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Report On

FCC Testing of the Sharp Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI, FDDV) & Tri-band LTE (B1, B11, B26) multi mode cellular phone with Bluetooth, WLAN, SRD (FeliCa) and GPS
In accordance with FCC CFR 47 Part 15C (FeliCa)

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FCC ID: APYHRO00215

Document 75928270 Report 09 Issue 1

January 2015



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REPORT ON

FCC Testing of the
Sharp Dual-band CDMA (BC0, BC6) & Quad-band GSM
(GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI,
FDDV) & Tri-band LTE (B1, B11, B26) multi mode cellular phone with
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DATED

14 January 2015

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);

G Lawler

M Russell

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SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp Dual-band CDMA (BC0, BC6) & Quad-band GSM
(GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI, FDDV) & Tri-band LTE
(B1, B11, B26) multi mode cellular phone with Bluetooth, WLAN, SRD (FeliCa) and GPS
In accordance with FCC CFR 47 Part 15C (FeliCa)



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1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI, FDDV) & Tri-band LTE (B1, B11, B26) multi mode cellular phone with Bluetooth, WLAN, SRD (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
Serial Number(s)	IMEI 004401115348506
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 15C (2013)
Disposal	Held Pending Disposal
Reference Number	Not Applicable
Date	Not Applicable
Order Number	10330
Date	20 October 2014
Start of Test	19 December 2014
Finish of Test	4 January 2015
Name of Engineer(s)	G Lawler M Russell
Related Document(s)	ANSI C63.10: 2009



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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	



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1.3 PRODUCT TECHNICAL DESCRIPTION

Please refer to the Model Description Form, reference FCC ID: APYHRO00215.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp Dual-band CDMA (BC0, BC6) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Dual-band UMTS (FDDI, FDDV) & Tri-band LTE (B1, B11, B26) multi mode cellular phone with Bluetooth, WLAN, SRD (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.



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SECTION 2

TEST DETAILS

FCC Testing of the
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In accordance with FCC CFR 47 Part 15C (FeliCa)



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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

S/N: IMEI 004401115348506 - Modification State 0

2.1.3 Date of Test

4 January 2015

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	21.4°C
Relative Humidity	28.0%

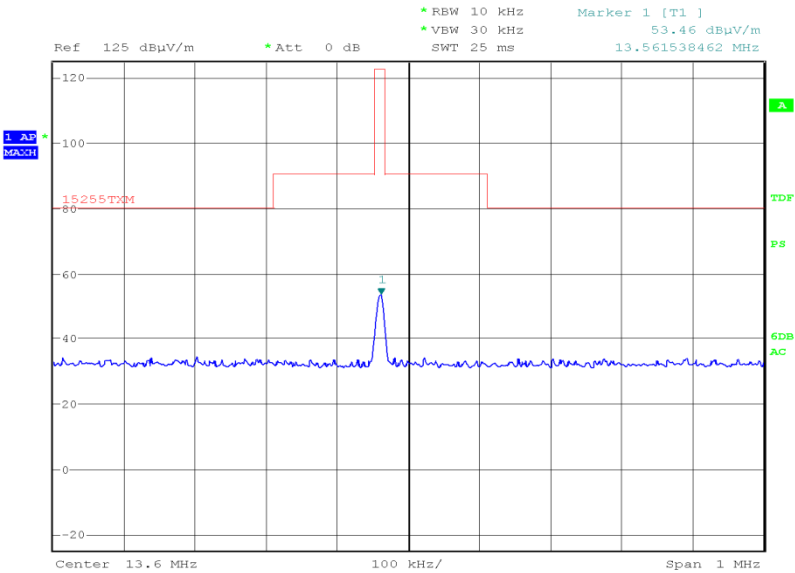


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2.1.7 Test Results

4.0 V DC Supply

Carrier



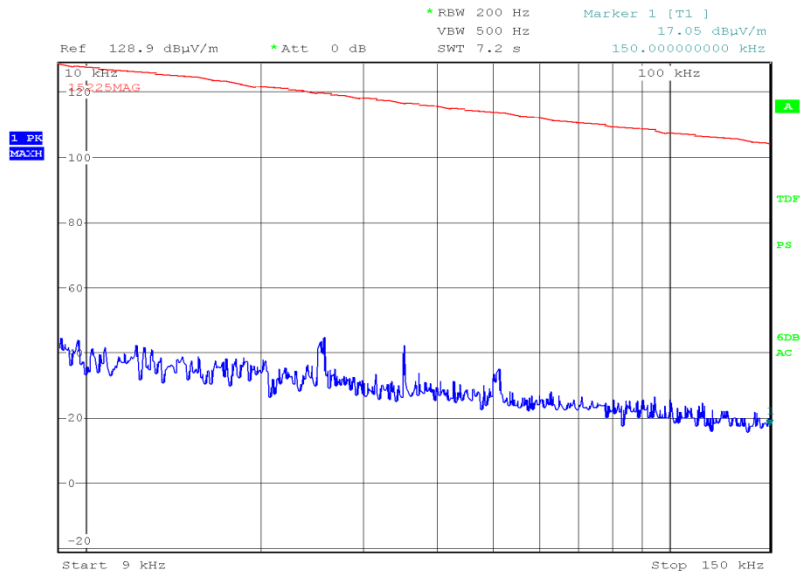
Date: 4.JAN.2015 10:47:43

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	52.63	428.06	124	15848.93	360	1.5	Face On

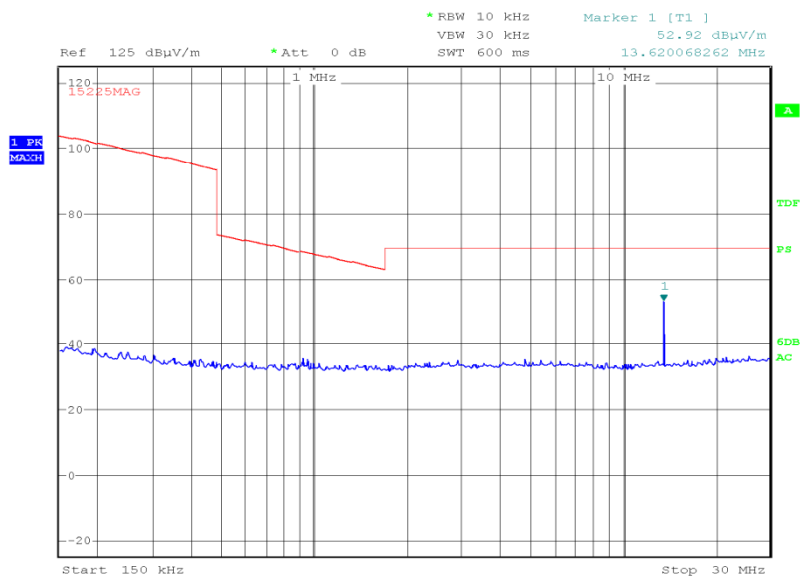
*Measurements were made at 3m and the limits extrapolated from 30m to 3m, using the guidance defined in ANSI C63.10, clause 5.3.2.



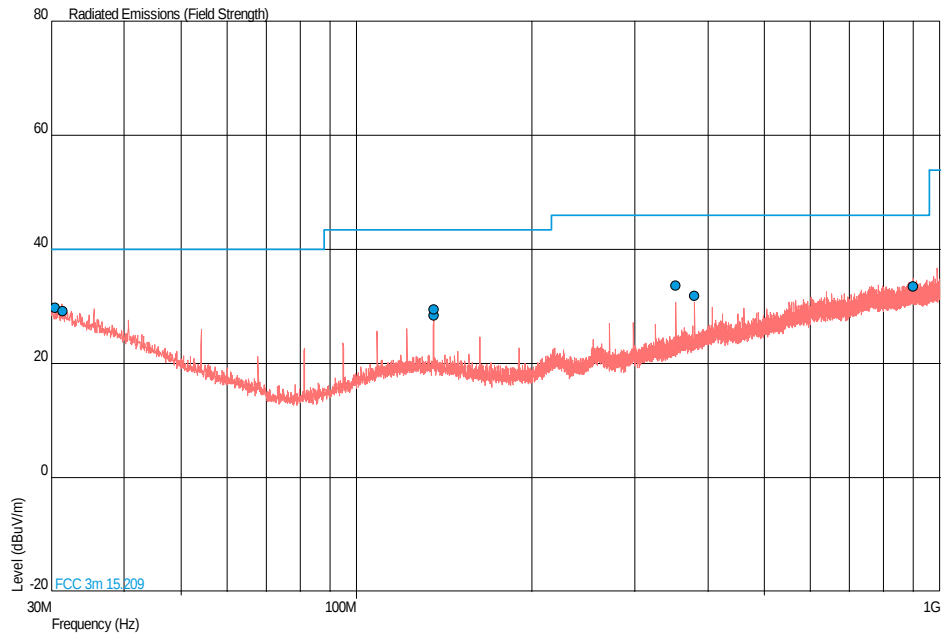
Product Service

9 kHz to 150 kHz

Date: 4.JAN.2015 10:35:31

150 kHz to 30 MHz

Date: 4.JAN.2015 10:13:19

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
30.435	29.7	30.6	40.0	100	-10.3	-69.4	152	1.00	Horizontal
31.371	29.2	28.8	40.0	100	-10.8	-71.2	138	1.00	Horizontal
135.583	29.5	29.9	43.5	150	-14.0	-120.1	90	3.19	Horizontal
135.599	28.4	26.3	43.5	150	-15.1	-123.7	357	1.00	Vertical
352.561	33.7	48.4	46.0	200	-12.3	-151.6	61	1.51	Vertical
379.685	31.9	39.4	46.0	200	-14.1	-160.6	273	1.24	Vertical
898.960	33.6	47.9	46.0	200	-12.4	-152.1	0	1.00	Vertical

Remark

Testing was performed in a stand-alone configuration as FeliCa operation cannot be enabled with the USB port active. As a result, no USB cable or AC charger was connected to the device for testing purposes.

FeliCa cannot be operational in final production for all USB operational modes.



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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

S/N: IMEI 004401115348506 - Modification State 0

2.2.3 Date of Test

19 December 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 test method requirements of FCC CFR 47 Part 15.215 (c).

The EUT was connected to a spectrum analyser via a test jig. The EUT was transmitting at maximum power with normal modulation. The resultant trace was displayed on screen and the peak point of the trace was measured and the markers positioned to give the -20 dBc points of the displayed spectrum.

2.2.6 Environmental Conditions

Ambient Temperature	22.3°C
Relative Humidity	39.6%

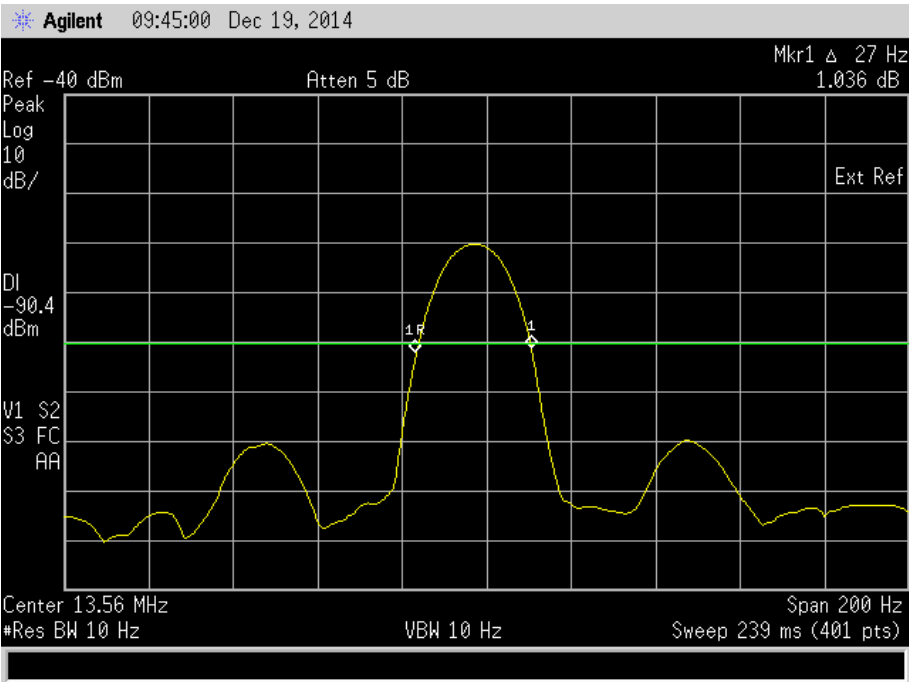


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2.2.7 Test Results

4.0 V DC Supply

Frequency (MHz)	20 dB Bandwidth (Hz)
13.56	27.00





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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

S/N: IMEI 004401115348506 - Modification State 0

2.3.3 Date of Test

19 December 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 were 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	22.4°C
Relative Humidity	48.2%



2.3.7 Test Results

4.0 V DC Supply

Temperature Interval (°C)	Voltage	Test Frequency (MHz)	Deviation (%)
-20	4.0 V DC	13.56	0.00008
-10	4.0 V DC	13.56	0.00054
0	4.0 V DC	13.56	0.00114
+10	4.0 V DC	13.56	0.00132
+20	4.0 V DC	13.56	0.00131
+20	4.0 V DC	13.56	0.00131
+30	4.0 V DC	13.56	0.00107
+40	4.0 V DC	13.56	0.00074
+50	4.0 V DC	13.56	0.00053

Limit Clause

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency.



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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 - Field Strength of any Emission					
Antenna (Dish/Tripod/Adaptor, 1GHz-18GHz)	Rohde & Schwarz	AC-008	334	-	TU
Screened Room (5)	Rainford	Rainford	1545	24	10-Jan-2015
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	27-Oct-2015
Antenna (Active Loop, 9kHz-30MHz)	Rohde & Schwarz	HFH2-Z2	3633	24	11-Jul-2016
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	matur GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	matur GmbH	NCD	3917	-	TU
Section 2.2 - Occupied Bandwidth					
Power Supply Unit	Farnell	LT30-2	41	-	O/P Mon
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	4-Jun-2015
RF Coupler	TUV SUD Product Service	RFC1	414	-	TU
Power Divider	Weinschel	1506A	603	12	28-May-2015
Multimeter	Fluke	79 Series III	611	12	1-Sep-2015
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	18-Jan-2015
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	5-Sep-2015
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	18-Jan-2015
Section 2.3 - Frequency Stability Under Temperature Variations					
Power Supply Unit	Farnell	LT30-2	41	-	O/P Mon
RF Coupler	TUV SUD Product Service	RFC1	414	-	TU
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Multimeter	Fluke	79 Series III	611	12	1-Sep-2015
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	18-Jan-2015
Thermocouple Thermometer	Fluke	51	3173	12	4-Dec-2015
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	5-Sep-2015

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



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3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	MU
Frequency Stability Under Temperature Variations	$\pm 3.54 \text{ Hz}$
Field Strength of any Emission	9 kHz to 1 GHz: $\pm 5.1 \text{ dB}$
Occupied Bandwidth	$\pm 4.12 \text{ Hz}$



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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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