Product Service

Choose certainty.
Add value.

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 15C (FeliCa)

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00214

Document 75928148 Report 14 Issue 1 **December 2014**

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

REPORT ON

FCC Testing of the
Sharp 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 15C (FeliCa)

Document 75928148 Report 14 Issue 1

December 2014

PREPARED FOR

Sharp Communication Compliance Limited
Inspired
Easthampstead Road
Bracknell
Berkshire
RG12 1NS

PREPARED BY

Natalie Bennett
Senior Administrator, Project Support

APPROVED BY

Ryan Henley
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 15C. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Russell A 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 15C (FeliCa)

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 15C.

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 004401115315901
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 15C (2013)
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	10329 20 October 2014
Start of Test	26 November 2014
Finish of Test	19 December 2014
Name of Engineer(s)	M Russell A Guy
Related Document(s)	ANSI C63.10: 2009

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15C is shown below.

Section	Spec Clause	Test Description	Result	Comments/Base Standard
FeliCa				
2.1	15.225 (a)(b)(c)(d)	Field Strength of any Emission	Pass	
2.2	15.225, 15.215 (c)	Occupied Bandwidth	Pass	
2.3	15.225 (e)	Frequency Stability Under Temperature Variations	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 15C (FeliCa)

2.1 FIELD STRENGTH OF ANY EMISSION

2.1.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.225 (a)(b)(c)(d)

2.1.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315901 - Modification State 0

2.1.3 Date of Test

19 December 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 EUT was placed on a remotely controlled turntable within a semi-anechoic chamber. Measurements of the Fundamental Frequency and any Spurious Radiated Emissions were measured as described below.

A preliminary profile of the Spurious Radiated Emissions was obtained over the range 9 kHz to 1 GHz.

During characterisation the turntable azimuth is adjusted from 0 to 360 degrees with the measuring antenna in one polarity. It is then repeated for the other polarity. Any frequencies of interest are noted for formal measurement later. The distance from the measuring antenna to the boundary of the EUT is 3m.

During formal measurement the spectrum analyser is tuned to the frequency of the emission. The turntable azimuth is adjusted from 0 to 360 degrees to determine the point at which the maximum emission level occurs. Once the point of maximum emission has been determined the emission is measured. All emissions over the range 9 kHz to 1 GHz were measured with a CISPR Quasi - Peak detector function.
The measurement bandwidths were as follows: for emissions in the range 9 kHz to 150 kHz a 200 Hz Resolution Bandwidth was used. For emissions in the range 150 kHz to 30 MHz a 10 kHz Resolution Bandwidth was used. For emissions in the range 30 MHz to 1GHz a 120 kHz Resolution Bandwidth was used.

To determine compliance with the specification, the level of the measured spurious emissions was compared to the limits in FCC 15.209 and 15.225. The level of the fundamental was compared to the limits in FCC 15.225.

2.1.6 Environmental Conditions

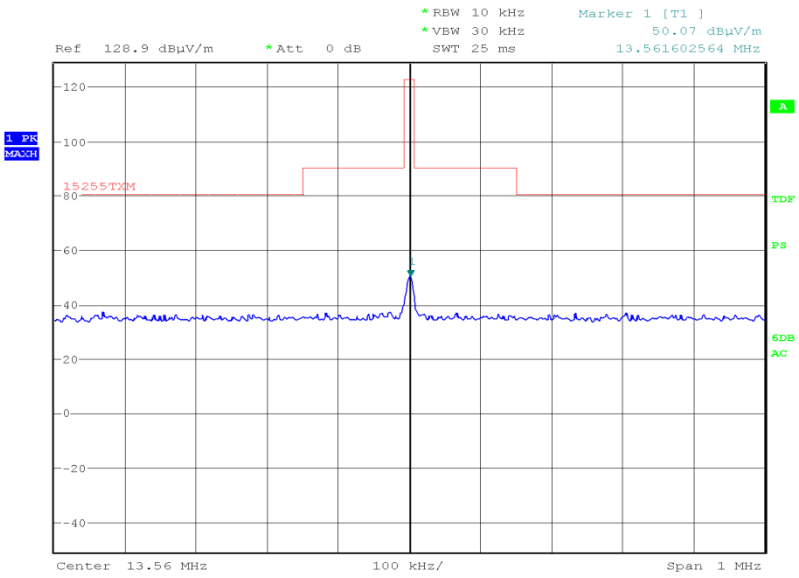
Ambient Temperature	20.1°C
Relative Humidity	43.0%

Product Service

2.1.7 Test Results

4.0 V DC Supply

Carrier

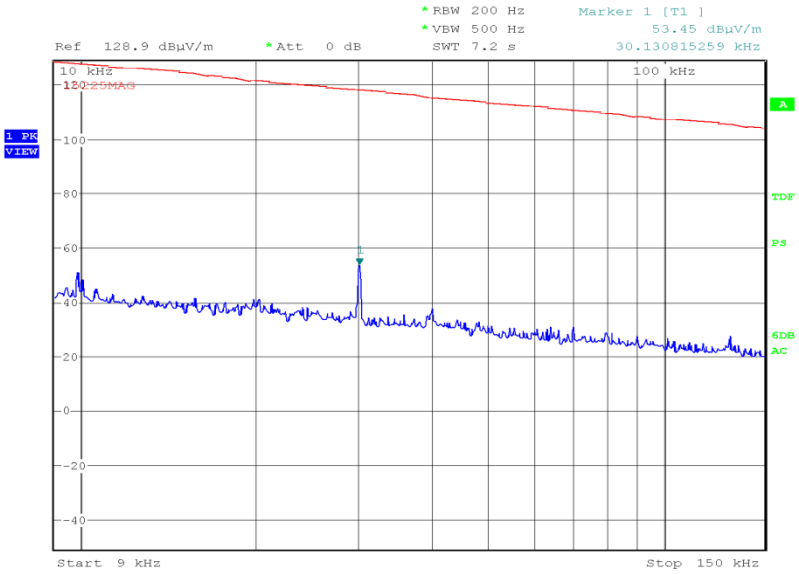


Frequency (MHz)	QP Level (dBµV/m) at 3m	QP Level (µV/m) at 3m*	QP Limit (dBµV/m) at 3m	QP Limit (µV/m) at 3m	Angle (deg)	Height (m)	Polarity
13.56	48.98	281.2	124	15848.93	270	1.5	Face on

*Measurements were made at 3m and the limits extrapolated from 30m to 3m, using the guidance defined in ANSI C63.10, clause 5.3.2.

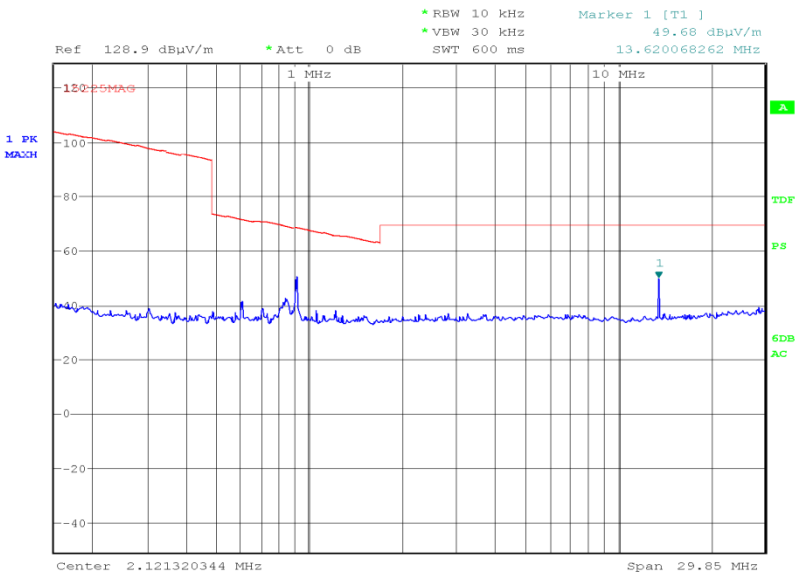
Product Service

9 kHz to 150 kHz



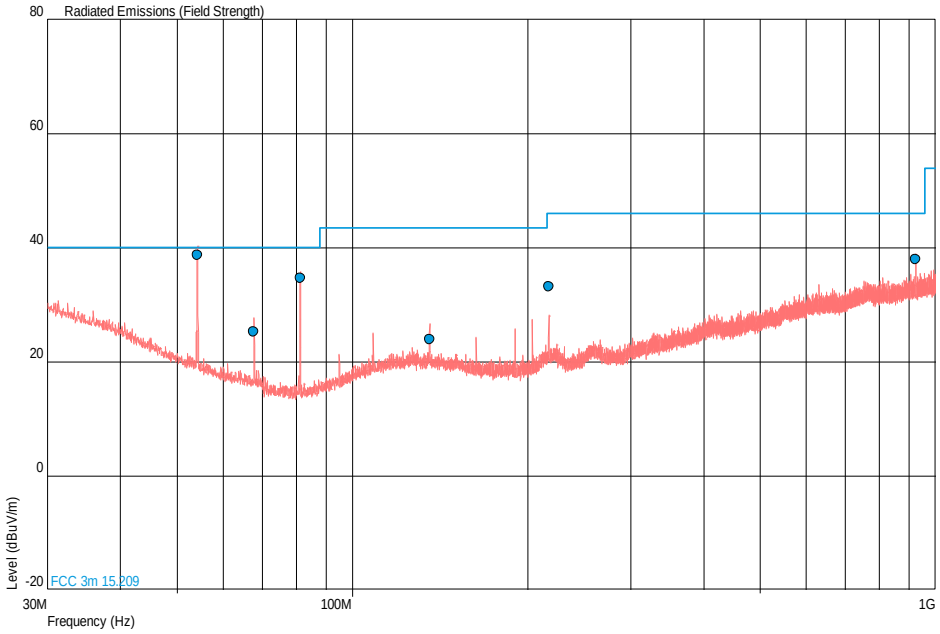
Date: 18.DEC.2014 22:59:45

150 kHz to 30MHz



Date: 18.DEC.2014 22:55:03

30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
54.240	38.7	86.1	40.0	100	-1.3	-13.9	25	1.00	Vertical
67.795	25.3	18.4	40.0	100	-14.7	-81.6	214	1.00	Vertical
81.364	34.7	54.3	40.0	100	-5.3	-45.7	307	1.00	Vertical
135.589	23.9	15.7	43.5	150	-19.6	-134.3	229	1.09	Vertical
216.961	33.2	45.7	46.0	200	-12.8	-154.3	0	3.76	Vertical
923.400	37.9	78.5	46.0	200	-8.1	-121.5	178	1.25	Vertical

2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.225, 15.215 (c)

2.2.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315901 - Modification State 0

2.2.3 Date of Test

26 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

The EUT was configured to transmit a modulated signal and placed on a test jig which was connected to a spectrum analyser. The analyser settings were configured with a 10 Hz RBW and VBW and the 20 dB bandwidth was measured using the markers.

2.2.6 Environmental Conditions

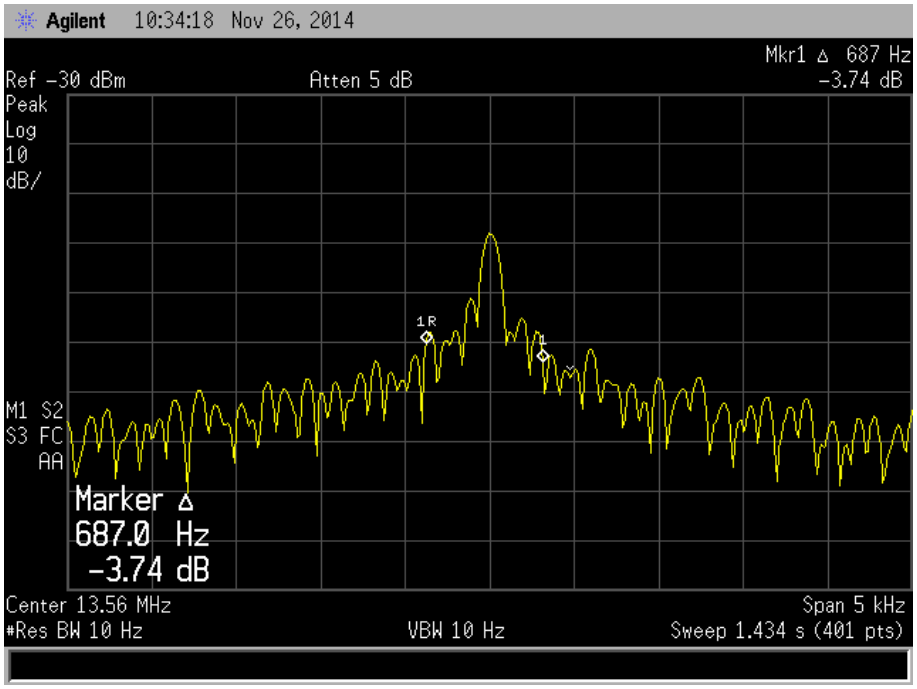
Ambient Temperature	22.7°C
Relative Humidity	38.3%

Product Service

2.2.7 Test Results

4.0 V DC Supply

Frequency (MHz)	20 dB Bandwidth (Hz)
13.56	687



2.3 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.3.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.225 (e)

2.3.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315901 - Modification State 0

2.3.3 Date of Test

27 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

The EUT was placed on a test jig inside a temperature chamber. The test jig was connected to a spectrum analyser via a cable. The spectrum analyser was set to 10 Hz RBW and VBW and the entire fundamental was displayed on screen. The upper and lower -20 dBc points were found and the mid-point between these values was recorded as the frequency error and the percentage error was recorded in the table below. The measurement was repeated with the temperature adjusted between -20°C and +50°C in 10° steps as per 15.225 (e).

2.3.6 Environmental Conditions

Ambient Temperature	22.7°C
Relative Humidity	38.3%

Product Service

2.3.7 Test Results

RFID

Temperature Interval (°C)	Voltage	Test Frequency (MHz)	Deviation (%)
-20	4.0 V DC	13.56	0.00099
-10	4.0 V DC	13.56	0.00201
0	4.0 V DC	13.56	0.00197
+10	4.0 V DC	13.56	0.00226
+20	4.0 V DC	13.56	0.00236
+30	4.0 V DC	13.56	0.00221
+40	4.0 V DC	13.56	0.00195
+50	4.0 V DC	13.56	0.00184

Limit Clause

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency.

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 - Field Strength of any Emission					
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	10-Jun-2015
Compliance 5 Emissions	Schaffner	C5e Software V.5.00.00	3275	-	N/A - Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	27-Oct-2015
Antenna (Active Loop, 9kHz-30MHz)	Rohde & Schwarz	HFH2-Z2	3633	24	11-Jul-2016
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Section 2.2 - Occupied Bandwidth					
RF Coupler	TUV SUD Product Service	RFC1	414	-	TU
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	15-Oct-2015
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Section 2.3 - Frequency Stability Under Temperature Variations					
RF Coupler	TUV SUD Product Service	RFC1	414	-	TU
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	15-Oct-2015
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Thermocouple Thermometer	Fluke	51	3173	12	04-Dec-2015
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015

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

Product Service

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	MU
Frequency Stability Under Temperature Variations	± 3.54 Hz
Field Strength of any Emission	9 kHz to 1 GHz: ± 5.1 dB
Occupied Bandwidth	± 45.21 Hz

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

UKAS TESTING 0141

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

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

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