SAR TEST REPORT

Test Report No. : 31CE0252-HO-01-E

Applicant	:	**Sharp Corporation**
Type of Equipment	:	**Mobile Terminal Equipment**
Model No.	:	**EB-W51GJ**
FCC ID	:	**APYHRO00141**
Test regulation	:	**FCC47CFR 2.1093** **FCC OET BULLETIN 65, SUPPLEMENT C (Edition 01-01)**
Test Result		**Complied**
Max. SAR Value **IEEE802.11b/g**	:	**0.998W/kg (2462MHz)**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: November 5 and 8, 2010

Representative test engineer:

Miyo Kishimoto
Engineer of EMC Service

Approved by:

Mitsuru Fujimura
Manager of EMC Service

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

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SECTION 1: Customer information

Company Name	:	Sharp Corporation
Address	:	2-13-1 Iida, Hachihonmatsu,Higashi-Hiroshima City,Hiroshima, 739-0192 Japan
Telephone Number	:	+81-82-420-1556
Facsimile Number	:	+81-82-420-1654
Contact Person	:	Chikashi Saizaki

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Mobile Terminal Equipment
Model No.	:	EB-W51GJ
Serial No.	:	No.5
Rating	:	DC5.0V (AC adaptor) Li-ion polymer battery Model:6027A0115801 3.7V / 1530mAh (5.66Wh) Option battery: none
Size	:	(L)167 x (W)92 x (H)12.9 Display:5.5inch
Accessory	:	Earphone (typical)
Receipt Date of Sample	:	November 5, 2010
Country of Mass-production	:	China
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model No: EB-W51GJ (referred to as the EUT in this report) is the Mobile Terminal Equipment.

General Specification

Clock frequency in the system	:	CPU: 800MHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	2412-2462MHz
Modulation	:	DSSS
Power Supply (radio part input)	:	DC 3.3V / DC1.8V
Antenna type	:	Chip Antenna
Antenna Gain	:	1.93dBi

SECTION 3 : Test standard information

3.1 Requirements for compliance testing defined by the FCC

The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

1 Specific Absorption Rate (SAR) is a measure of the rate of energy absorption due to exposure to an RF transmitting source (wireless portable device).
2 IEEE/ANSI Std. C95.1-1992 limits are used to determine compliance with FCC ET Docket 93-62.

Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01):

Supplement C (Edition 01-01) - Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions
OET Bulletin 65 (Edition 97-01) - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

IEEE Std 1528-2003:

IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques Supplement C

In additions;

KDB 447498 D01(v04):	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
KDB 248227 (rev.1.2):	SAR Measurement Procedures for 802.11a//b/g Transmitters

3.2 Procedure and result

No.	Item	Test Procedure	Limit	Remarks	Exclusion	Result
1	Human Exposure	FCC OET BULLETIN 65, SUPPLEMENT C	FCC47CFR 2.1093	SAR Measurement	N/A	Complied
Note: UL Japan, Inc. 's SAR Work Procedures QPM46 and QPM47						

Result of Max. SAR value
Max. SAR Value:
IEEE802.11b/g : 0.998W/kg (2462MHz)

3.3 Exposure limit

(A) Limits for Occupational/Controlled Exposure (W/kg)

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.4	8.0	20.0

(B) Limits for General population/Uncontrolled Exposure (W/kg)

Spatial Average (averaged over the whole body	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.08	1.6	4.0

Occupational/Controlled Environments: are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

General Population/Uncontrolled Environments: are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE
SPATIAL PEAK(averaged over any 1g of tissue) LIMIT
1.6 W/kg

3.4 Test Location

*Shielded room for SAR testings
UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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3.5 Confirmation before SAR testing

3.5.1 Correlation of Output Power between EMC and SAR tests

Correlation of Output Power between EMC and SAR tests (WLAN IEEE802.11b/g)
It was checked that the antenna port power was correlated within 0~+5% (FCC requirements)

SAR power is equal to DATA of EMC test. (November 5, 2010) based on the following reason.

- EMC and SAR tests are performed with the same test sample (S/N: No.5) under the same condition.
- EMC and SAR tests are performed at the same laboratory.
- The test mode setting is simple, and there is no possibility that the power (value) is changed by the wrong setting.

The result is shown in Section 6.

3.5.2 Average power for SAR testing

Step.1 Data rate check
The data rate check was measurement all data rate in the middle frequency of each frequency band.
Reference of modulation table

11b		11g	
Modulation	Data rate [Mbps]	Modulation	Data rate [Mbps]
DBPSK	1	BPSK	6
DQPSK	2	BPSK	9
CCK	5.5	QPSK	12
CCK	11	QPSK	18
-	-	16QAM	24
-	-	16QAM	36
-	-	64QAM	48
-	-	64QAM	54

Step.2 Decision of SAR test channel

Mode	GHz	Channel	"Default Test Channel"	
			FCC 15.247	
			802.11b	802.11g
802.11 b/g	2.412	1	√	Δ
	2.437	6	√	Δ
	2.462	11	√	Δ

√ = “default test channels”
Δ = Possible 802.11g channels with maximum average output ¼ dB ≥ the “default test channels”

3.6 Confirmation after SAR testing

It was checked that the power drift [W] is within +/-5%.The verification of power drift during the SAR test is that DASY4 system calculates the power drift by measureing the e-filed at the same location at beginning and the end of the scan measurement for each test position.

DASY4 system calucation Power drift value[dB] =20log(Ea)/(Eb)
Before SAR testing : Eb[V/m]
After SAR testing : Ea[V/m]

Limit of power drift[W] =+/-5%
X[dB]=10log[P]=10log(1.05/1)=10log(1.05)-10log(1)=0.212dB

from E-filed relations with power.
S=E*H=E^2/ η =P/4 π r^2 (η : Space impedance)
P=E^2*4 π r^2/η
Therefore, The correlation of power and the E-filed
XdB=10log(P)=10log(E)^2=20log(E)

From the above mentioned,
The calculated power drift of DASY4 System must be the less than +/-0.212dB.

3.7 Measurement procedure

1. IEEE 802.11b

Step1. The searching for the modulation
The 11b(DSSS) mode test was performed on the DBPSK(1Mbps) and CCK (11Mbps) modulations because the CCK(11Mbps) was maximum average power.

Step2. The searching for the worst position
This test was performed at the worst modulation of Step1.

Step3. Change to the Low and High channels
This test was performed at the worst conditions of Step2.

2. IEEE 802.11g

According to the KDB 248227 (Rev1.2) SAR Measurement Procedures for 802 11 a/b/g Transmitters, SAR is not required for 802.11g channels when the maximum average output power is less than $^{1}/_{4}$dB higher than that measured on the corresponding 802.11b channels. Refer to the Section 6.

3.8 Test setup of EUT

When users operate or carry the EUT, it could be considered to touch or get close to their bodies. In order to assume this situation, we performed the test at the following positions. Please refer to "APPENDIX 1" for more details.

(1) Rear surface:
The test was performed in touch with rear surface of the transmitter to the flat phantom.

(2) Right edge :
The test was performed in touch with right edge of the transmitter to the flat phantom.

(3) Left edge:
The test was performed in touch with left edge of the transmitter to the flat phantom.

(4) Top edge:
The test was performed in touch with top edge of the transmitter to the flat phantom.

(5) Bottom edge:
The test was performed in touch with bottom edge of the transmitter to the flat phantom.

SECTION 4 : Operation of E.U.T. during testing

4.1 Operating modes for SAR testing

4.1.1 Setting of EUT

This EUT was tested in IEEE.802.11b/g continuous transmitting modes by the following test tool.

Software name for test tool : adb version 7.0.0.0
Power setting : 11b:17dBm 11g:15dBm

The frequency band and the modulation used in the testing of IEEE.802.11b/g are shown as a following.

1. IEEE 802.11b mode

Tx frequency band : 2412-2462MHz
Channel : 1ch(2412MHz),6ch(2437MHz),11ch(2462MHz)
Modulation : DSSS
Crest factor : 1 (Duty 100%)

2. IEEE 802.11g mode

Tx frequency band : 2412-2462MHz
Channel : 1ch(2412MHz),6ch(2437MHz),11ch(2462MHz)
Modulation : OFDM
Crest factor : 1 (Duty 100%)

Note: IEEE802.11g mode was measured in power testing only.

SECTION 5 : Test surrounding

5.1 Measurement uncertainty

The uncertainty budget has been determined for the DASY4 measurement system according to the SPEAG documents[6][7] and is given in the following Table.

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±6.8	Normal	1	1	±6.8	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	$(1\text{-cp})^{1/2}$	±1.9	∞
Spherical isotropy of the probe	±9.6	Rectangular	√3	$(\text{cp})^{1/2}$	±3.9	∞
Boundary effects	±2.0	Rectangular	√3	1	±1.2	∞
Probe linearity	±4.7	Rectangular	√3	1	±2.7	∞
Detection limit	±1.0	Rectangular	√3	1	±0.6	∞
Readout electronics	±0.3	Normal	1	1	±0.3	∞
Response time	±0.8	Rectangular	√3	1	±0.5	∞
Integration time	±2.6	Rectangular	√3	1	±1.5	∞
RF ambient Noise	±3.0	Rectangular	√3	1	±1.7	∞
RF ambient Reflections	±3.0	Rectangular	√3	1	±1.7	∞
Probe Positioner	±0.8	Rectangular	√3	1	±0.5	∞
Probe positioning	±9.9	Rectangular	√3	1	±5.7	∞
Max.SAR Eval.	±4.0	Rectangular	√3	1	±2.3	∞
Test Sample Related						
Device positioning	±2.9	Normal	1	1	±2.9	8
Device holder uncertainty	±3.6	Normal	1	1	±3.6	4
Power drift	±5.0	Rectangular	√3	1	±2.9	∞
Phantom and Setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	∞
Liquid conductivity (target)	±5.0	Rectangular	√3	0.64	±1.8	∞
Liquid conductivity (meas.)	±5.0	Rectangular	1	0.64	±3.2	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±1.7	∞
Liquid permittivity (meas.)	±5.0	Rectangular	1	0.6	±3.0	∞
Combined Standard Uncertainty					**±13.453**	
Expanded Uncertainty (k=2)					**±26.9**	

SECTION 6 : Confirmation before testing

6.1 Correlation of Output Power between EMC and SAR tests

6.1.1 EMC power

This data is reference data of EMC test.
Date of test: November 5, 2010

[IEEE 802.11b 11Mbps]

Freq.	Reading	Cable Loss	Atten.	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	6.45	2.67	10.08	19.20	83.08
2437	6.63	2.51	10.08	19.22	83.50
2462	6.33	2.44	10.08	18.85	76.67

[IEEE 802.11g 6Mbps]

Freq.	Reading	Cable Loss	Atten.	Result	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
2412	11.50	2.67	10.08	24.25	265.77
2437	11.44	2.51	10.08	24.03	252.76
2462	11.14	2.44	10.08	23.66	232.09

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

6.1.2 SAR power

Date of test: November 5, 2010

[IEEE 802.11b 11Mbps]

Freq.	Reading	Cable Loss	Atten.	SAR Result		EMC Result		**Difference between SAR and EMC**
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	6.45	2.67	10.08	19.20	83.08	19.20	83.08	0.00
2437	6.63	2.51	10.08	19.22	83.50	19.22	83.50	0.00
2462	6.33	2.44	10.08	18.85	76.67	18.85	76.67	0.00

[IEEE 802.11g 6Mbps]

Freq.	Reading	Cable Loss	Atten.	SAR Result		EMC Result		**Difference between SAR and EMC**
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	11.50	2.67	10.08	24.25	265.77	24.25	265.77	0.00
2437	11.44	2.51	10.08	24.03	252.76	24.03	252.76	0.00
2462	11.14	2.44	10.08	23.66	232.09	23.66	232.09	0.00

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

6.2 Average power for SAR testing

Date of test: November 5, 2010

[IEEE802.11b] Rate Check

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
1.0	2437	6.31	4.26	2.51	10.08	18.90	16.85	77.57	48.38
2.0	2437	6.54	4.36	2.51	10.08	19.13	16.95	81.79	49.51
5.5	2437	6.12	4.06	2.51	10.08	18.71	16.65	74.25	46.21
11.0	2437	6.63	4.50	2.51	10.08	19.22	17.09	83.50	51.13

[IEEE802.11b 11Mbps]

Ch	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
1	2412	6.45	4.32	2.67	10.08	19.20	17.07	83.08	50.87
6	2437	6.63	4.50	2.51	10.08	19.22	17.09	83.50	51.13
11	2462	6.33	4.17	2.44	10.08	18.85	16.69	76.67	46.63

[IEEE802.11g] Rate Check

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
6.0	2437	11.44	2.50	2.51	10.08	24.02	15.09	252.35	32.26
9.0	2437	10.95	1.97	2.51	10.08	23.00	14.56	199.53	28.56
12.0	2437	10.79	1.89	2.51	10.08	22.76	14.48	188.80	28.03
18.0	2437	11.24	2.27	2.51	10.08	23.59	14.86	228.56	30.60
24.0	2437	11.40	2.42	2.51	10.08	23.90	15.01	245.47	31.67
36.0	2437	11.25	2.16	2.51	10.08	23.49	14.75	223.36	29.83
48.0	2437	11.23	2.15	2.51	10.08	23.46	14.74	221.82	29.76
54.0	2437	11.22	2.05	2.51	10.08	23.35	14.64	216.27	29.09

**: SAR is not required for 802.11g channels when the maximum average output power is less than 1/4dB higher than that measured on the corresponding 802.11b channels.

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

SECTION 7 : Measurement results

7.1 BODY SAR 2450MHz

Model : **EB-W51GJ**
Serial No. : **No.5**
Modulation : **DSSS**
Measured By : **Miyo Kishimoto**

Date : **November 8, 2010**
Liquid Depth (cm) : **15.0**
Parameters : **εr =50.4 σ =1.98**
Ambient temperature(deg.c.) : **24.5**
Relative Humidity (%) : **42**

BODY SAR RESULT									
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separatio [mm]	Before	After	Maximum value of multi-peak
Step 1. Search for the worst modulation									
6	2437	DBPSK(1Mbps)	Flat	Fixed	Rear surface	0	24.0	24.0	**0.916**
6	2437	CCK(11Mbps)	Flat	Fixed	Rear surface	0	24.0	24.0	**0.895**
Step 2. Search for the worst position									
6	2437	DBPSK(1Mbps)	Flat	Fixed	Right edge	0	24.0	24.0	**0.505**
6	2437	DBPSK(1Mbps)	Flat	Fixed	Left edge	0	24.0	24.0	**0.014**
6	2437	DBPSK(1Mbps)	Flat	Fixed	Top edge	0	24.0	24.0	**0.00748**
6	2437	DBPSK(1Mbps)	Flat	Fixed	Bottom edge	0	24.0	24.0	**0.020**
Step 3. Change to the channels									
1	2412	DBPSK(1Mbps)	Flat	Fixed	Rear surface	0	24.0	24.0	**0.841**
11	2462	DBPSK(1Mbps)	Flat	Fixed	Rear surface	0	24.0	24.0	**0.998**