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Report On

FCC Testing of the Sharp Hep-band LTE (B1 / B3 / B5 / B13 / B17 / B26 / B38), Dual-band WCDMA (FDD I / V), Quad-band GSM (850 / 900 / 1800 / 1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, SRD(NFC, FeliCa) and GPS
In accordance with FCC 47 CFR Part 15C (FeliCa)

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00234

Document 75933606 Report 24 Issue 1

May 2016



Product Service

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COMMERCIAL-IN-CONFIDENCE

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DATED

05 May 2016

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 47 CFR Part 15C. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Toubella

A Guy





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SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp Hep-band LTE (B1 / B3 / B5 / B13 / B17 / B26 / B38), Dual-band WCDMA (FDD I / V),
Quad-band GSM (850 / 900 / 1800 / 1900) & WiMAX2+ (TDD41) multi mode Smart phone with
Bluetooth, WLAN, SRD(NFC, FeliCa) and GPS
In accordance with FCC 47 CFR 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 Hep-band LTE (B1 / B3 / B5 / B13 / B17 / B26 / B38), Dual-band WCDMA (FDD I / V), Quad-band GSM (850 / 900 / 1800 / 1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, SRD(NFC, FeliCa) and GPS to the requirements of FCC 47 CFR 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 004401115724052 IMEI 004401115724045
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 15C (2015)
Disposal	Held Pending Disposal
Reference Number	Not Applicable
Date	Not Applicable
Order Number	10749
Date	15 February 2016
Start of Test	14 April 2016
Finish of Test	15 April 2016
Name of Engineer(s)	M Toubella A Guy
Related Document(s)	ANSI C63.10: 2013



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1.2 BRIEF SUMMARY OF RESULTS

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

Section	Specification Clause	Test Description	Result	Comments/Base Standard
FeliCa				
2.1	15.225 and 15.215 (c)	20 dB Bandwidth	Pass	
2.2	15.225 (a)(b)(c)(d)	Field Strength of any Emission	Pass	
2.3	15.225 (e)	Frequency Tolerance Under Temperature Variations	Pass	



1.3 PRODUCT TECHNICAL DESCRIPTION

Refer to Model Description APYHRO00234 Rev 4.0 document.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp Hep-band LTE (B1 / B3 / B5 / B13 / B17 / B26 / B38), Dual-band WCDMA (FDD I / V), Quad-band GSM (850 / 900 / 1800 / 1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, 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 or test plan were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.



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SECTION 2

TEST DETAILS

FCC Testing of the
Sharp Hep-band LTE (B1 / B3 / B5 / B13 / B17 / B26 / B38), Dual-band WCDMA (FDD I / V),
Quad-band GSM (850 / 900 / 1800 / 1900) & WiMAX2+ (TDD41) multi mode Smart phone with
Bluetooth, WLAN, SRD(NFC, FeliCa) and GPS
In accordance with FCC 47 CFR Part 15C (FeliCa)



Product Service

2.1 20 dB BANDWIDTH**2.1.1 Specification Reference**

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

2.1.2 Equipment Under Test and Modification State

S/N: IMEI 004401115724052 - Modification State 0

2.1.3 Date of Test

15 April 2016

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 performed in accordance with ANSI C63.10, clause 6.9.2.

2.1.6 Environmental Conditions

Ambient Temperature	20.9 - 21.6°C
Relative Humidity	43.0 - 53.9%



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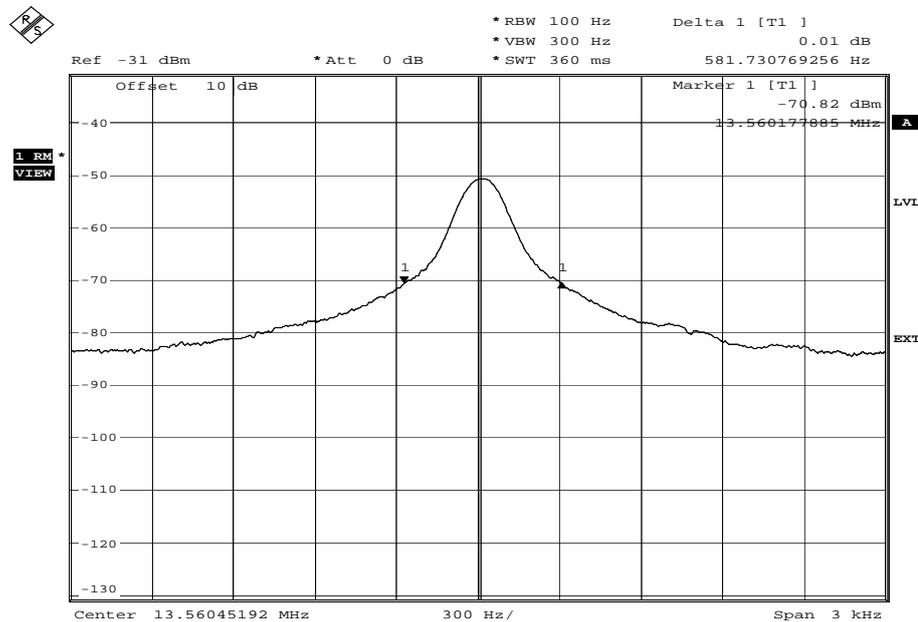
2.1.7 Test Results

4.0 V DC Supply

FeliCa, 20 dB Bandwidth Result

Frequency (MHz)	20 dB Bandwidth (Hz)
13.56	581.73

FeliCa, 20 dB Bandwidth Plot



Date: 1.JAN.2000 22:08:00

FCC 47 CFR Part 15, Limit Clause 15.215 (c)

The 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.



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2.2 FIELD STRENGTH OF ANY EMISSION

2.2.1 Specification Reference

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

2.2.2 Equipment Under Test and Modification State

S/N: IMEI 004401115724045 - Modification State 0

2.2.3 Date of Test

15 April 2016

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 performed in accordance with ANSI C63.10, clause 6.3, 6.4 and 6.5.

Remarks

Modulation Type F [212 kbps] was proven to be the worst case modulation scheme available. The orientation that produced the highest Transmitter power was with the EUT in an upright position.

2.2.6 Environmental Conditions

Ambient Temperature	22.3°C
Relative Humidity	33.5%



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2.2.7 Test Results

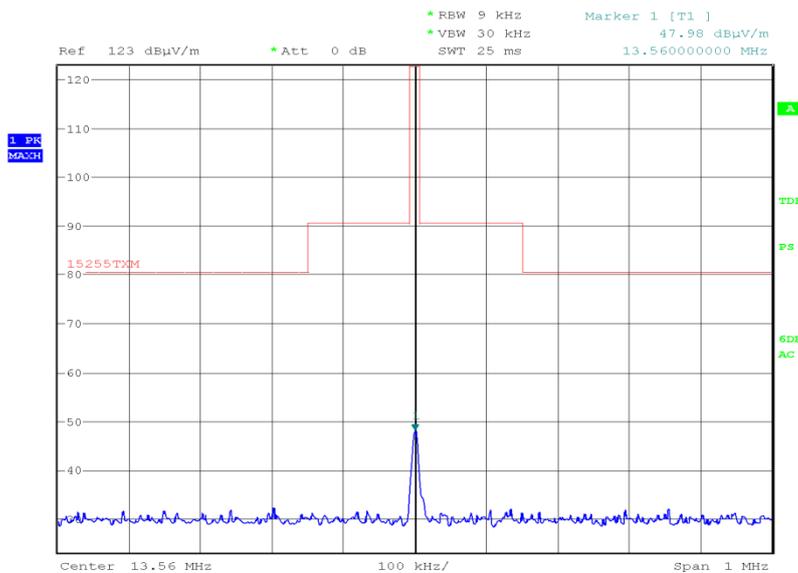
4.0 V DC Supply

FeliCa, Carrier Results

Frequency (MHz)	Quasi-Peak Level (dBµV/m) at 3m	Quasi-Peak Level (dBµV/m) at 30m*	Quasi-Peak Level (µV/m) at 3m	Quasi-Peak Level (µV/m) at 30m*	Angle (°)	Height (m)	Polarisation
13.56	47.98	7.98	250.61	2.50	177	1.00	Face On

*The level at 30m was calculated using the dBµV/m measurement at 3m and extrapolating this result to produce a level at 30m. This value was then converted to obtain the value in µV/m.

FeliCa, Carrier Plot



Date: 15.APR.2016 00:32:37

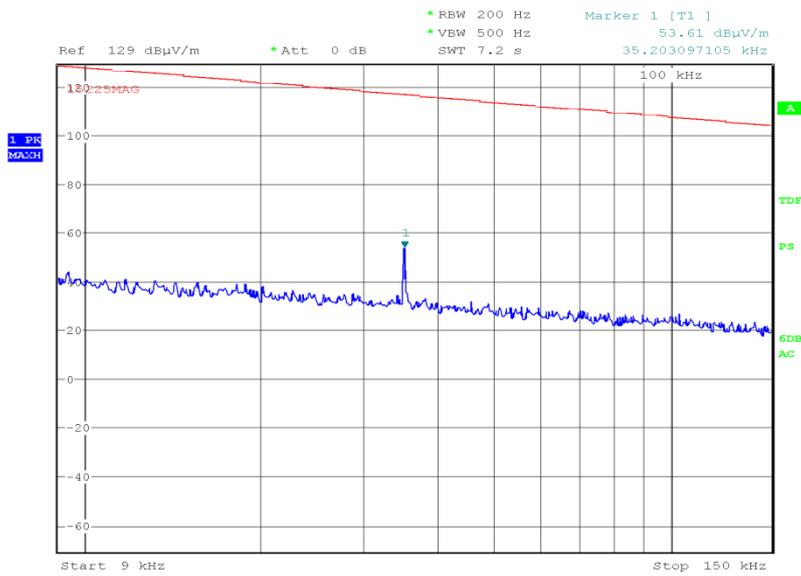


FeliCa, 9 kHz to 30 MHz, Field Strength of any Emission Results

Frequency (MHz)	Quasi-Peak Level (dBµV/m) at 3m	Quasi-Peak Level (dBµV/m) at 30m	Quasi-Peak Level (µV/m) at 3m	Quasi-Peak Level (µV/m) at 30m	Angle (°)	Height (m)	Polarisation
*							

*No emissions were detected within 20 dBof the limit.

FeliCa, 9 kHz to 150 kHz, Field Strength of any Emission Plot

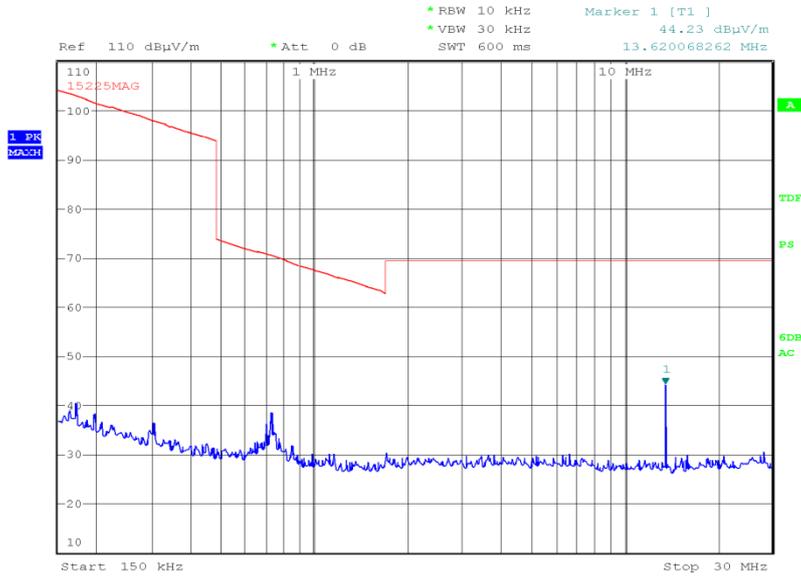


Date: 15.APR.2016 01:42:55



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FeliCa, 150 kHz to 30 MHz, Field Strength of any Emission Plot



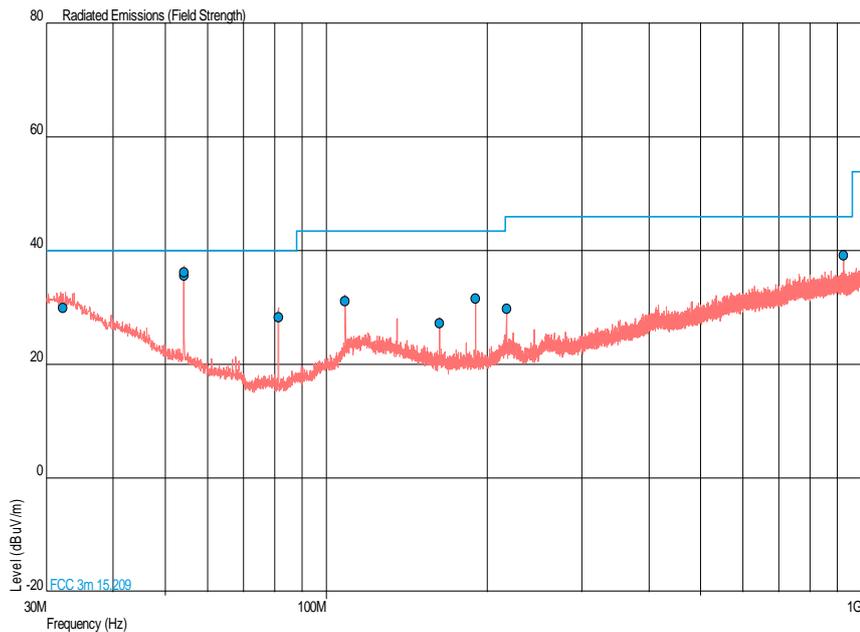
Date: 15.APR.2016 01:08:15



FeliCa, 30 MHz to 1 GHz, Field Strength of any Emission Results

Frequency (MHz)	Quasi-Peak Level (dBµV/m)	Quasi-Peak Level (µV/m)	Quasi-Peak Margin (dµV/m)	Quasi-Peak Margin (µV/m)	Angle (°)	Height (m)	Polarisation
32.280	29.9	31.3	-10.1	-68.7	360	1.00	Vertical
54.241	36.1	63.8	-3.9	-36.2	188	1.00	Vertical
54.243	35.6	60.3	-4.4	-39.7	126	1.00	Vertical
81.357	28.3	26.0	-11.7	-74.0	134	1.00	Vertical
108.485	31.1	35.9	-12.4	-114.1	206	1.00	Vertical
162.714	27.2	22.9	-16.3	-127.1	103	1.09	Horizontal
189.844	31.6	38.0	-11.9	-112.0	89	1.00	Horizontal
216.961	29.8	30.9	-16.2	-169.1	92	1.00	Horizontal
923.414	39.2	91.2	-6.8	-108.8	50	3.99	Horizontal

FeliCa, 30 MHz to 1 GHz, Field Strength of any Emission Plot



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

- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.



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FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 to 0.490	2400/F (kHz)	300
0.490 to 1.705	24000/F (kHz)	30
1705 to 30	30	30
30 to 88	100**	3
88 to 216	150**	3
216 to 960	200**	3
Above 960	500	3



2.3 FREQUENCY TOLERANCE UNDER TEMPERATURE VARIATIONS

2.3.1 Specification Reference

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

2.3.2 Equipment Under Test and Modification State

S/N: IMEI 004401115724052 - Modification State 0

2.3.3 Date of Test

14 April 2016 & 15 April 2016

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 test was performed in accordance with ANSI C63.10, clause 6.8.

2.3.6 Environmental Conditions

Ambient Temperature 20.4 - 24.6°C
Relative Humidity 36.3 - 41.1%

2.3.7 Test Results

Felica, Frequency Tolerance Under Temperature Variations Results

Temperature Interval	Voltage	Fundamental Frequency (MHz)	Fundamental Frequency Deviation (%)
-20 °C	4.0 V DC	13.56	0.003
-10 °C	4.0 V DC	13.56	0.004
0 °C	4.0 V DC	13.56	0.004
+10 °C	4.0 V DC	13.56	0.004
+20 °C	4.0 V DC	13.56	0.003
+20 °C	4.0 V DC	13.56	0.003
+30 °C	4.0 V DC	13.56	0.003
+40 °C	4.0 V DC	13.56	0.003
+50 °C	4.0 V DC	13.56	0.003

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

The frequency tolerance of the carrier signal shall be maintained within ± 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 - 20dB Bandwidth					
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
RF Coupler	TUV SUD Product Service	RFC1	414	-	TU
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	10-Sep-2016
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	29-Jan-2017
Thermocouple Thermometer	Fluke	51	3174	12	9-Dec-2016
Section 2.2 - Field Strength of any Emission					
Dual Power Supply Unit	Thurlby	PL320	288	-	TU
Antenna (Active Loop, 9kHz-30MHz)	Rohde & Schwarz	HFH2-Z2	333	24	28-Nov-2016
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Biconnical)	Schaffner	VBA6106A	3106	12	11-Sep-2016
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	28-Sep-2016
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	2-Nov-2016
Tilt Antenna Mast	mature GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	mature GmbH	NCD	3917	-	TU
Section 2.3 - Frequency Tolerance Under Temperature Variations					
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
RF Coupler	TUV SUD Product Service	RFC1	414	-	TU
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	29-Jan-2017
Hygrometer	Rotronic	I-1000	2882	12	4-Nov-2016
Thermocouple Thermometer	Fluke	51	3174	12	9-Dec-2016
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	29-Jan-2017
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4519	12	16-Feb-2017

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
Field Strength of any Emission	9 kHz to 1 GHz: ± 5.1 dB
20 dB Bandwidth	± 16.74 kHz
Frequency Tolerance Under Temperature Variations	± 3.54 Hz



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SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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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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