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# Report On

FCC Testing of the  
Sharp SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band  
UMTS (FDDI, FDDV) & Dual-band LTE (B1, B26) multi mode cellular  
phone with Bluetooth, WLAN, SRD(FeliCa) and GPS  
In accordance with FCC 47 CFR Part 15C

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FCC ID: APYHRO00224

Document 75930192 Report 10 Issue 1

June 2015



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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](http://www.tuv-sud.co.uk)

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**PREPARED FOR**

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

**PREPARED BY**

**Natalie Bennett**  
Senior Administrator , Project Support

**APPROVED BY**

**Simon Bennett**  
Authorised Signatory

**DATED**

19 June 2015

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**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

M Choudhury



T Guy



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## **SECTION 1**

### **REPORT SUMMARY**

FCC Testing of the  
Sharp SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band UMTS (FDDI, FDDV) &  
Dual-band LTE (B1, B26) multi mode cellular phone with Bluetooth, WLAN, SRD(FeliCa) and  
GPS  
In accordance with FCC 47 CFR Part 15C



## 1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band UMTS (FDDI, FDDV) & Dual-band LTE (B1, B26) multi mode cellular phone with Bluetooth, WLAN, SRD(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
Model Number(s)	SHF32
Serial Number(s)	IMEI 004401115362390
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C (2014)
Disposal	Held Pending Disposal
Reference Number	Not Applicable
Date	Not Applicable
Order Number	10534
Date	17 April 2015
Start of Test	4 June 2015
Finish of Test	8 June 2015
Name of Engineer(s)	M Toubella M Choudhury T Guy
Related Document(s)	ANSI C63.10: 2009



## 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	



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### **1.3 PRODUCT TECHNICAL DESCRIPTION**

Please refer to the SHF32 Model Description Form.

### **1.4 PRODUCT INFORMATION**

#### **1.4.1 Technical Description**

The Equipment Under Test (EUT) was a Sharp SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band UMTS (FDDI, FDDV) & Dual-band LTE (B1, 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 (Integral Battery).

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 SHF32 Quad-band GSM (850/900/1800/1900) & Dual-band UMTS (FDDI, FDDV) &  
Dual-band LTE (B1, B26) multi mode cellular phone with Bluetooth, WLAN, SRD(FeliCa) and  
GPS  
In accordance with FCC 47 CFR Part 15C





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**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**

SHF32 S/N: IMEI 004401115362390 - Modification State 0

**2.1.3 Date of Test**

4 June 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 test was performed in accordance with ANSI C63.10, clause 6.9.1.

An RBW sufficiently small was used within the measurement instruments capabilities to demonstrate compliance with the requirements.

**2.1.6 Environmental Conditions**

Ambient Temperature	24.6°C
Relative Humidity	31.5%



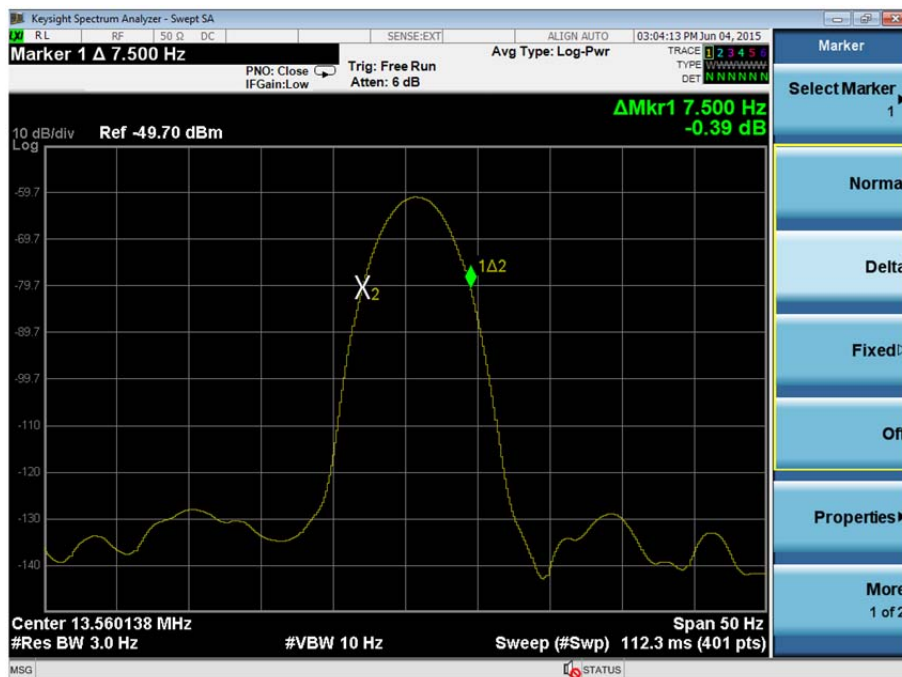
## 2.1.7 Test Results

4.0 V DC Supply

### FeliCa, 20 dB Bandwidth Result

Frequency (MHz)	20 dB Bandwidth (Hz)
13.56	7.50

### FeliCa, 20 dB Bandwidth Plot



### 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**

SHF32 S/N: IMEI 004401115362390 - Modification State 0

**2.2.3 Date of Test**

6 June 2015

**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**

This test was performed in accordance with ANSI C63, clauses 6.3, 6.4 and 6.5.

**Remarks**

This measurement was performed at 3m and the limit was extrapolated by 40 dB/decade as per ANSI C63.10 clause 5.2 and 5.3.2.

**2.2.6 Environmental Conditions**

Ambient Temperature	20.7°C
Relative Humidity	34.0 - 43.0%



## 2.2.7 Test Results

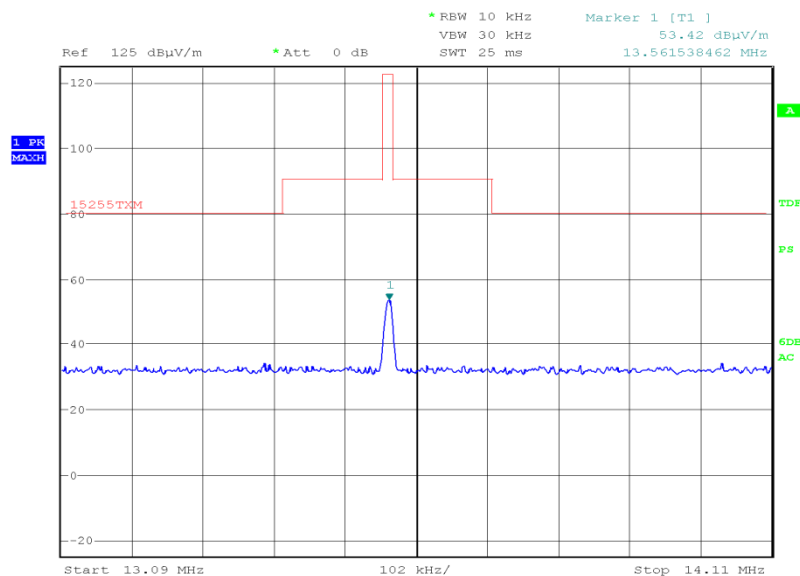
4.0 V DC Supply

### 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	52.08	12.08	401.8	4.02	0	1	Vertical

\*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: 6.JUN.2015 12:27:26



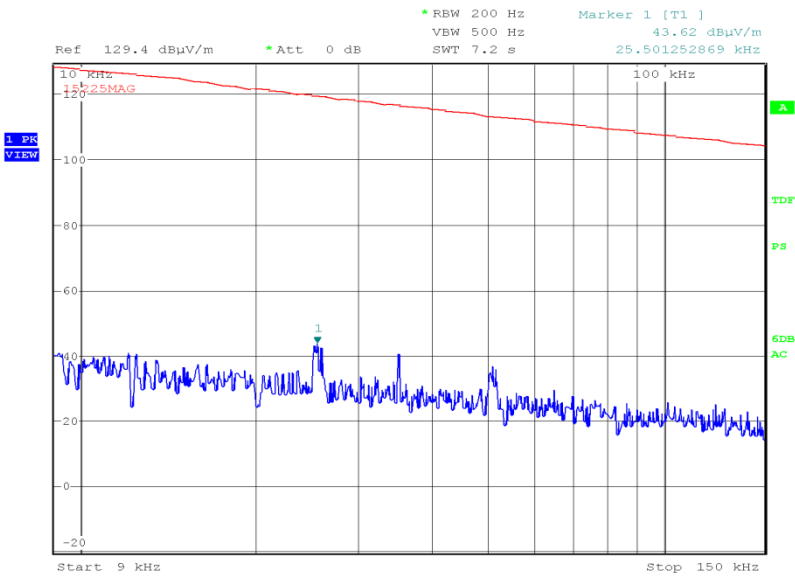
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FeliCa, Field Strength of any Emission Results

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 10 dB of the limit.

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

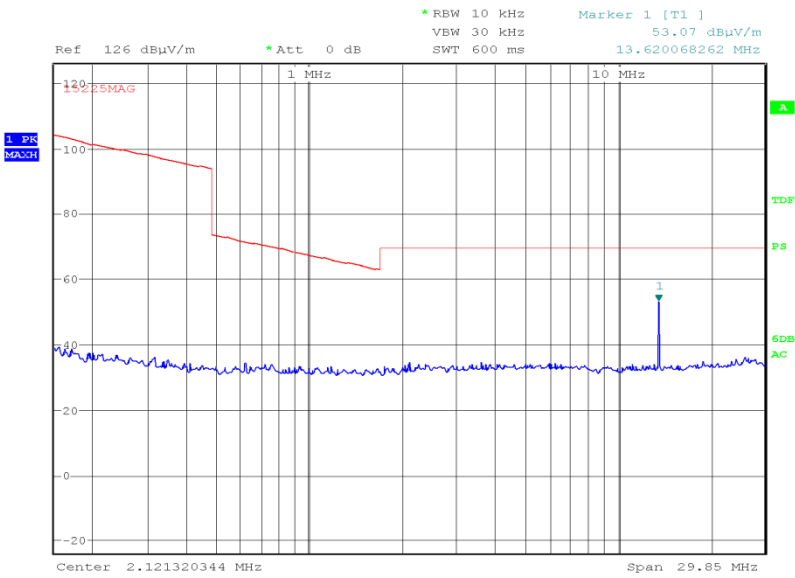


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FeliCa, 150 kHz to 30 MHz, Field Strength of any Emission Plot



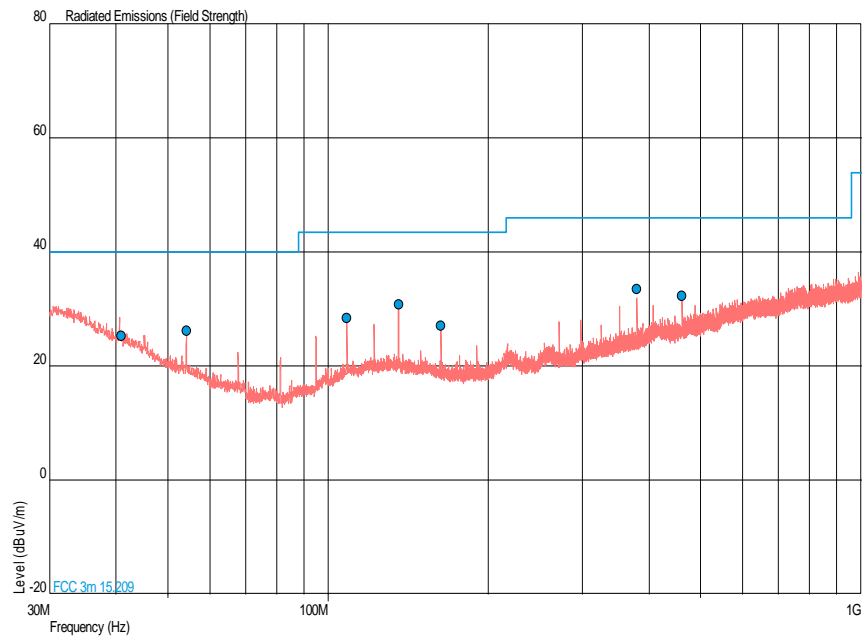
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### FeliCa, 30 MHz to 1 GHz, Field Strength of any Emission Results

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
40.931	25.3	18.4	-14.7	-81.6	353	2.63	Vertical
54.238	26.2	20.4	-13.8	-79.6	294	1.00	Vertical
108.483	28.4	26.3	-15.1	-123.7	10	1.00	Vertical
135.602	30.8	34.7	-12.7	-115.3	337	1.00	Vertical
162.719	27.1	22.6	-16.4	-127.4	0	1.00	Vertical
379.688	33.5	47.3	-12.5	-152.7	27	1.19	Vertical
461.040	32.3	41.2	-13.7	-158.8	156	1.00	Vertical

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





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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.

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	5





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## **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**

SHF32 S/N: IMEI 004401115362390 - Modification State 0

### **2.3.3 Date of Test**

5 June 2015 & 8 June 2015

### **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 over the temperature variations using a fully charged battery as specified in FCC 15.225 (e). A spectrum analyser was used to monitor the frequency of the carrier signal.

### **2.3.6 Environmental Conditions**

Ambient Temperature	22.6 - 25.0°C
Relative Humidity	31.0 - 34.0%



### 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	13.560201	0.002
-10 °C	4.0 V DC	13.560226	0.002
0 °C	4.0 V DC	13.560219	0.002
+10 °C	4.0 V DC	13.560182	0.001
+20 °C	4.0 V DC	13.560147	0.001
+30 °C	4.0 V DC	13.560122	0.001
+40 °C	4.0 V DC	13.560093	0.001
+50 °C	4.0 V DC	13.560077	0.001

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

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
<b>Section 2.1 – 20 dB Bandwidth</b>					
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	12	15-Aug-2015
Hygrometer	Rotronic	I-1000	3220	12	24-Jul-2015
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	16-Feb-2016
2 metre SMA Cable	IW Microwave	3PS-1806LC-788-3PS	4525	12	29-Jan-2016
<b>Section 2.2 - Field Strength of any Emission</b>					
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 (Bilog)	Chase	CBL6143	2904	24	10-Jun-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
<b>Section x.x Wireless Group - Frequency Tolerance Under Temperature Variations</b>					
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	23-Jul-2015
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	28-Jul-2015
Digital Thermometer	Digitron	T208	2831	12	31-Jul-2015
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	28-Jul-2015
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	16-Feb-2016
2 metre SMA Cable	IW Microwave	3PS-1806LC-788-3PS	4524	12	29-Jan-2016

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



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## **SECTION 4**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



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#### 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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