1.14

Limit Clause

Mobile and Portable Stations – 2 W or 33 dBm

Product Service

2.5 MODULATION CHARACTERISTICS

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047(d)

2.5.2 Equipment Under Test

SHL25

2.5.3 Test Results

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

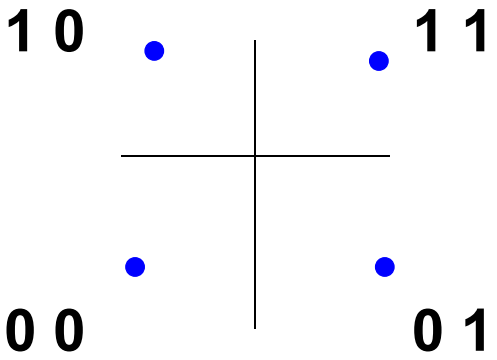
GMSK OVERVIEW

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

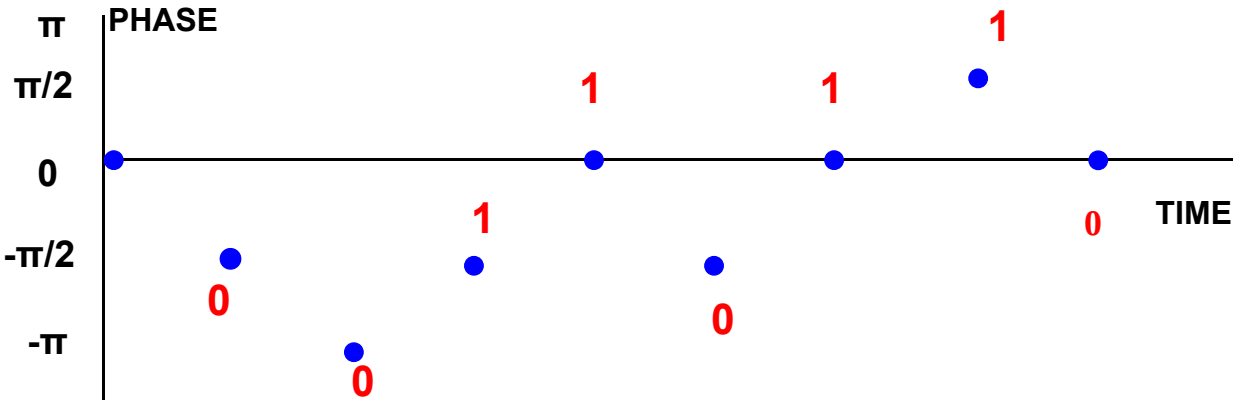
2. Modulate each stream with PSK (1 = 90° or π/2, 0 = -90° or - π/2 phase shift)

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

3. Combine (add) the two PSK signals:

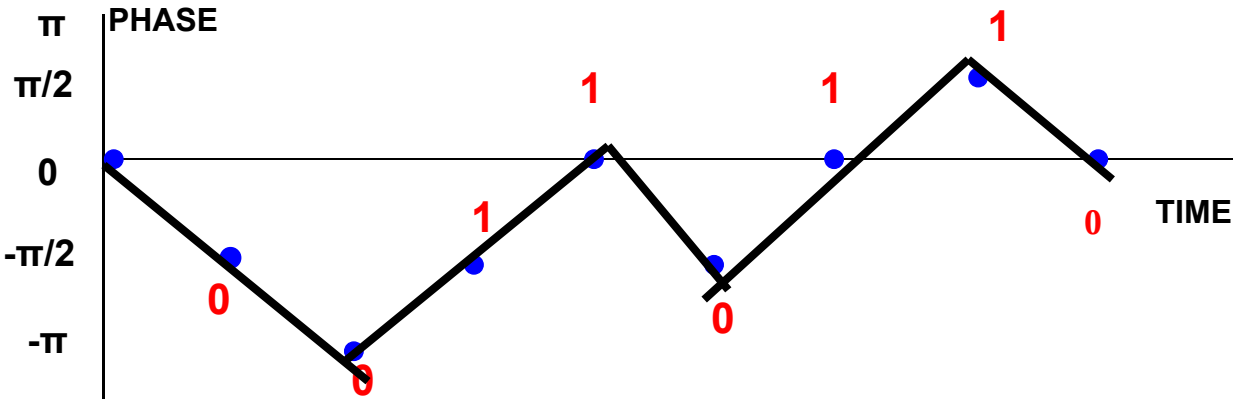
Combined Phase	-π/2	-π	-π/2	0	-π/2	0	π/2	0

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.

2.6 EMISSION LIMITATIONS 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

SHL25 S/N: IMEI 004401115170207 - Modification State 0

2.6.3 Date of Test

11 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

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 configured in a GSM circuit switched voice call using GMSK modulation at maximum output power on the bottom, middle and top channels using a communications test set.

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

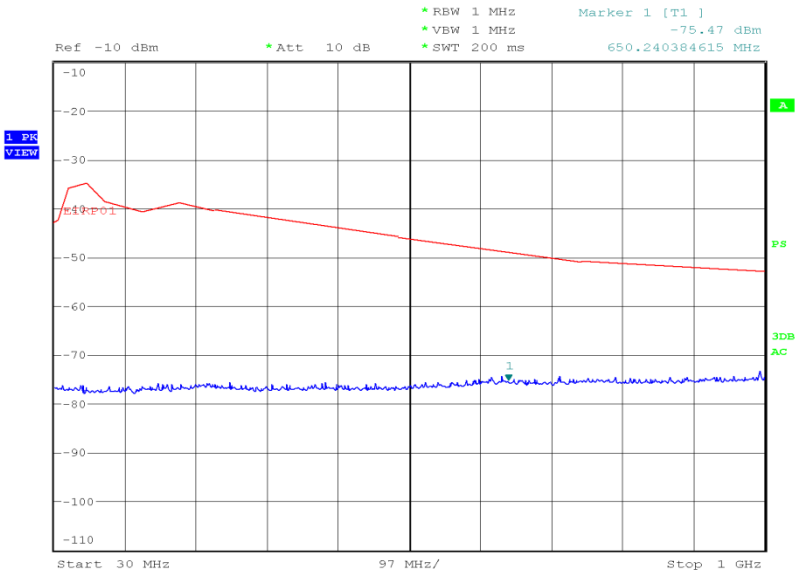
Ambient Temperature	20.9°C
Relative Humidity	39.0%

Product Service

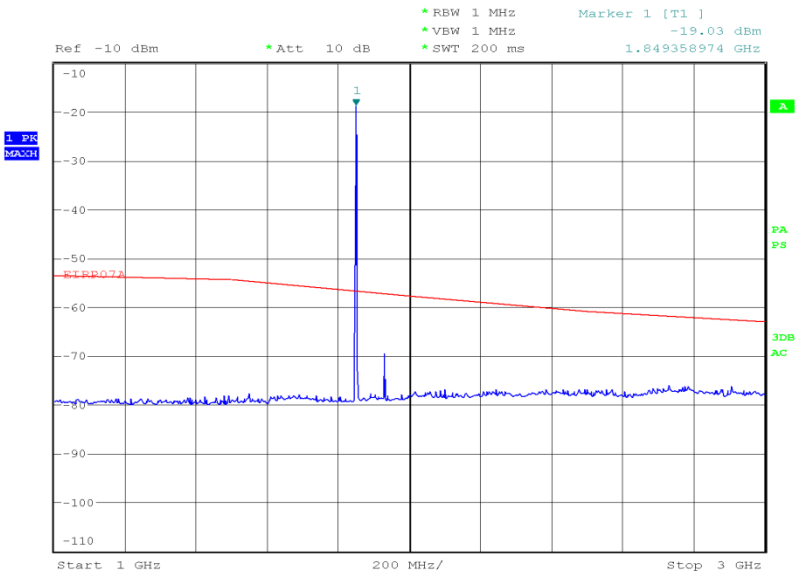
2.6.7 Test Results

1850.2 MHz

30 MHz to 1 GHz

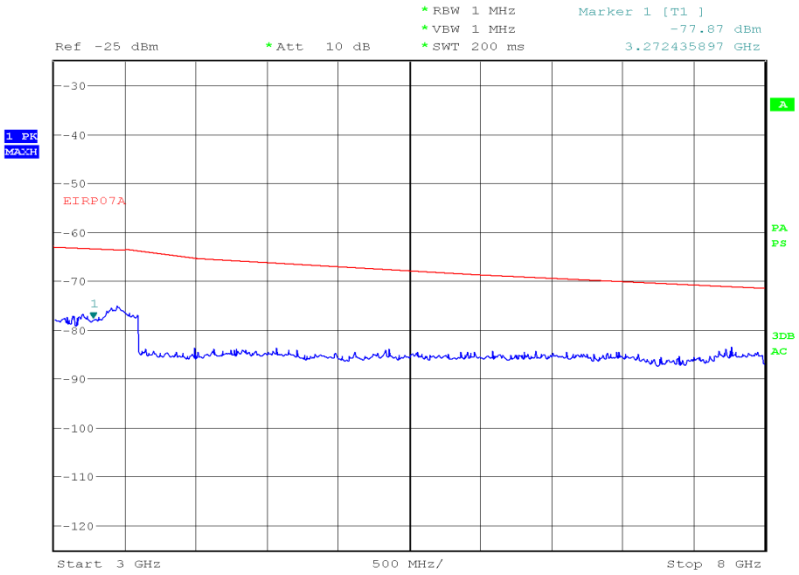


1 GHz to 3 GHz



Product Service

3 GHz to 8 GHz



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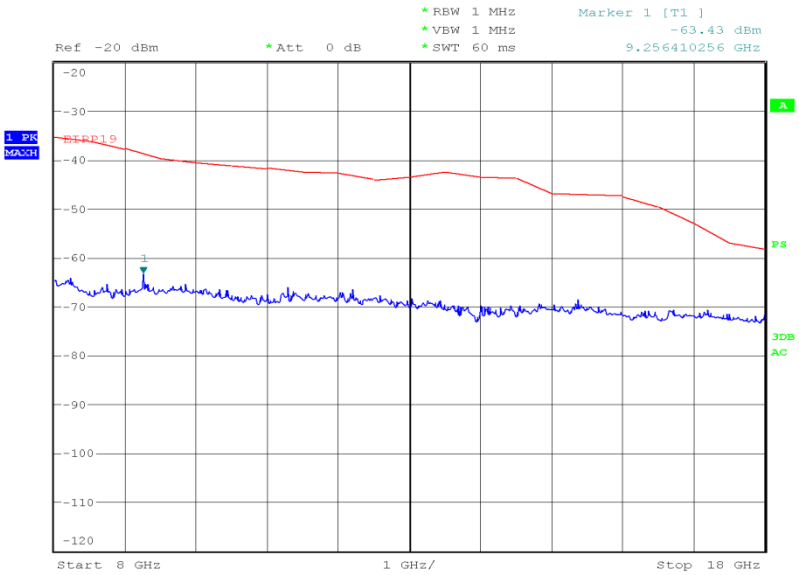
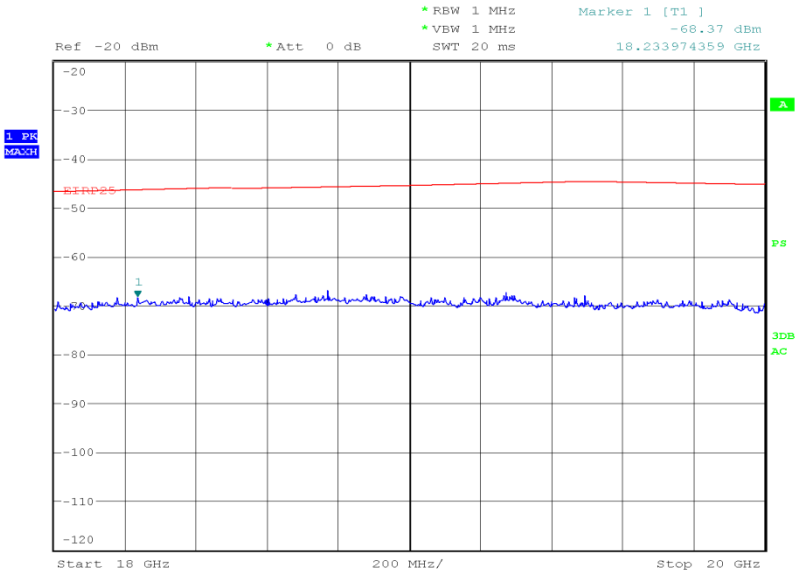
8 GHz to 18 GHz



Date: 10.APR.2014 12:16:13

Product Service

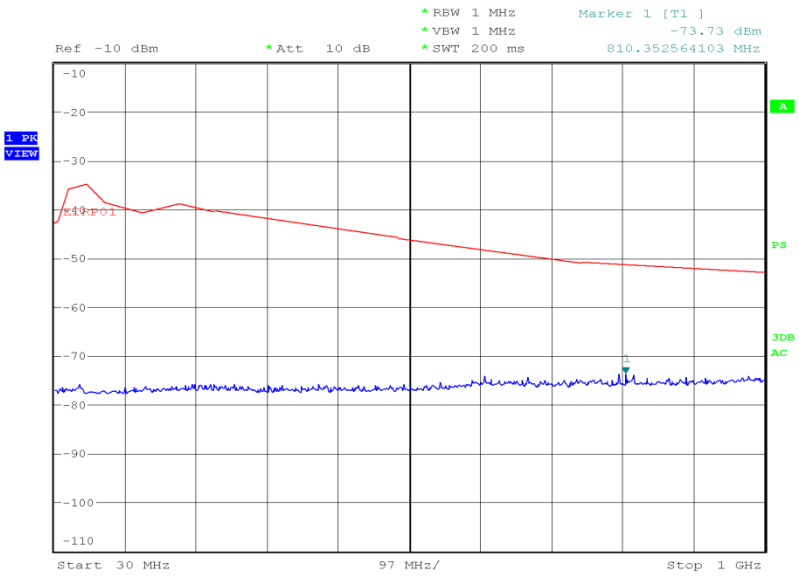
18 GHz to 20 GHz



Date: 11.APR.2014 16:45:45

1880.0 MHz

30 MHz to 1 GHz



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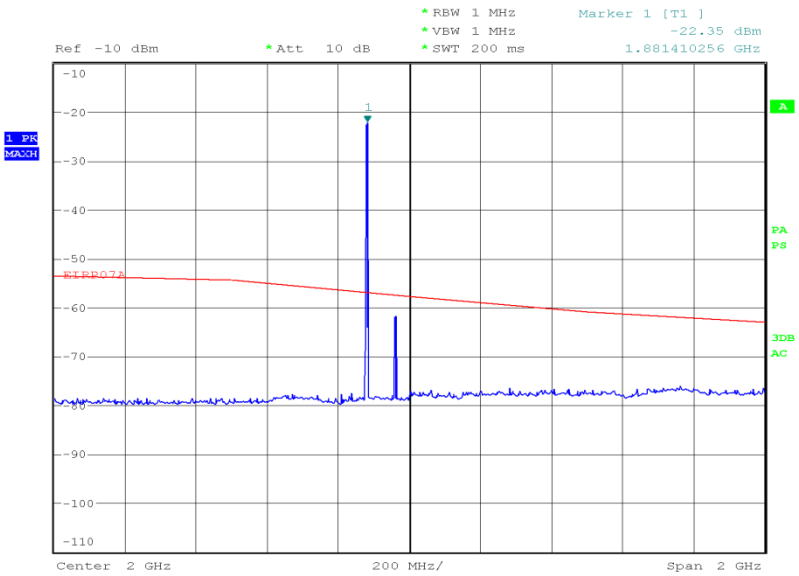
1 GHz to 3 GHz



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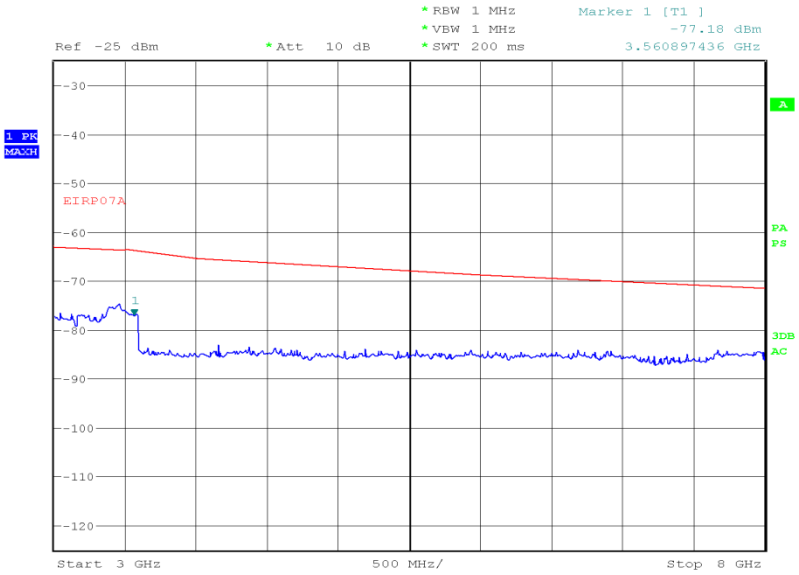
Product Service

3 GHz to 8 GHz



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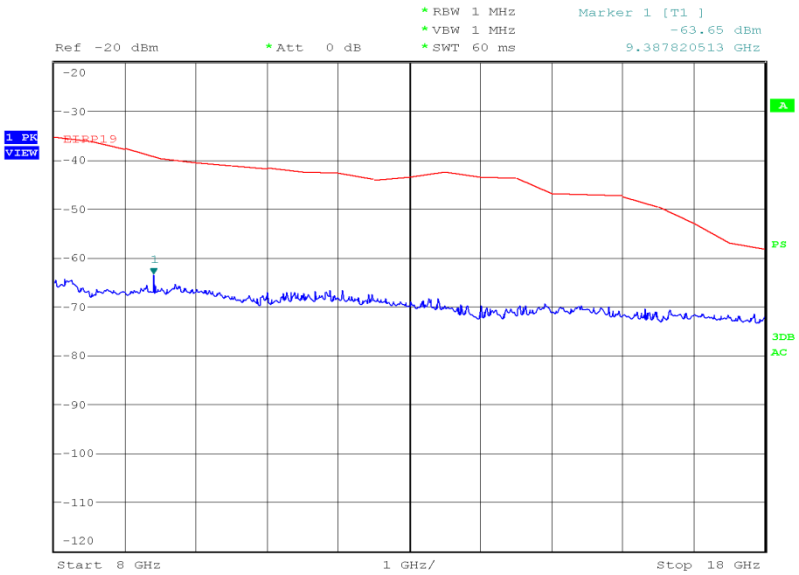
8 GHz to 18 GHz



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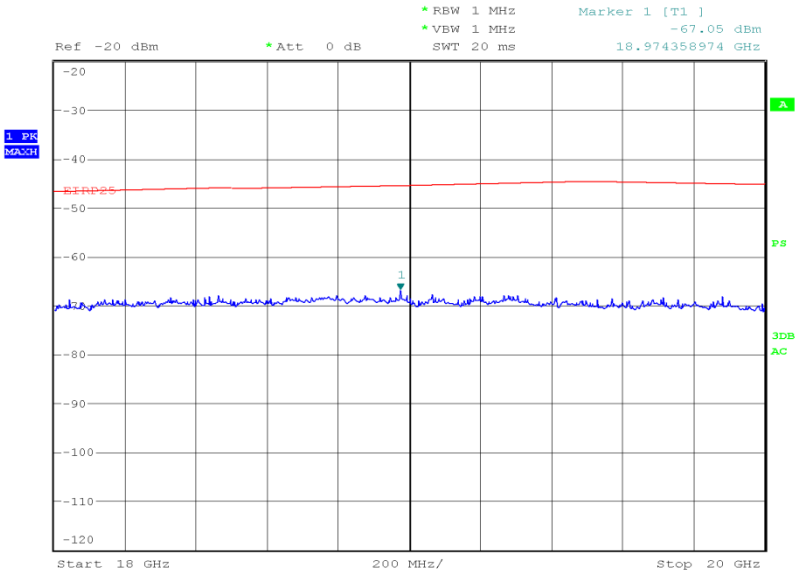
Product Service

18 GHz to 20 GHz



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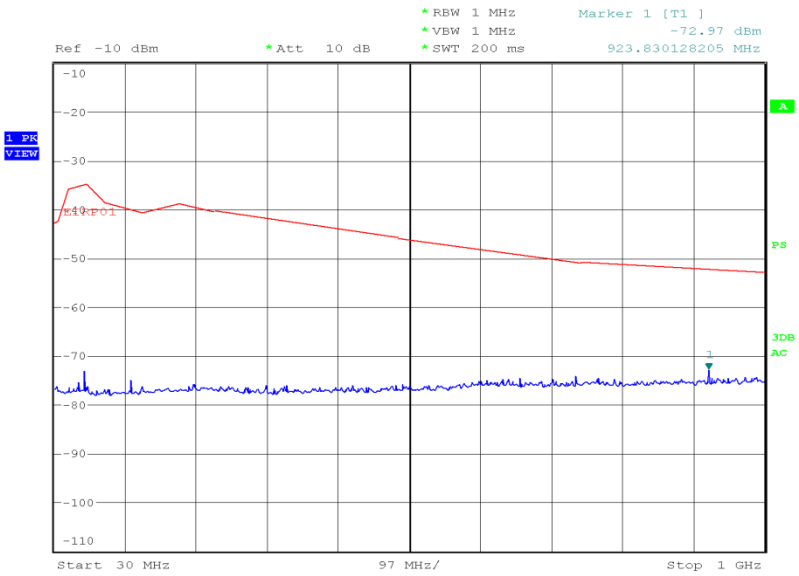
Product Service

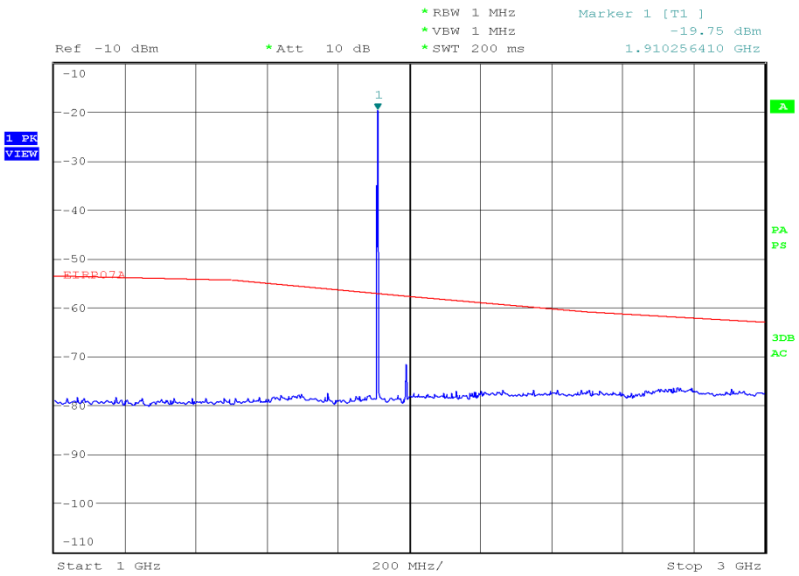
1909.8 MHz

30 MHz to 1 GHz



Date: 10.APR.2014 09:55:36

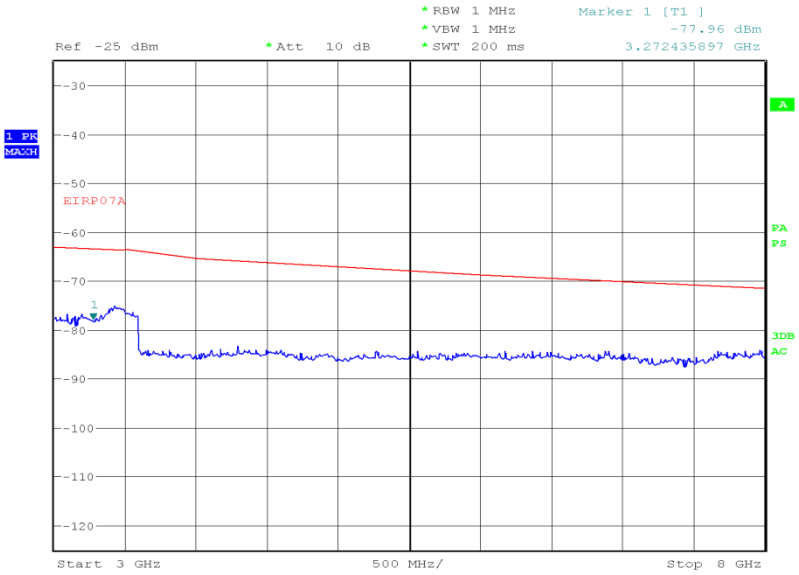
1 GHz to 3 GHz



Date: 9.APR.2014 14:58:39

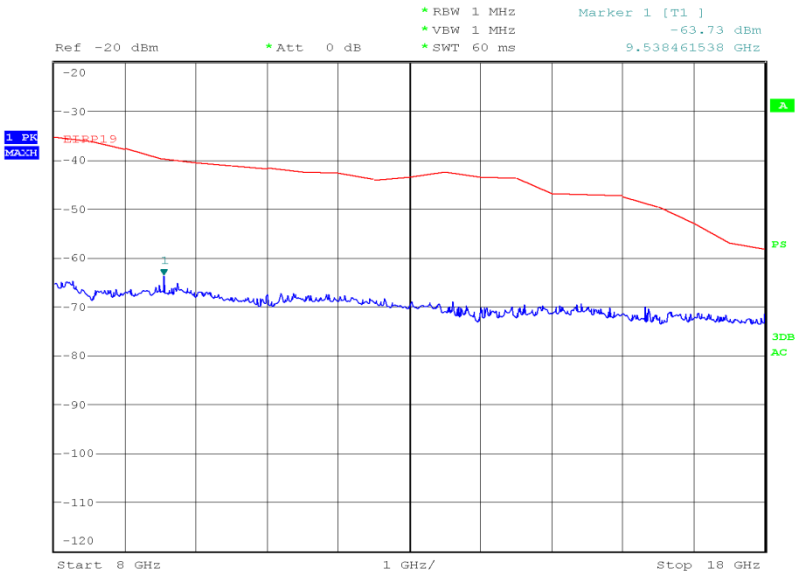
Product Service

3 GHz to 8 GHz



Date: 9.APR.2014 14:33:20

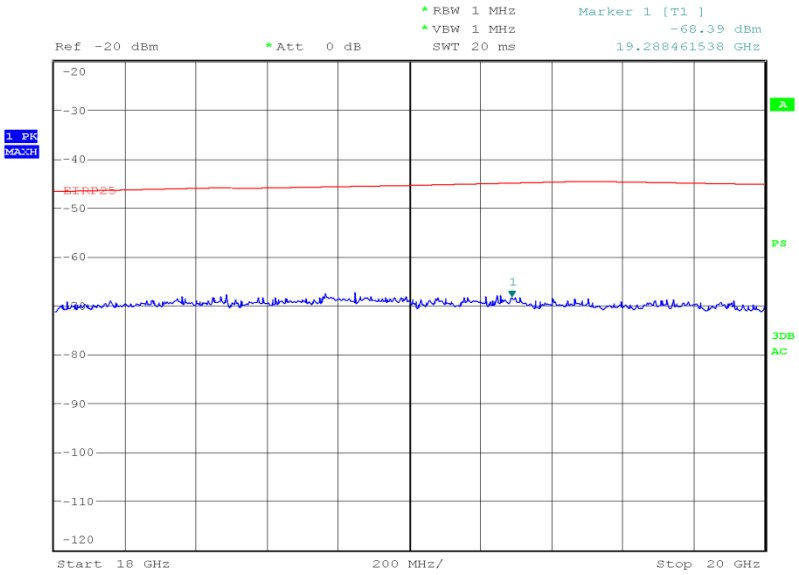
8 GHz to 18 GHz



Date: 10.APR.2014 12:00:10

Product Service

18 GHz to 20 GHz



Date: 11.APR.2014 16:57:02

Limit Clause

43+10log(P) or -13 dBm

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

SHL25 S/N: IMEI 004401115170785 - Modification State 0

2.7.3 Date of Test

10 April 2014

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

The test was applied in accordance with the requirements of FCC CFR 47 Part 24.238 (a) in conjunction with the test methods described in document 971168 D01 Power Meas License Digital Systems v02r01.

The EUT was configured in a GSM circuit switched voice call using GMSK modulation at maximum output power using a communications test set via a combiner and a 10 dB attenuator.

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.

From 9 kHz to 4 GHz, a 30 dB attenuator was used. For measuring in the range 4 GHz to 20 GHz a 10 dB attenuator and 4 GHz 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	24.5°C
Relative Humidity	26.0%

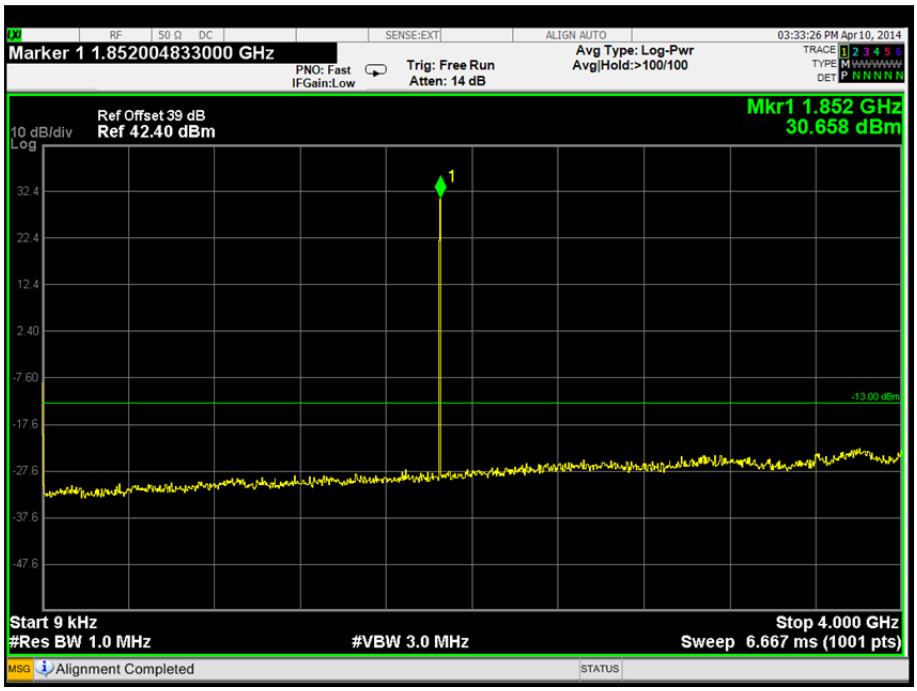
Product Service

2.7.7 Test Results

4.0 V DC Supply

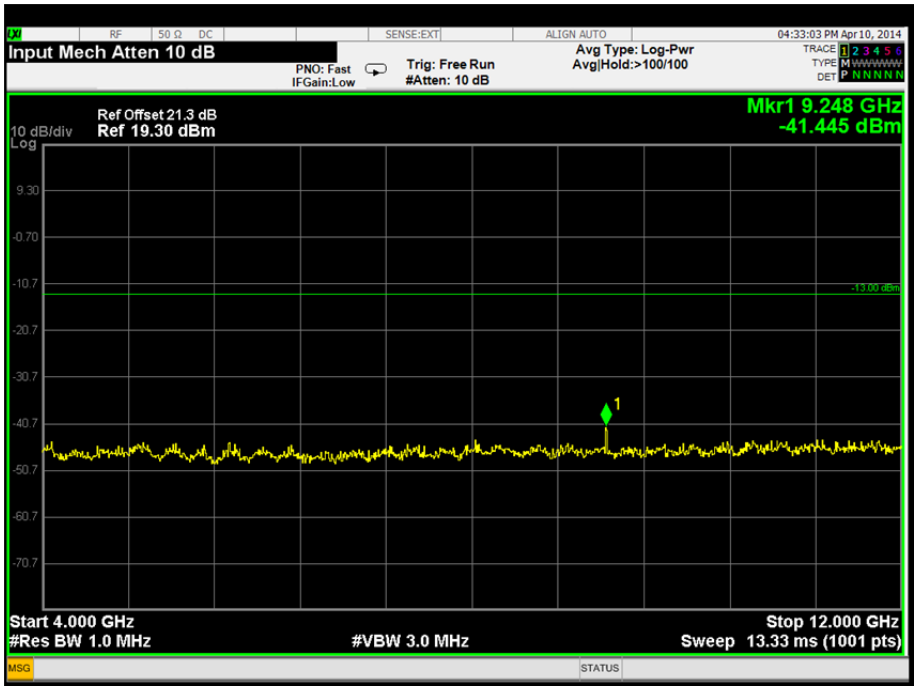
1850.2 MHz

9 kHz to 4 GHz

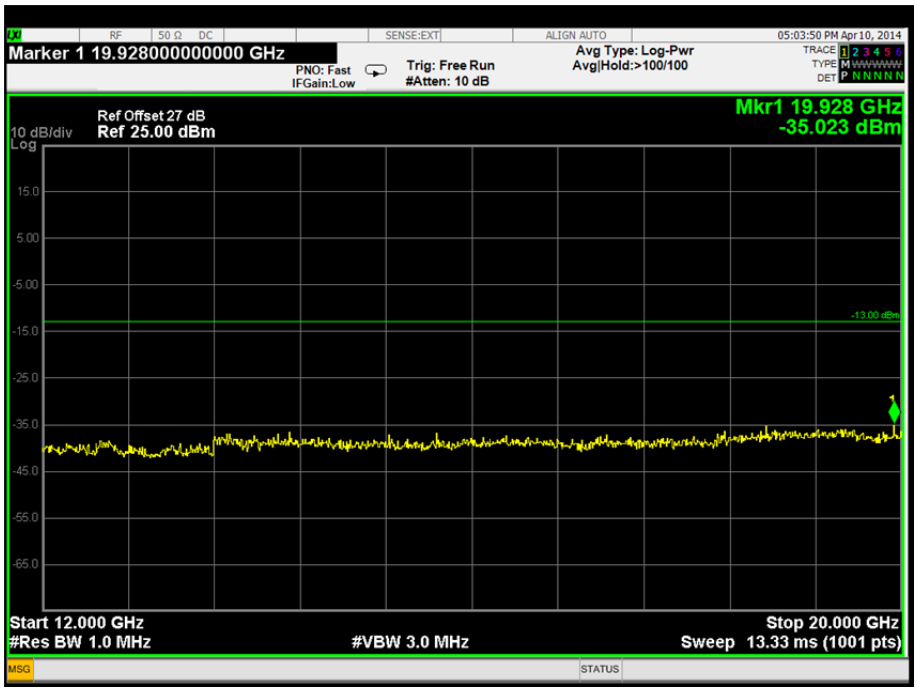


Product Service

4 GHz to 12 GHz



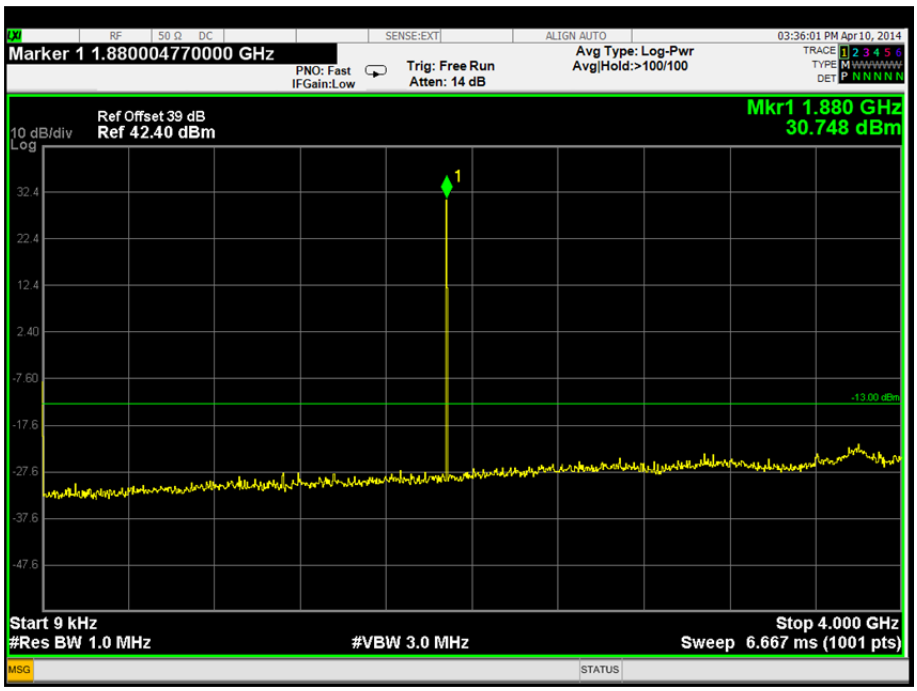
12 GHz to 20 GHz



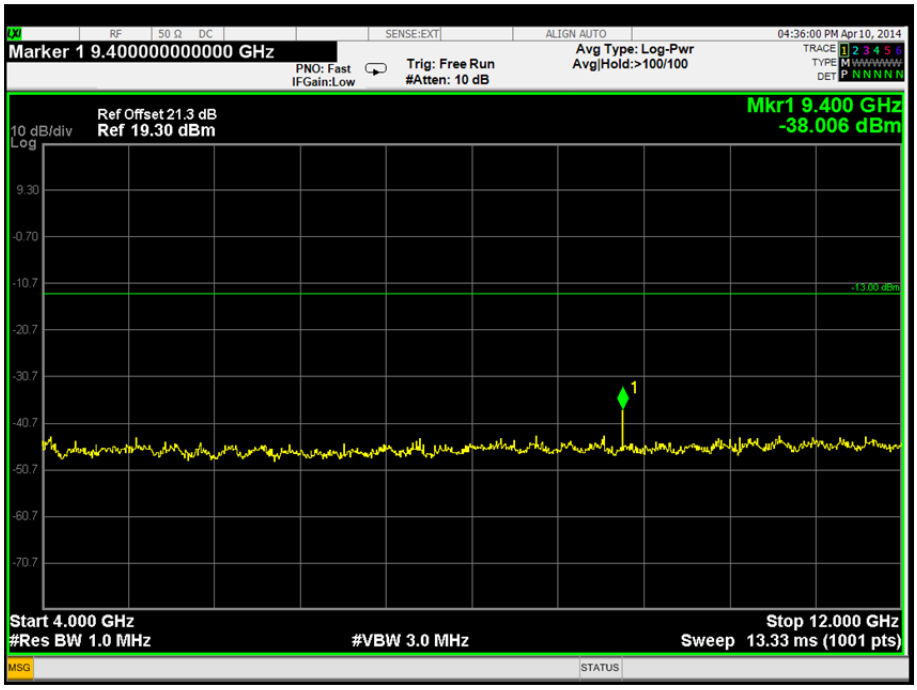
Product Service

1880.0 MHz

9 kHz to 4 GHz

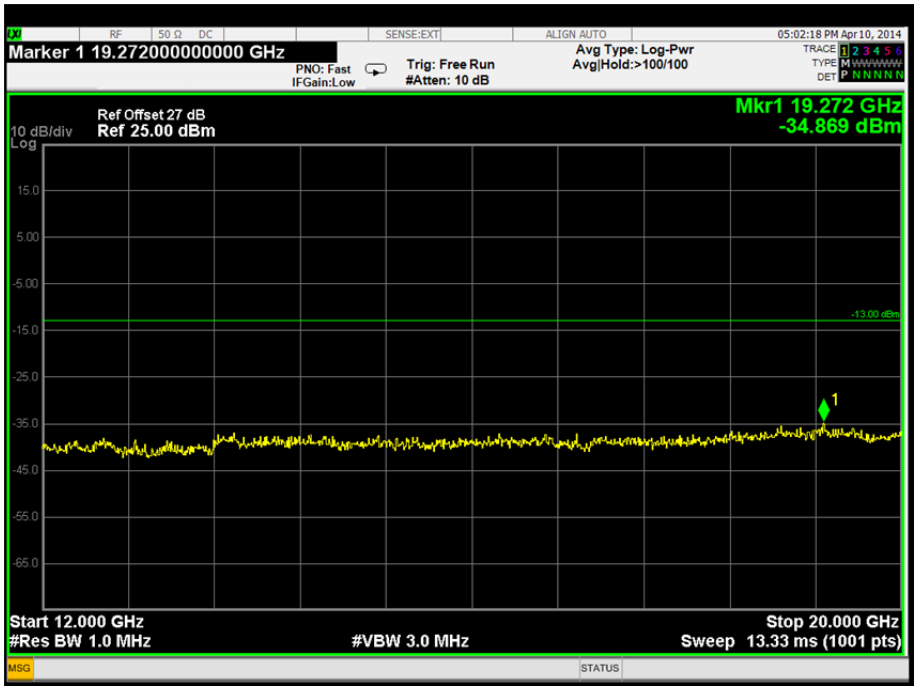


4 GHz to 12 GHz



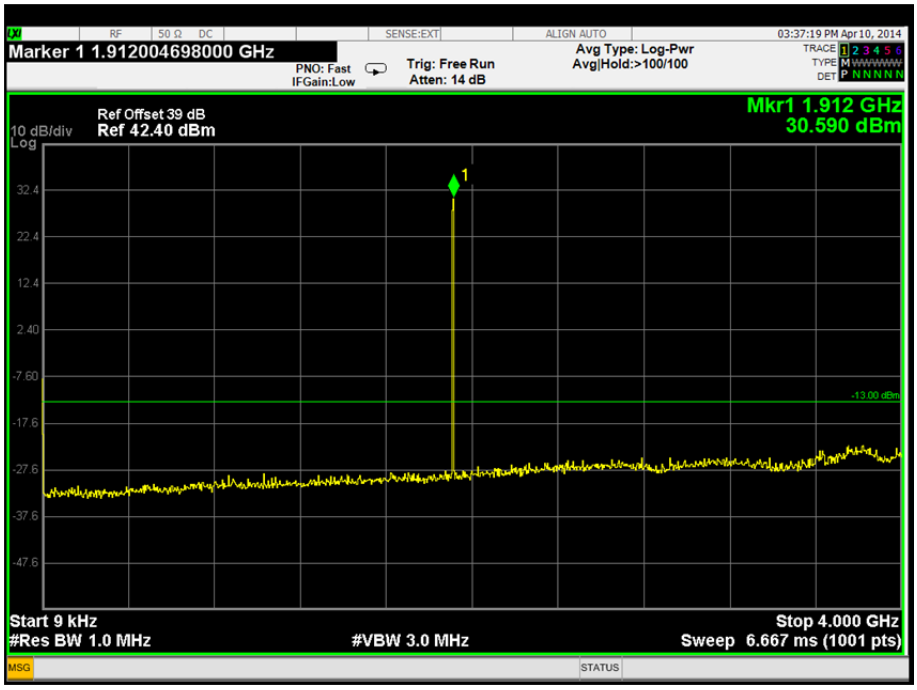
Product Service

12 GHz to 20 GHz



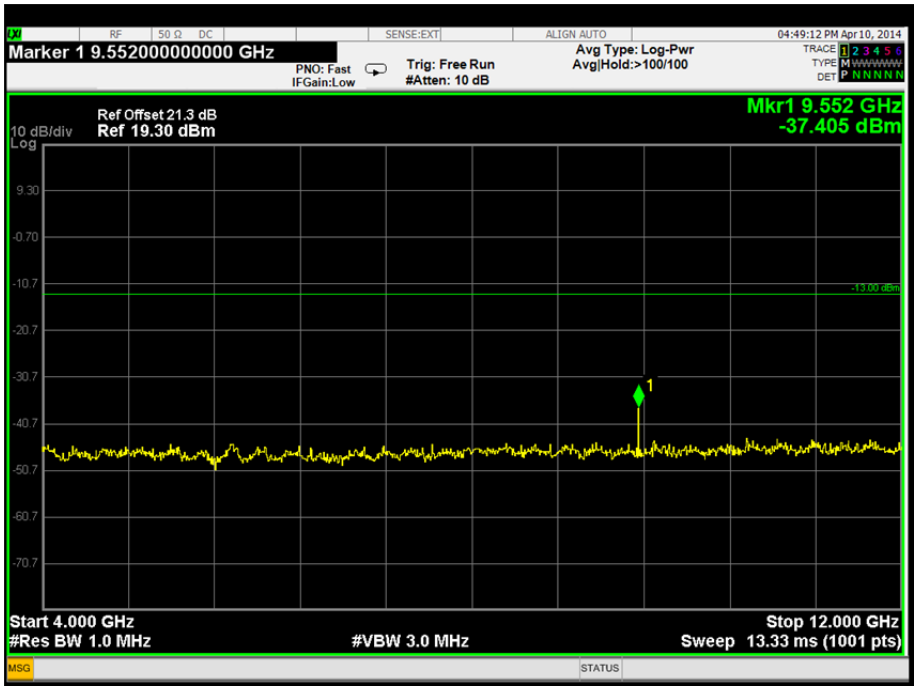
1909.8 MHz

9kHz to 4 GHz

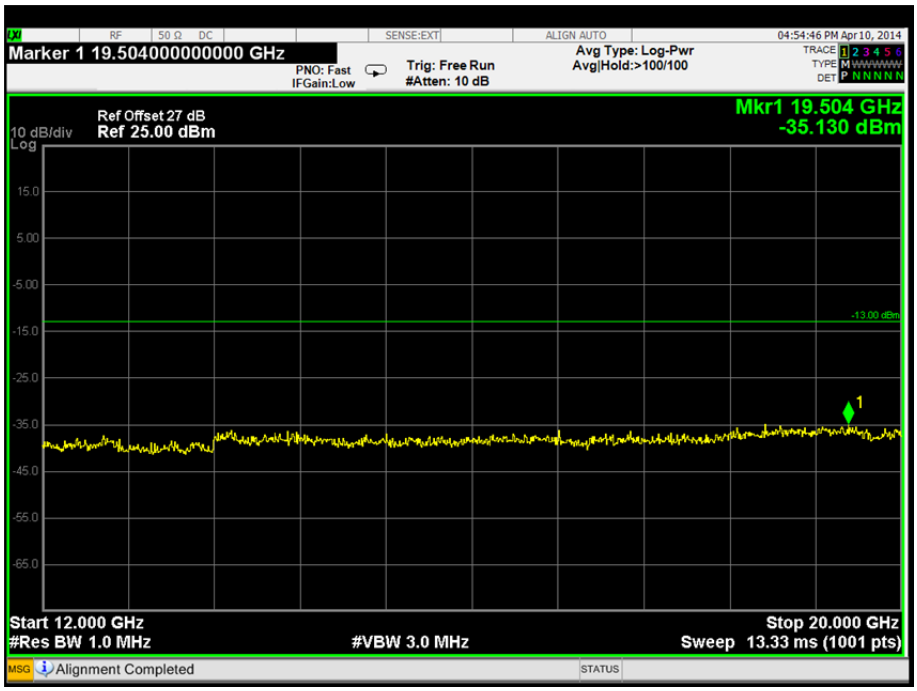


Product Service

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

2.8.2 Equipment Under Test and Modification State

SHL25 S/N: IMEI 004401115170785 - Modification State 0

2.8.3 Date of Test

10 April 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 requirements of FCC CFR 47 Part 24.238 (b) in conjunction with the test methods described in document 971168 D01 Power Meas License Digital Systems v02r01.

The EUT was configured in a GSM circuit switched voice call using GMSK modulation 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.

2.8.6 Environmental Conditions

Ambient Temperature	22.9°C
Relative Humidity	28.9%

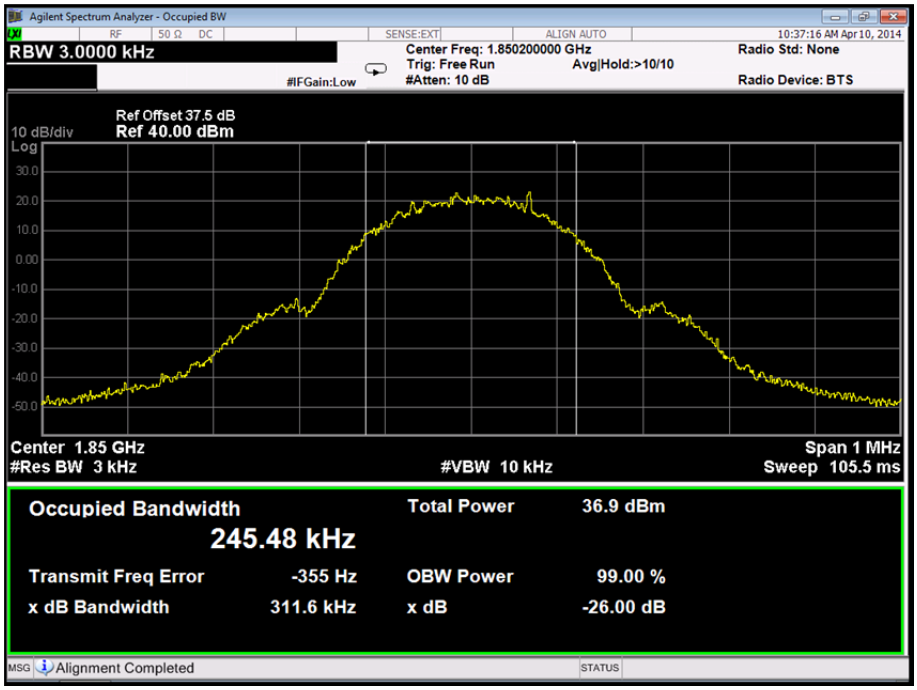
Product Service

2.8.7 Test Results

4.0 V DC Supply

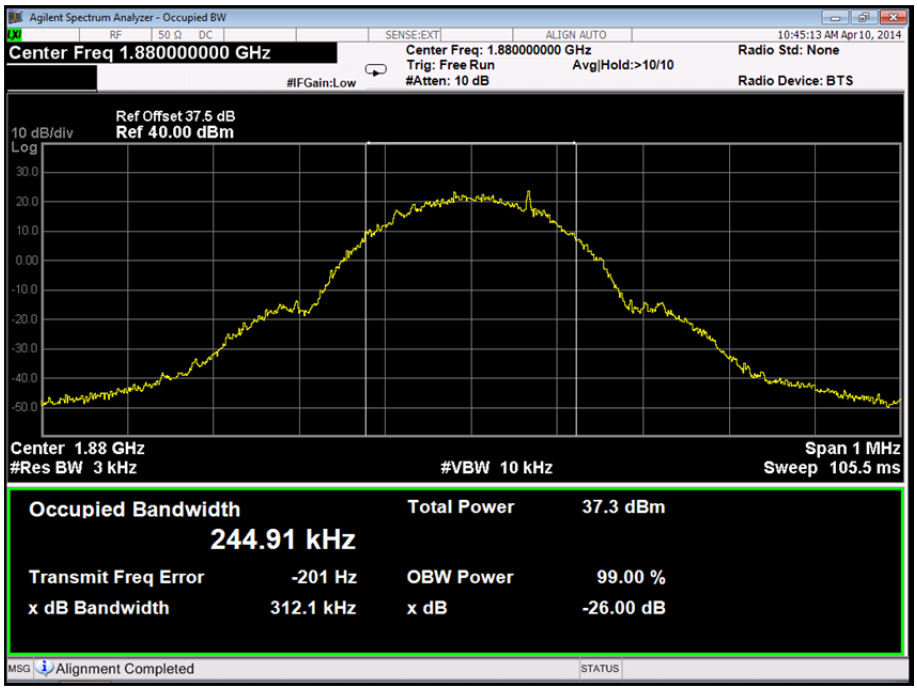
1850.2 MHz

Mode	Occupied Bandwidth (kHz)
GMSK	311.6



1880.0 MHz

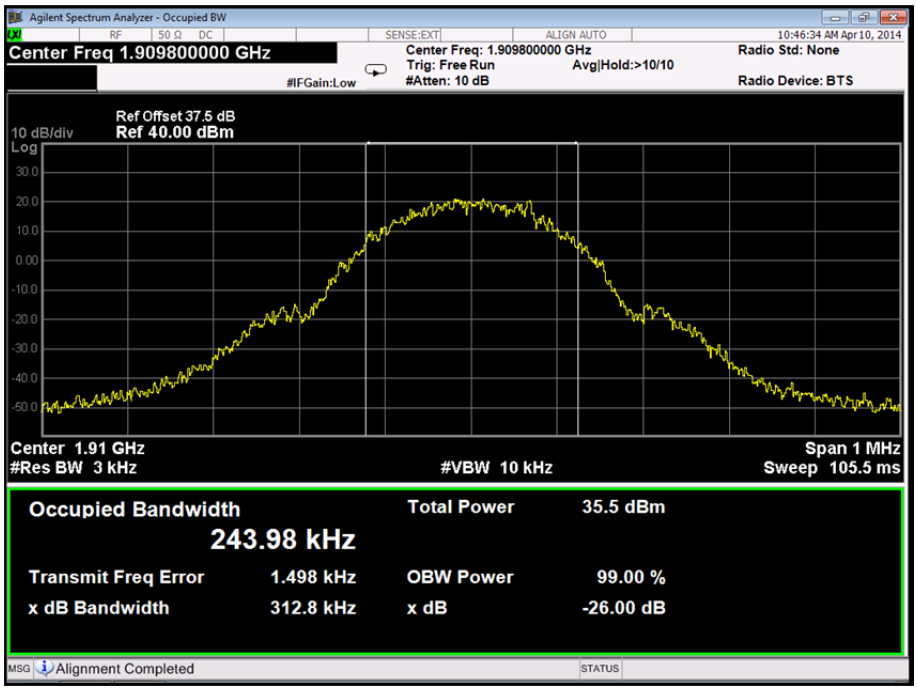
Mode	Occupied Bandwidth (kHz)
GMSK	312.1



Product Service

1909.8 MHz

Mode	Occupied Bandwidth (kHz)
GMSK	312.8



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					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Digital Temperature Indicator + T/C	Fluke	51	412	12	12-Feb-2015
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Attenuator (20dB, 2W)	Pasternack	PE7004-20	2943	12	28-Mar-2015
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	17-Oct-2014
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	22-Jul-2014
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4144	12	17-Jul-2014
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	22-Jul-2014
Section 2.2 - Spurious Emissions at Band Edge					
Attenuator (10dB)	Weinschel	47-10-34	481	12	28-Mar-2015
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Hygrometer	Rotronic	I-1000	2891	12	8-Jul-2014
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	25-Oct-2014
Multimeter	Fluke	79 Series II	3057	12	24-Sep-2014
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	12-Dec-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
Combiner/Splitter	Weinschel	1506A	3878	12	21-Mar-2015
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	22-Jul-2014
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	27-Feb-2015
Section 2.3 - Effective Isotropic 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
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	1002	12	18-Sep-2014
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
GSM Test Set	Rohde & Schwarz	CMU 200	2809	12	18-Jun-2014
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Section 2.4 - Maximum Peak Output Power - Conducted					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Communications Tester	Rohde & Schwarz	CMU 200	442	12	8-Nov-2014
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	30-Oct-2014
Power Divider	Weinschel	1506A	604	12	23-May-2014
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
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
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.6 - Emission Limitations for Broadband PCS Equipment					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	3-May-2014
Filter (High Pass)	Lorch	SHP7-7000-SR	566	12	24-Feb-2015
Pre-Amplifier	Phase One	PS04-0086	1533	12	19-Dec-2014
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
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Suspended Subtrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4411	12	21-Mar-2015
Section 2.7 - Conducted Spurious Emissions					
Attenuator (10dB)	Weinschel	47-10-34	481	12	28-Mar-2015
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	04-Feb-2014
Hygrometer	Rotronic	I-1000	2891	12	8-Jul-2014
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	25-Oct-2014
Multimeter	Fluke	79 Series II	3057	12	24-Sep-2014
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	12-Dec-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
Combiner/Splitter	Weinschel	1506A	3878	12	21-Mar-2015
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	22-Jul-2014
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	27-Feb-2015
Section 2.8 - Occupied Bandwidth					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Communications Tester	Rohde & Schwarz	CMU 200	442	12	8-Nov-2014
Attenuator (10dB)	Weinschel	47-10-34	481	12	28-Mar-2015
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	30-Oct-2014
Power Divider	Weinschel	1506A	604	12	23-May-2014
Power Supply Unit	Farnell	H60-25	1092	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Hygrometer	Rotronic	I-1000	2891	12	8-Jul-2014
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	25-Oct-2014
Multimeter	Fluke	79 Series II	3057	12	24-Sep-2014
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	12-Dec-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
Combiner/Splitter	Weinschel	1506A	3878	12	21-Mar-2015
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	22-Jul-2014
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	27-Feb-2015

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

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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).

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