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Report On

FCC Testing of the Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP (TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 22 (GSM 850)

COMMERCIAL-IN-CONFIDENCE
FCC ID: APYHRO00214

Document 75928148 Report 09 Issue 1 **November 2014**

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REPORT ON

FCC Testing of the Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP (TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS
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Document 75928148 Report 09 Issue 1

November 2014

PREPARED FOR

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PREPARED BY

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APPROVED BY

Nic Forsyth
Authorised Signatory

DATED 23 December 2014

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 2 and FCC CFR 47 Part 22. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Russell T Guy

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM
(GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP
(TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 22 (GSM 850)

1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP (TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS to the requirements of FCC CFR 47 Part 2 and FCC CFR 47 Part 22.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Sharp Corporation
Model Number(s)	SHV31
Serial Number(s)	IMEI 004401115315372 IMEI 004401115315331
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 2 (2013) FCC CFR 47 Part 22 (2013)
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	10329 20 October 2014
Start of Test	10 November 2014
Finish of Test	16 November 2014
Name of Engineer(s)	M Russell T Guy
Related Document(s)	ANSI C63.4: 2009

Product Service

1.2 BRIEF SUMMARY OF RESULTS

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

Section	Spec Clause		Test Description	Result	Comments/Base Standard
	Pt 2	Pt 22			
GSM 850					
2.1	2.1051	22.905	Spurious Emissions at Band Edge	Pass	
2.2	-	22.913 (a)	Effective Radiated Power	Pass	
2.3	2.1046	22.913 (a)	Maximum Peak Output Power - Conducted	Pass	
2.4	-	22.917	Emission Limitations for Cellular Equipment	Pass	
2.5	2.1051	22.917 (a)	Conducted Spurious Emissions	Pass	
2.6	2.1049 (h)	22.917 (b)	Emission Bandwidth	Pass	
2.7	2.1047 (d)	-	Modulation Characteristics	-	Customer Declaration
2.8	2.1055	22.355	Frequency Stability	Pass	

1.3 PRODUCT TECHNICAL DESCRIPTION

Please refer to the SHV31 Model Description Form.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP (TDD41) 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 SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM
(GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP
(TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 22 (GSM 850)

2.1 SPURIOUS EMISSIONS AT BAND EDGE

2.1.1 Specification Reference

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

2.1.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315372 - Modification State 0

2.1.3 Date of Test

14 November 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

Measurements were performed in accordance with KDB 971168 v02r02 clause 6.

The EUT was connected to a spectrum analyser via a cable, combiner and attenuator. The other port of the combiner was connected to a communications test set which was configured with a circuit switched voice call at maximum output power. The path loss was calibrated using a vector network analyser and was entered as a reference level offset on the spectrum analyser. The frame clock output from the communications test set was used to trigger the spectrum analyser and using a gated trigger with RMS detector an average measurement was performed. The RBW of the spectrum analyser was configured at not less than 1% of the emission bandwidth and it was verified that all emissions in the 100 kHz immediately adjacent to the authorized bandwidth were below 43 + 10 Log (P).

2.1.6 Environmental Conditions

Ambient Temperature	23.5°C
Relative Humidity	40.2%

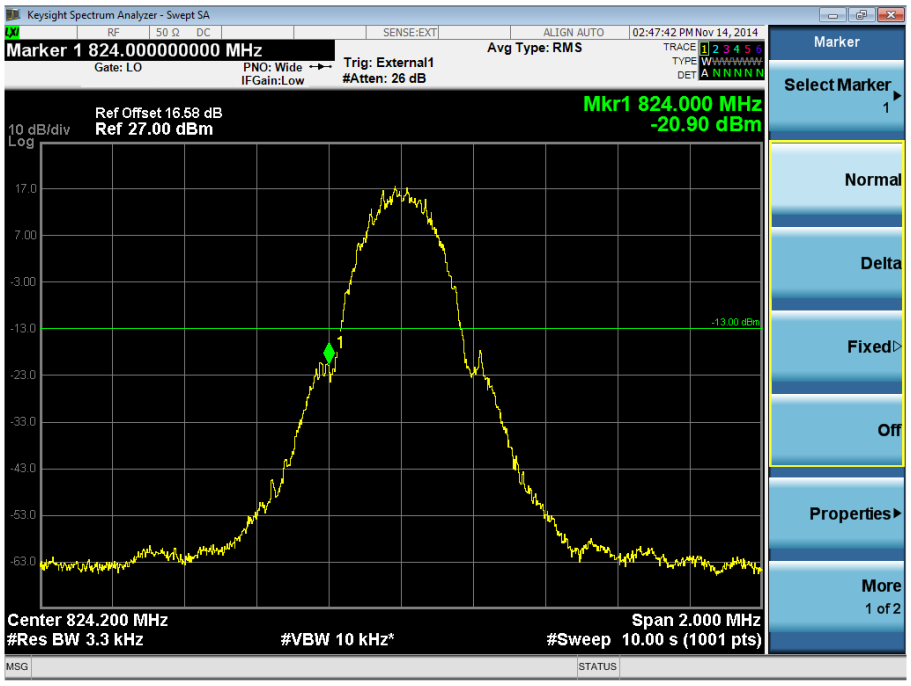
Product Service

2.1.7 Test Results

4.0 V DC Supply

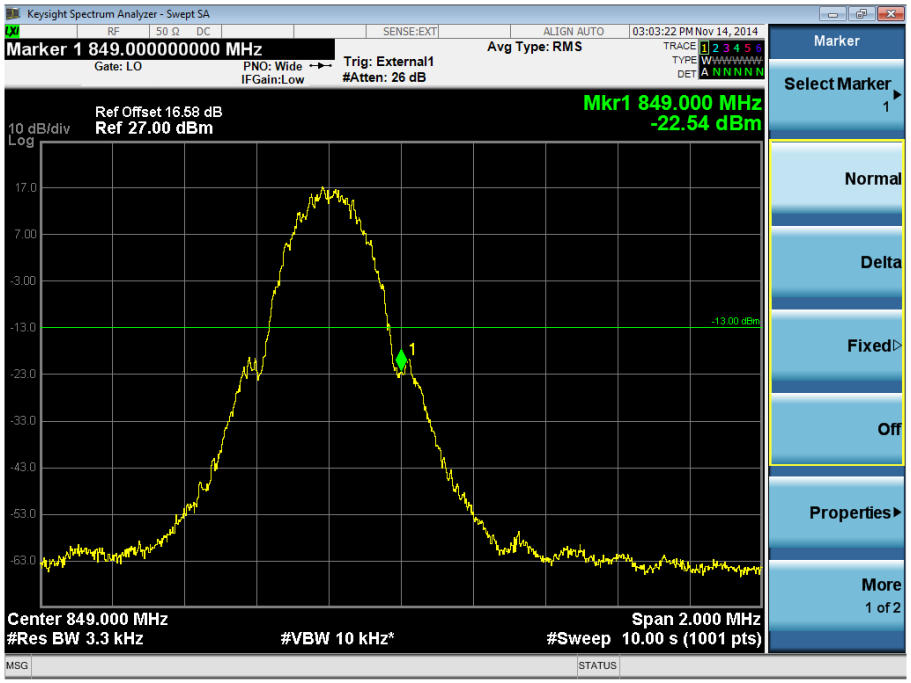
Frequency Block (MHz)	Mode	Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
A :(824.0 – 835.0)	GSM	Channel : 128 Frequency : 824.2 MHz	N/A
B :(846.5 – 849.0)	GSM	N/A	Channel : 251 Frequency : 848.8MHz

Frequency Block A



Product Service

Frequency Block B



Remark

In order for the band edge to satisfy the appropriate requirements, the measurement had to be performed in an average manner. Consequently the maximum conducted average power was measured in section 2.3 of this test report.

Limit Clause

-13 dBm at block edge.

2.2 EFFECTIVE RADIATED POWER

2.2.1 Specification Reference

FCC CFR 47 Part 22, Clause 22.913 (a)

2.2.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315331 - Modification State 0

2.2.3 Date of Test

16 November 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

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.

2.2.6 Environmental Conditions

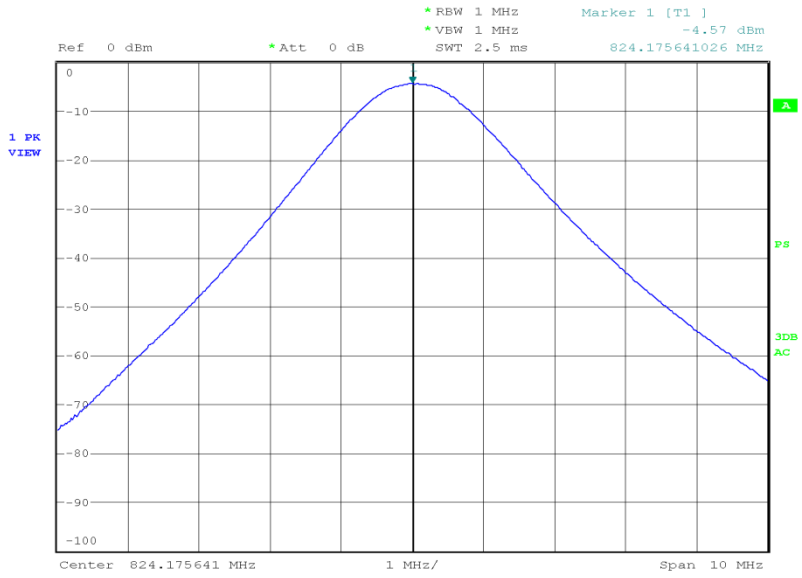
Ambient Temperature	20.1°C
Relative Humidity	63.2%

2.2.7 Test Results

4.0 V DC Supply

824.20 MHz

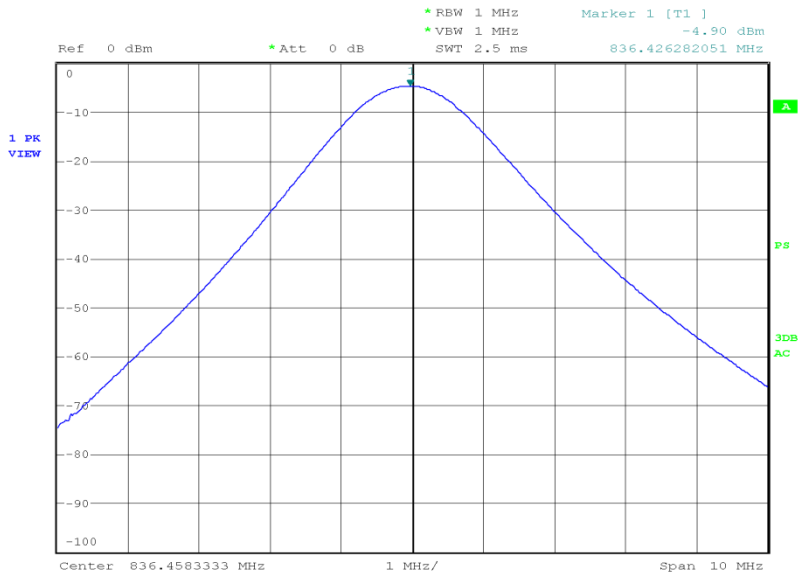
Result (dBm)	Result (W)
30.0	1.00



Date: 15.NOV.2014 22:13:00

836.40 MHz

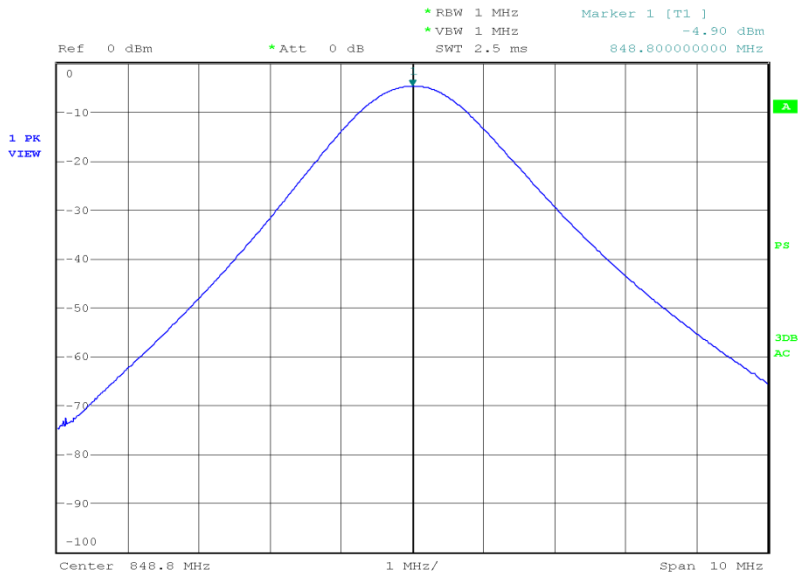
Result (dBm)	Result (W)
29.91	0.979



Date: 15.NOV.2014 22:05:38

848.80 MHz

Result (dBm)	Result (W)
30.23	1.054



Date: 15.NOV.2014 22:10:17

Limit Clause

Mobile – 7 W or 38.45 dBm

2.3 MAXIMUM PEAK OUTPUT POWER - CONDUCTED

2.3.1 Specification Reference

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

2.3.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315372 - Modification State 0

2.3.3 Date of Test

10 November 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

This test was performed with the test method requirements as stated in KDB 971168 D01 v02r01 clause 5.1.2 and 5.2.3.

The EUT was connected to a broadband power meter via a cable, combiner and attenuator. The other port of the combiner was connected to a communications test set which was configured with a 12.2 kbps RMC at maximum output power. The path loss was calibrated using a vector network analyser and was entered as an offset on the power meter. The power meter was configured so that average measurements were only made over the active part of the transmission. Both peak and average measurements were recorded.

2.3.6 Environmental Conditions

Ambient Temperature	22.3°C
Relative Humidity	46.8%

2.3.7 Test Results

4.0 V DC Supply

824.20 MHz

Mode	Peak		Average	
	Result (dBm)	Result (W)	Result (dBm)	Result (W)
GSM	32.50	1.778	32.02	1.592

836.40 MHz

Mode	Peak		Average	
	Result (dBm)	Result (W)	Result (dBm)	Result (W)
GSM	32.16	1.644	31.69	1.476

848.80 MHz

Mode	Peak		Average	
	Result (dBm)	Result (W)	Result (dBm)	Result (W)
GSM	32.13	1.633	31.72	1.486

Limit Clause

Mobile – 7 W or 38.45 dBm

Product Service

2.4 EMISSION LIMITATIONS FOR CELLULAR EQUIPMENT

2.4.1 Specification Reference

FCC CFR 47 Part 22, Clause 22.917

2.4.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315331 - Modification State 0

2.4.3 Date of Test

16 November 2014

2.4.4 Test Equipment Used

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

2.4.5 Test Procedure

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

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

The EUT was set to transmit on maximum power with modulation. The EUT was tested on bottom, middle and top channels at maximum power.

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

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

2.4.6 Environmental Conditions

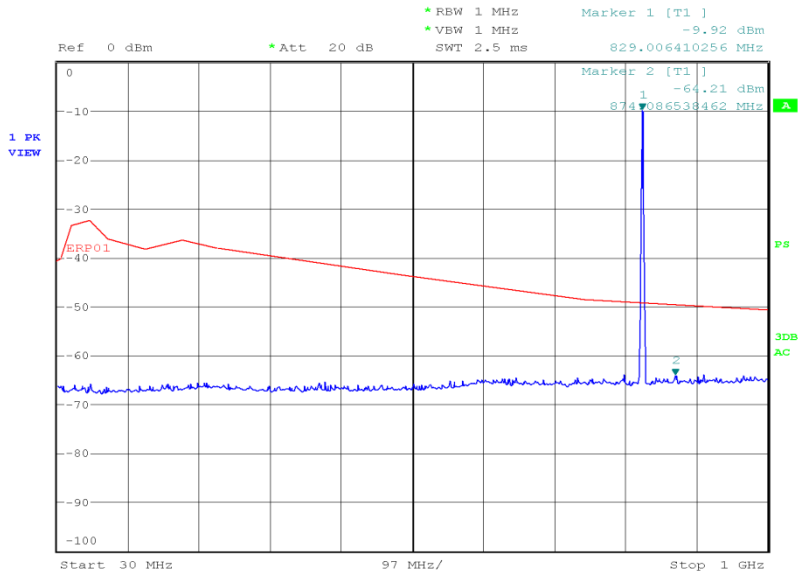
Ambient Temperature	19.7°C
Relative Humidity	62.5%

Product Service

2.4.7 Test Results

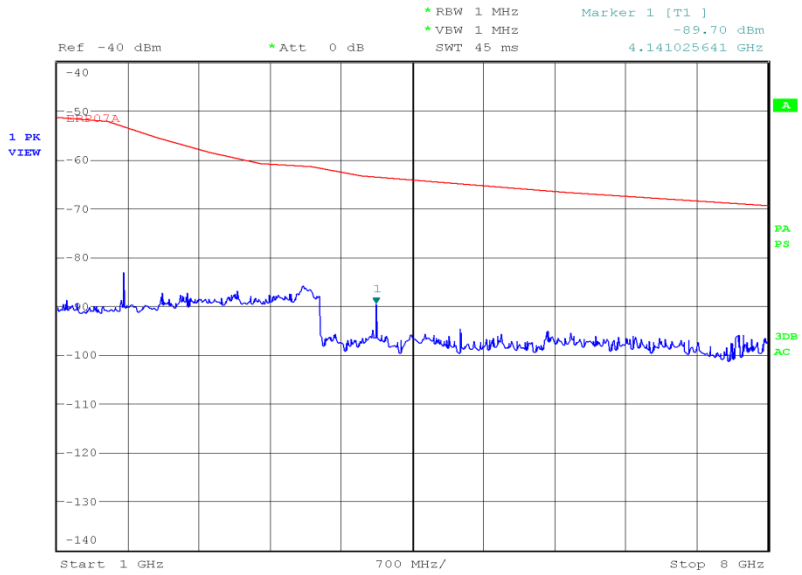
824.20 MHz

30 MHz to 1 GHz



Date: 15.NOV.2014 23:18:55

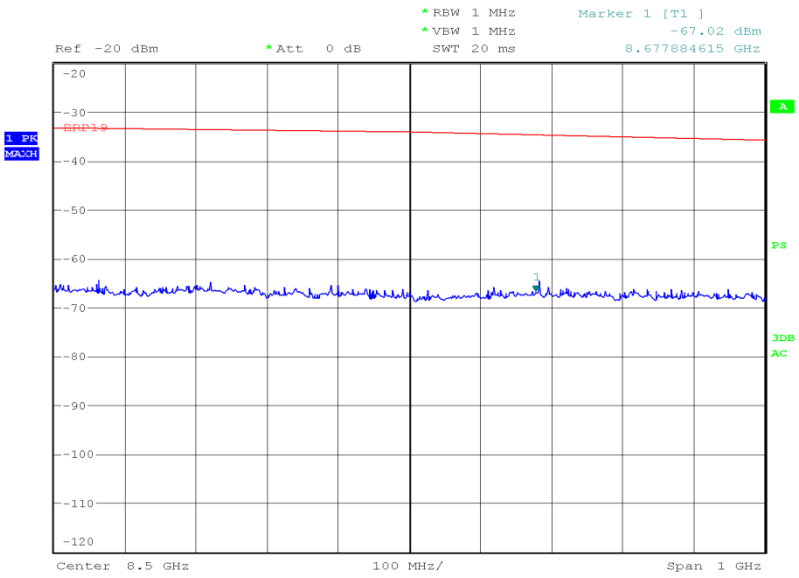
1 GHz to 8 GHz



Date: 15.NOV.2014 23:02:38

Product Service

8 GHz to 9 GHz



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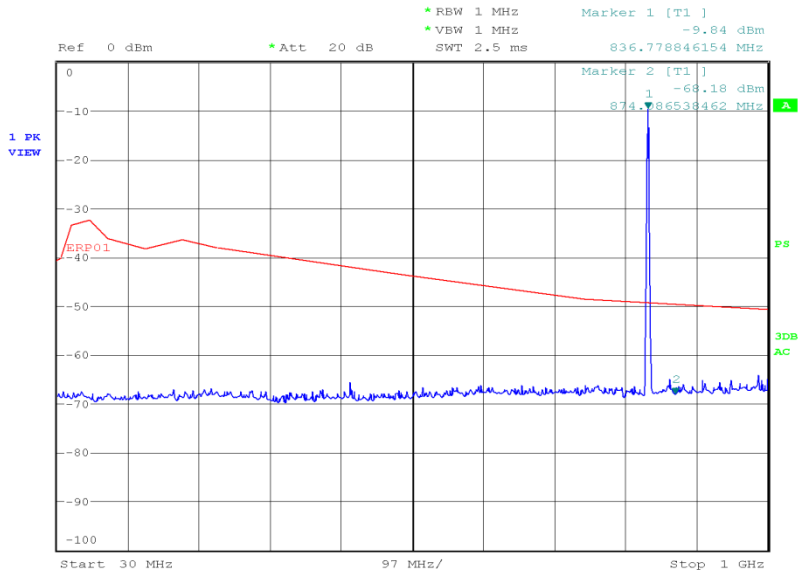
Product Service

836.40 MHz

30 MHz to 1 GHz



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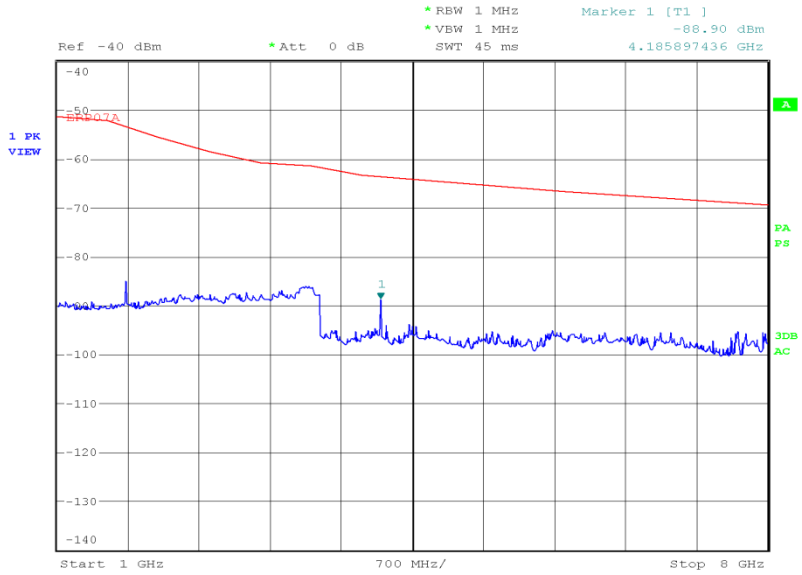
1 GHz to 8 GHz



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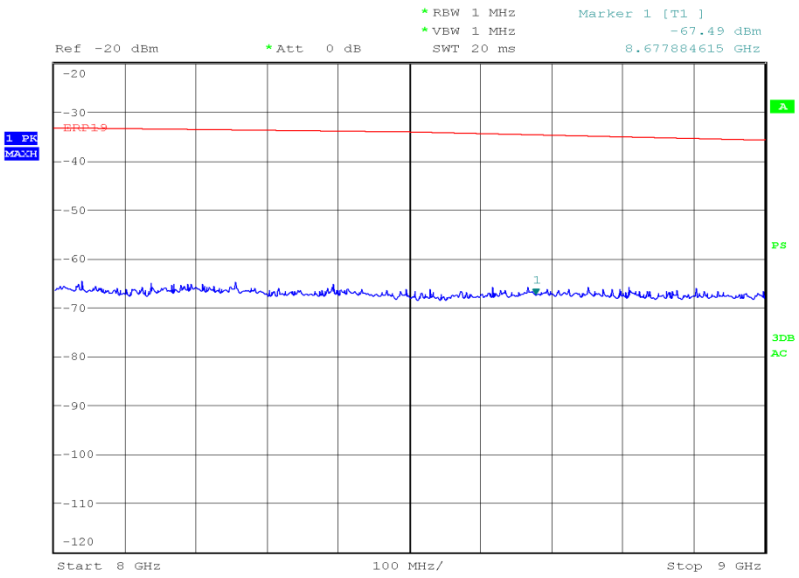
Product Service

8 GHz to 9 GHz

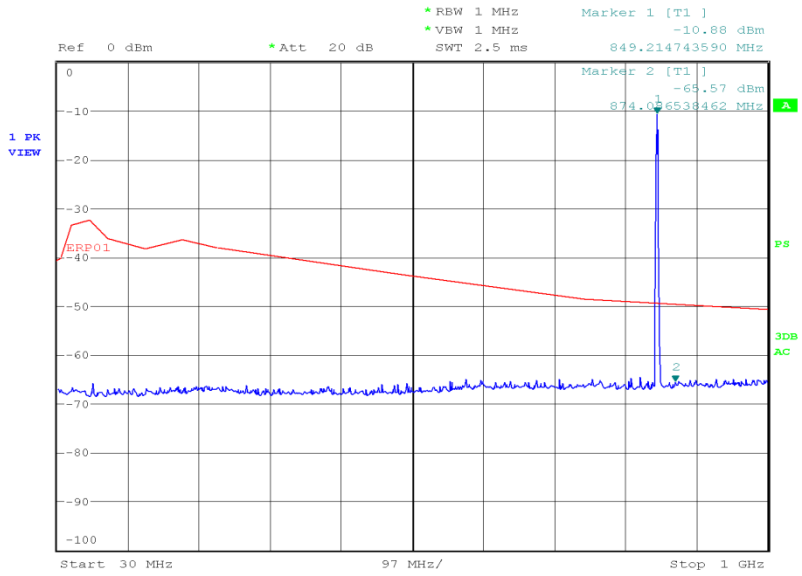


Date: 16.NOV.2014 05:22:57

Product Service

848.80 MHz

30 MHz to 1 GHz



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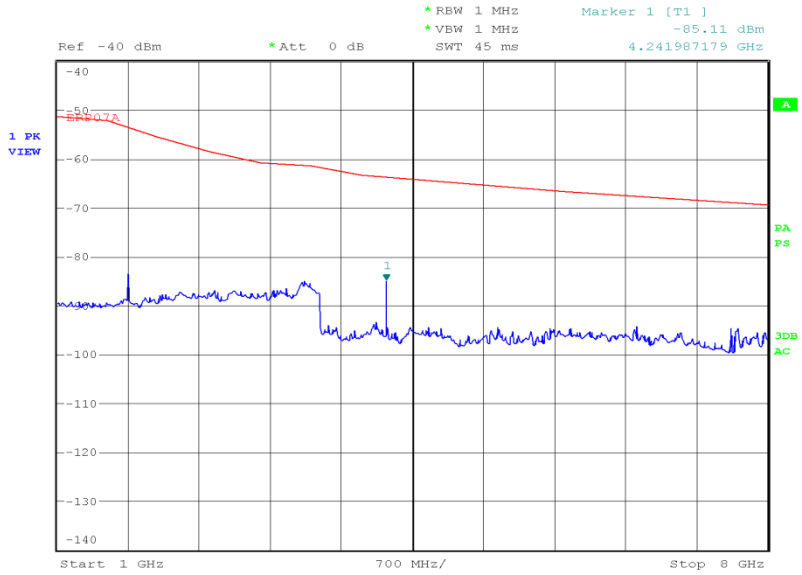
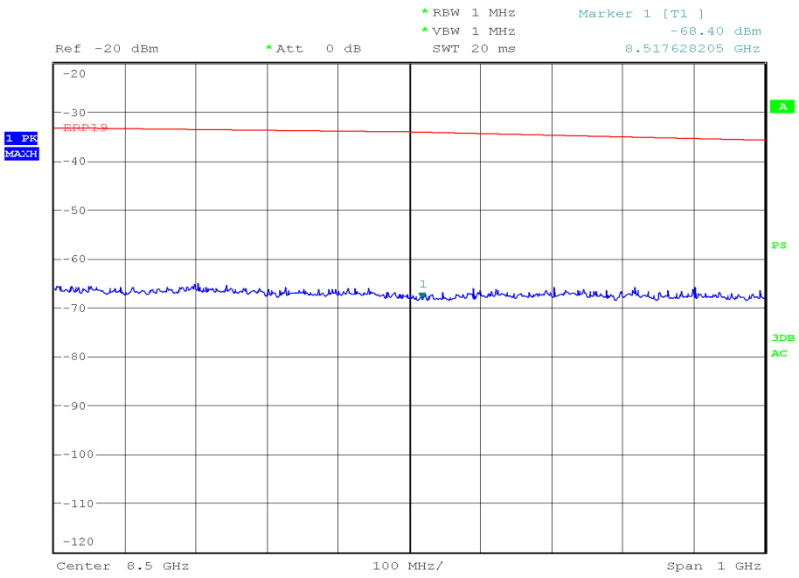
1 GHz to 8 GHz



Date: 15.NOV.2014 22:36:37

Product Service

8 GHz to 9 GHz



Date: 16.NOV.2014 05:29:24

Limit Clause

43+10log(P) or -13 dBm

2.5 CONDUCTED SPURIOUS EMISSIONS

2.5.1 Specification Reference

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

2.5.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315372 - Modification State 0

2.5.3 Date of Test

14 November 2014

2.5.4 Test Equipment Used

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

2.5.5 Test Procedure

Measurements were performed in accordance with KDB 971168 v02r02, clause 6.

The EUT was connected to a spectrum analyser via a cable, combiner and attenuator, additionally between 1.5GHz and 9GHz a 1.5GHz high pass filter was used. The other port of the combiner was connected to a communications test set which was configured with a circuit switched voice call at maximum output power. The path loss was calibrated using a vector network analyser and the value with the highest loss for the frequency range of interest was entered as a reference level offset on the spectrum analyser. The RBW was configured with an RBW of 100 kHz using a peak detector and max hold trace.

2.5.6 Environmental Conditions

Ambient Temperature	23.3°C
Relative Humidity	40.7%

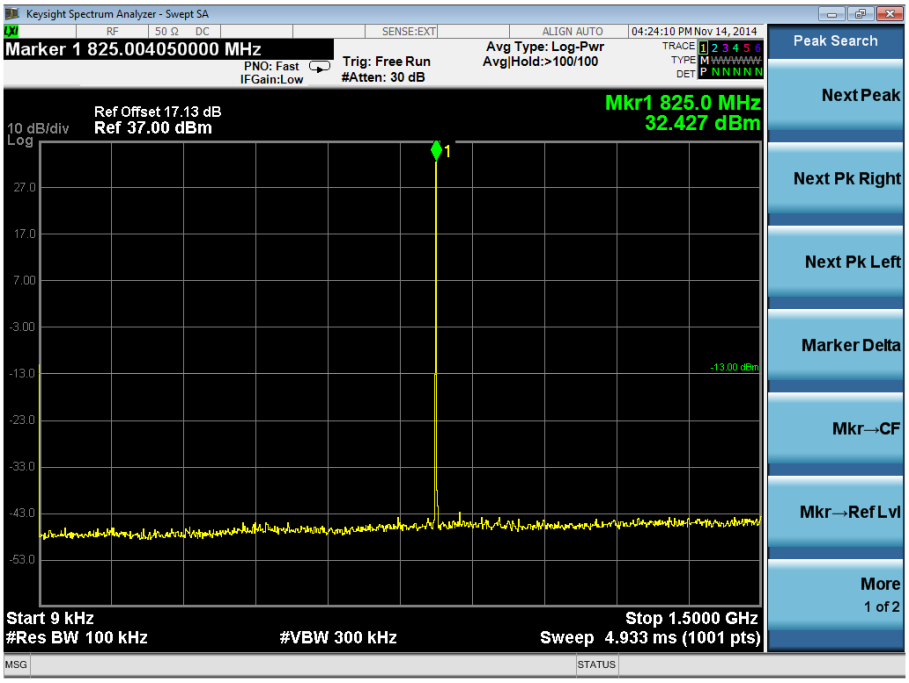
Product Service

2.5.7 Test Results

4.0 V DC Supply

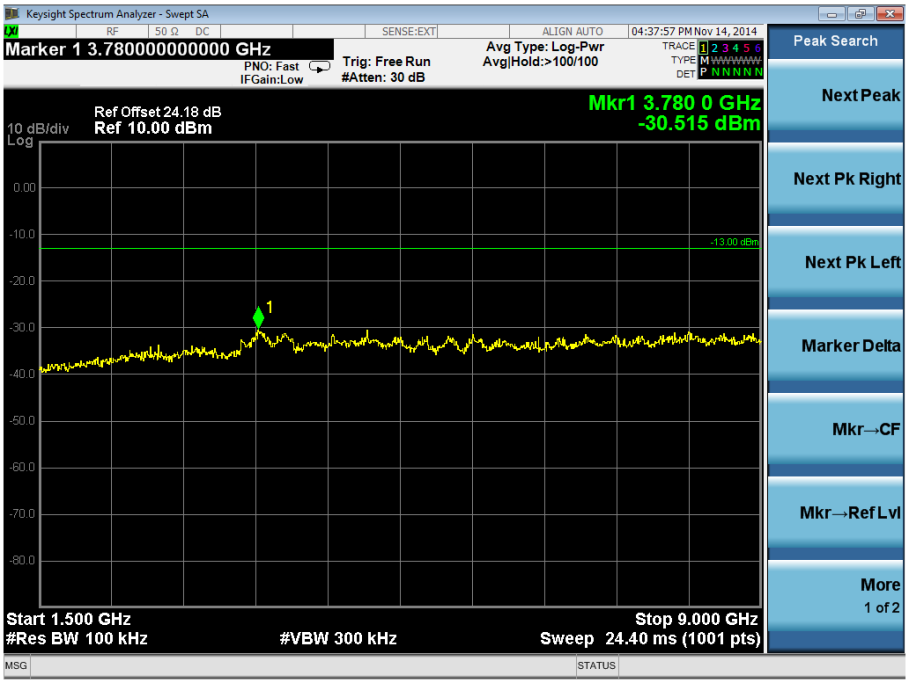
824.20 MHz

9 kHz to 1.5 GHz



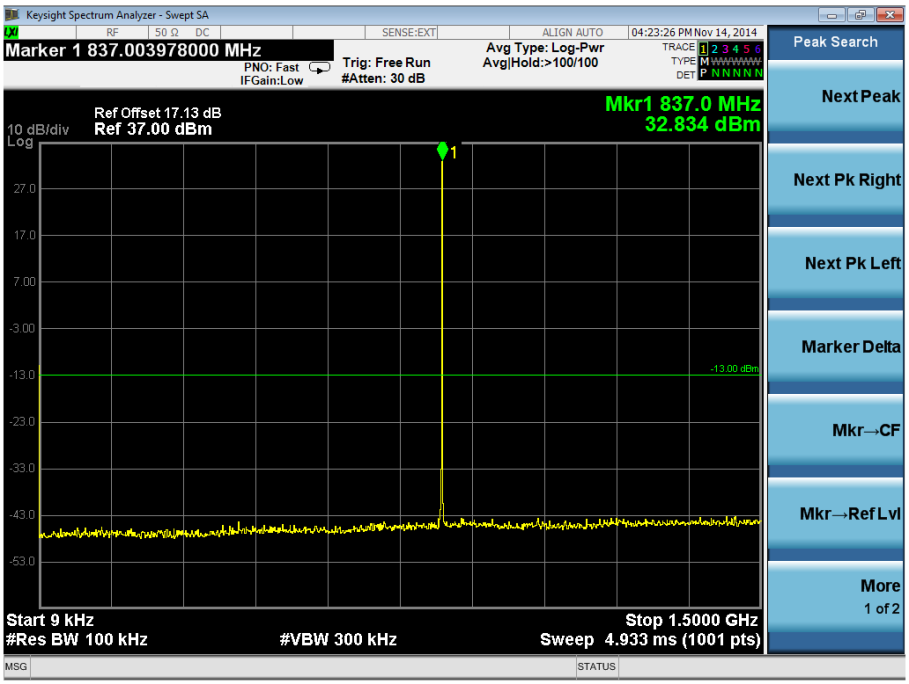
Product Service

1.5 GHz to 9 GHz



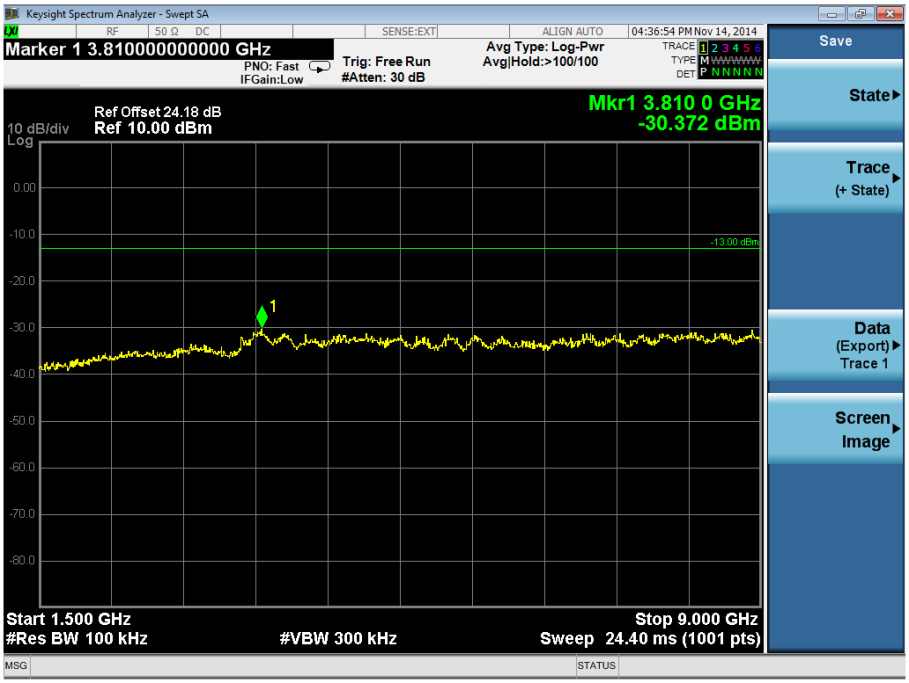
836.40 MHz

9 kHz to 1.5 GHz



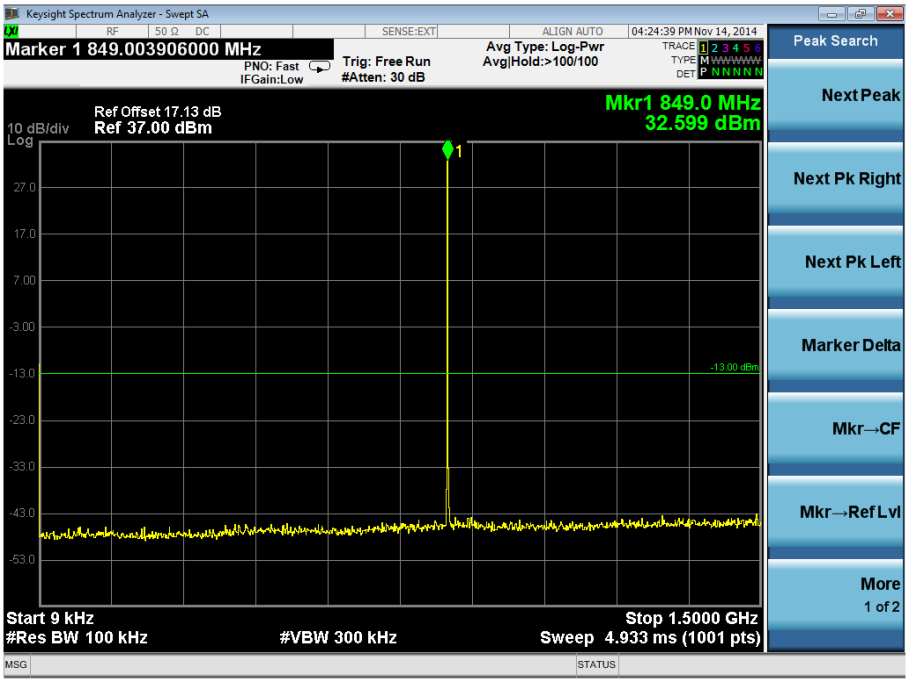
Product Service

1.5 GHz to 9 GHz



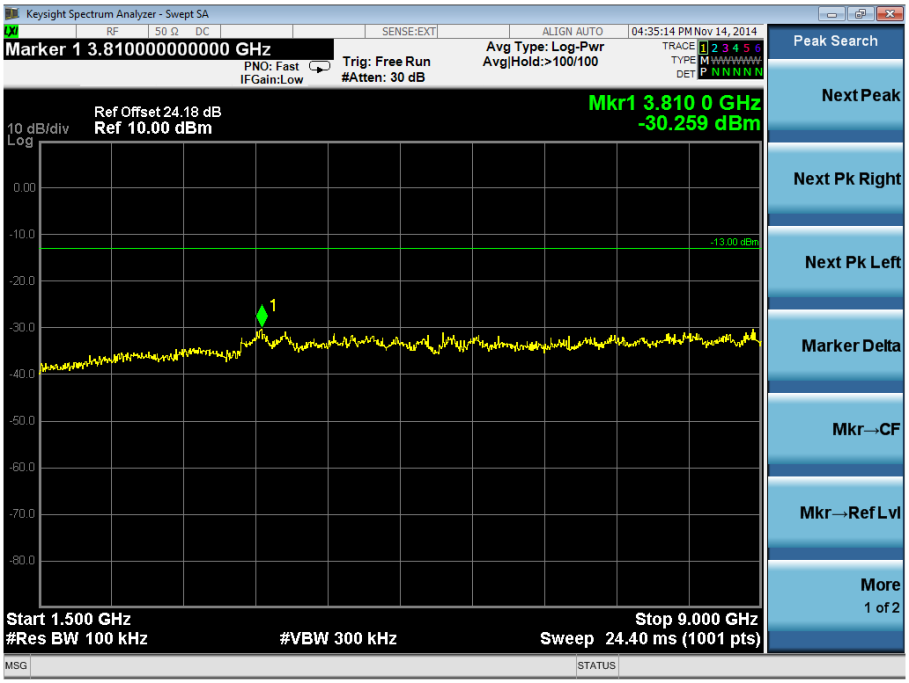
848.80 MHz

9 kHz to 1.5 GHz



Product Service

1.5 GHz to 9 GHz



Limit Clause

43+10log(P) or -13 dBm

2.6 EMISSION BANDWIDTH

2.6.1 Specification Reference

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

2.6.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315372 - Modification State 0

2.6.3 Date of Test

10 November 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

Measurements were performed in accordance with KDB 971168 v02r02 clause 4.1.

The EUT was connected to a spectrum analyser via a cable, combiner and attenuator. The other port of the combiner was connected to a communications test set which was configured with a circuit switched voice call at maximum output power. The path loss was calibrated using a vector network analyser and was entered as a reference level offset on the spectrum analyser. The occupied bandwidth measurement function of the spectrum analyser was used and the 26 dB bandwidth was recorded.

2.6.6 Environmental Conditions

Ambient Temperature	23.4°C
Relative Humidity	41.1%

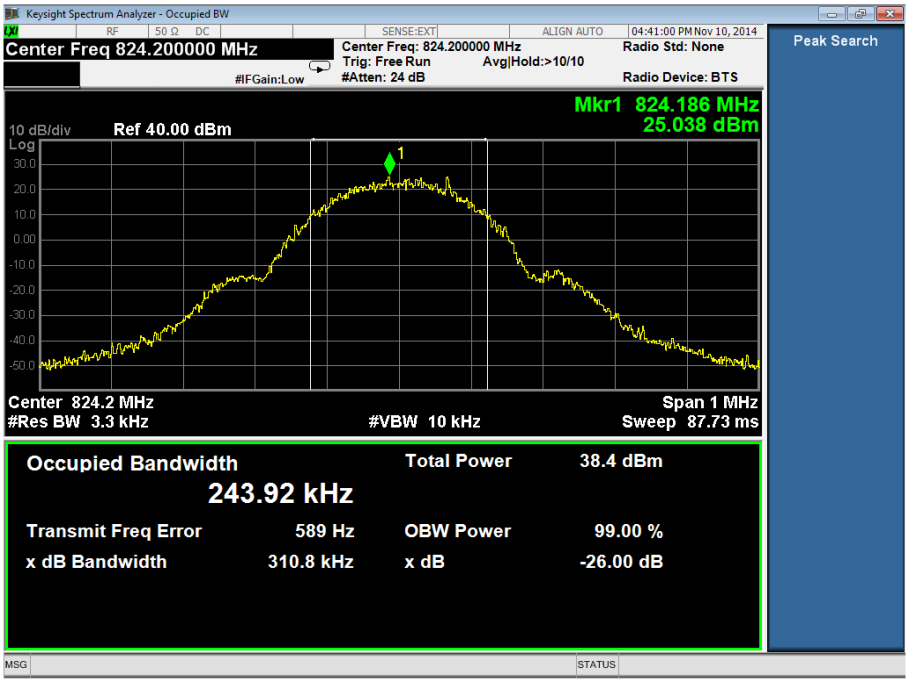
Product Service

2.6.7 Test Results

4.0 V DC Supply

824.20 MHz

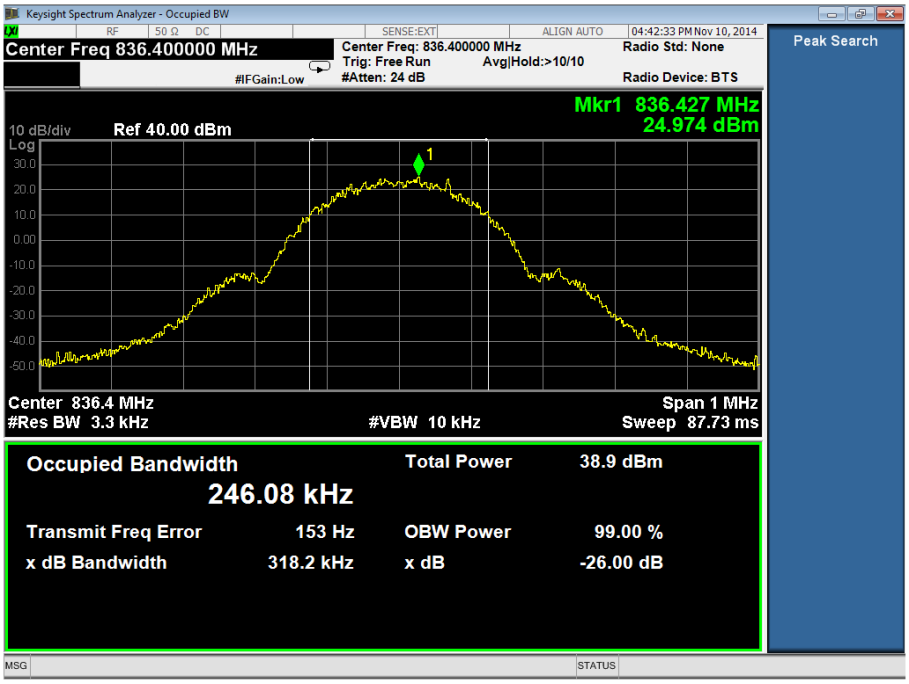
Mode	Occupied Bandwidth (kHz)
GSM	310.8



Product Service

836.40 MHz

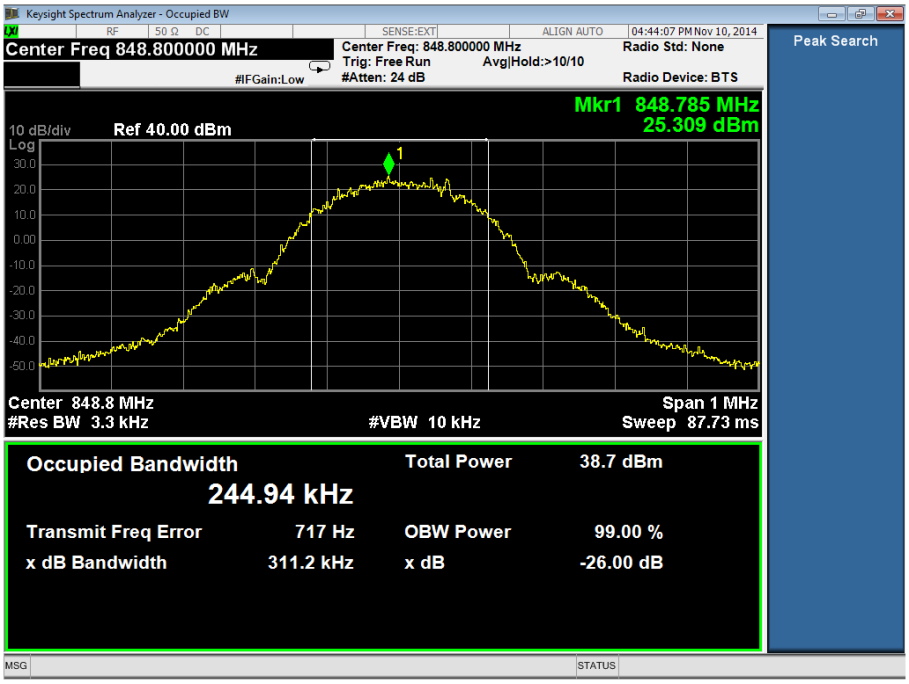
Mode	Occupied Bandwidth (kHz)
GSM	318.2



Product Service

848.80 MHz

Mode	Occupied Bandwidth (kHz)
GSM	311.2



Limit

None specified.

2.7 MODULATION CHARACTERISTICS

2.7.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047 (d)

2.7.2 Equipment Under Test

SHV31

2.7.3 Test Results

Customer Description

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

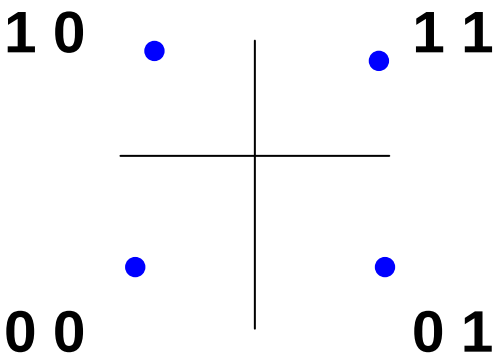
GMSK OVERVIEW

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

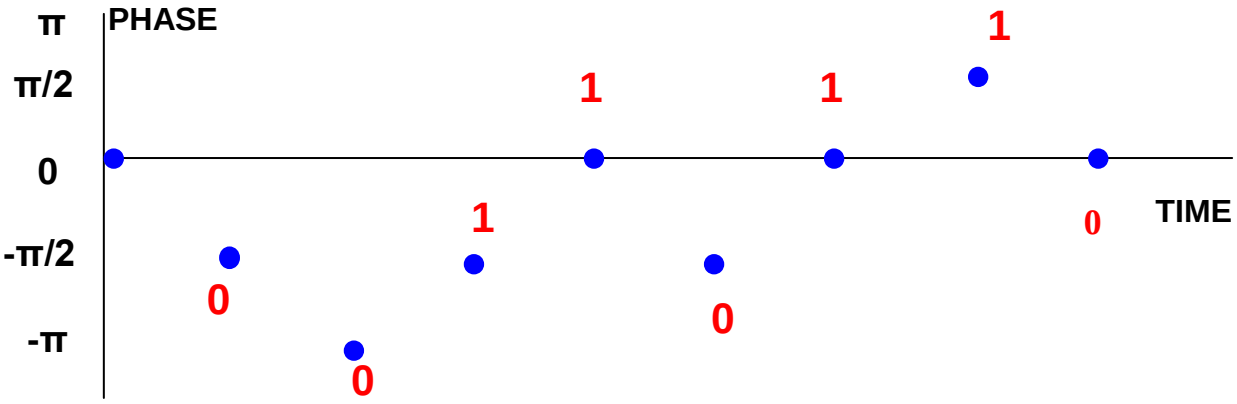
2. Modulate each stream with PSK (1 = 90° or π/2, 0 = -90° or - π/2 phase shift)

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:

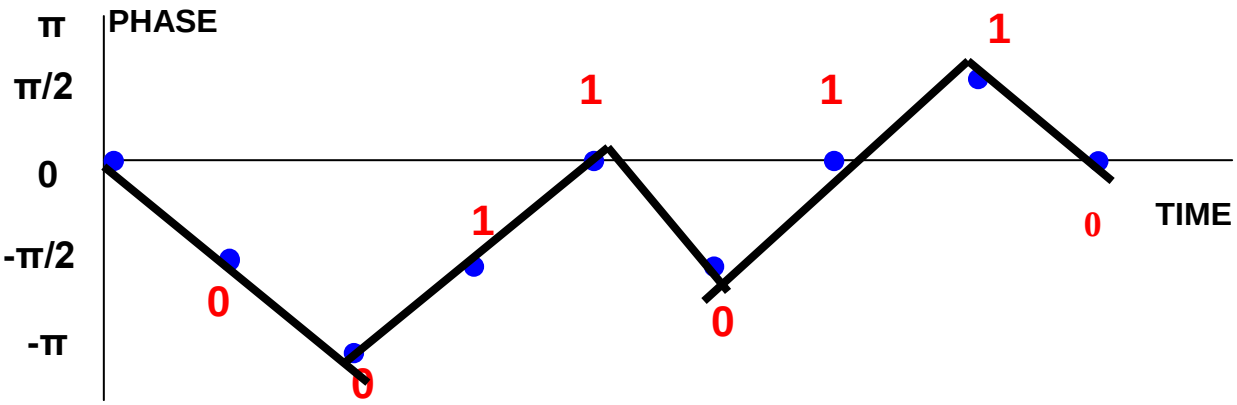
Combined Phase	-π/2	-π	-π/2	0	-π/2	0	π/2	0

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.

2.8 FREQUENCY STABILITY

2.8.1 Specification Reference

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

2.8.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315372 - Modification State 0

2.8.3 Date of Test

15 November 2014

2.8.4 Test Equipment Used

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

2.8.5 Test Procedure

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 22.315 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^{0}C in 10^{0}C steps and at +20^{0}C the voltage was varied to the maximum and minimum end point voltages as declared by the manufacturer.

2.8.6 Environmental Conditions

Ambient Temperature	21.4°C
Relative Humidity	48.4%

2.8.7 Test Results

4.0 V DC Supply

Under Temperature Variations

836.40 MHz

Temperature Interval (ºC)	Mode	Modulation	Deviation (ppm)
-30	GSM	GMSK	0.029
-20	GSM	GMSK	0.023
-10	GSM	GMSK	0.024
0	GSM	GMSK	0.024
+10	GSM	GMSK	0.022
+20	GSM	GMSK	0.024
+30	GSM	GMSK	0.027
+40	GSM	GMSK	0.026
+50	GSM	GMSK	0.022

Limit Clause

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

Under Voltage Variations

836.40 MHz

DC Voltage (V)	Mode	Modulation	Deviation (ppm)
3.7 V DC	GSM	GMSK	0.026
4.0 V DC	GSM	GMSK	0.024

Limit Clause

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

Product Service

SECTION 3

TEST EQUIPMENT USED

Product Service

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 - Spurious Emissions at Band Edge					
Power Supply Unit	Hewlett Packard	6282A	132	-	TU
Communications Tester	Rohde & Schwarz	CMU 200	442	12	8-Dec-2014
Attenuator (10dB)	Weinschel	47-10-34	481	12	28-Mar-2015
Multimeter	Iso-tech	IDM101	2419	12	7-Oct-2015
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	3-Sep-2015
Combiner/Splitter	Weinschel	1506A	3877	12	21-Mar-2015
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	24-Sep-2015
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	27-Feb-2015
Section 2.2 - Effective Radiated Power					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	2-May-2015
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	1002	12	19-Sep-2015
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (DRG Horn)	ETS-LINDGREN	3115	3125	12	16-Jul-2015
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	27-Oct-2015
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Section 2.3 - Maximum Peak Output Power - Conducted					
Power Supply Unit	Hewlett Packard	6282A	132	-	TU
Communications Tester	Rohde & Schwarz	CMU 200	442	12	8-Dec-2014
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	12-Dec-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	3-Sep-2015
Combiner/Splitter	Weinschel	1506A	3877	12	21-Mar-2015
P-Series Power Meter	Agilent Technologies	N1911A	3980	12	22-Sep-2015
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3982	12	22-Sep-2015
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	24-Sep-2015
Section 2.4 - Emission Limitations for Cellular Equipment					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	2-May-2015
Dual Power Supply Unit	Thurlby	PL320	288	-	TU
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	1002	12	19-Sep-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
Antenna (DRG Horn)	ETS-LINDGREN	3115	3125	12	16-Jul-2015
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	27-Oct-2015
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 - Conducted Spurious Emissions					
Power Supply Unit	Hewlett Packard	6282A	132	-	TU
Communications Tester	Rohde & Schwarz	CMU 200	442	12	8-Dec-2014
Attenuator (10dB)	Weinschel	47-10-34	481	12	28-Mar-2015
Multimeter	Iso-tech	IDM101	2419	12	7-Oct-2015
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	4-Feb-2015
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	3-Sep-2015
Combiner/Splitter	Weinschel	1506A	3877	12	21-Mar-2015
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	24-Sep-2015
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	27-Feb-2015
Suspended Subtrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4411	12	21-Mar-2015
Section 2.6 - Emission Bandwidth					
Power Supply Unit	Hewlett Packard	6282A	132	-	TU
Communications Tester	Rohde & Schwarz	CMU 200	442	12	8-Dec-2014
Attenuator (10dB)	Weinschel	47-10-34	481	12	28-Mar-2015
Multimeter	Iso-tech	IDM101	2419	12	7-Oct-2015
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015
Combiner/Splitter	Weinschel	1506A	3877	12	21-Mar-2015
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	27-Feb-2015
Section 2.8 - Frequency Stability					
Communications Tester	Rohde & Schwarz	CMU 200	442	12	8-Dec-2014
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	18-Jan-2015
Digital Thermometer	Digitron	T208	2831	12	31-Jul-2015
Power Supply	Farnell	LT30-2	2903	-	TU
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	12-Dec-2014
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015
True RMS Multimeter	Fluke	179	4007	12	31-Jul-2015
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	18-Jan-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	-
Frequency Stability	± 46.70 Hz
Maximum Peak Output Power - Conducted	± 0.70 dB
Conducted Spurious Emissions	± 3.454 dB
Emission Limitations for Cellular Equipment	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Spurious Emissions at Band Edge	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Emission Bandwidth	± 16.74 kHz
Effective Radiated Power	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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).