JQA File No. : KL80110351
Issue Date : October 24, 2011

TEST REPORT (SAR EVALUATION)

APPLICANT	:	Sharp Corporation, Communication Systems Group
ADDRESS	:	2-13-1, Iida, Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
PRODUCTS	:	Cellular Phone
MODEL NO.	:	102SH
SERIAL NO.	:	004401/11/359847/4
FCC ID	:	APYHRO00157
TEST STANDARD	:	FCC/OET Bulletin 65 Supplement C (Edition 01-01)
TESTING LOCATION	:	Japan Quality Assurance Organization KITA-KANSAI Testing Center 1-7-7, Ishimaru, Minoh-shi, Osaka 562-0027, Japan
TEST RESULTS	:	**Passed**
DATE OF TEST	:	September 30 ~ October 14, 2011

Lab Accreditation
VLAC-001-2

Kousei Shibata
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Japan Quality Assurance Organization
KITA-KANSAI Testing Center
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DEFINITIONS FOR ABBREVIATION AND SYMBOLS USED IN THIS TEST REPORT

EUT	: Equipment Under Test	EMC	: Electromagnetic Compatibility
AE	: Associated Equipment	EMI	: Electromagnetic Interference
N/A	: Not Applicable	EMS	: Electromagnetic Susceptibility
N/T	: Not Tested	SAR	: Specific Absorption Rate

☒ - indicates that the listed condition, standard or equipment is applicable for this report.
☐ - indicates that the listed condition, standard or equipment is not applicable for this report.

Documentation

1 Test Regulation

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

Test Procedure : FCC/OET Bulletin 65 Supplement C (Edition 01-01)
IEEE Std.1528–2003
KDB Publication #941225 D03 v01 (December 2008)
KDB Publication #941225 D06 v01 (April 2011)
KDB Publication #648474 D01 v01r05 (September 2008)
KDB Publication #248227 D01 v01r02 (May 2007)

Exposure Limits : ANSI/IEEE Std. C95.1, 1999 Edition

2 Test Location

Japan Quality Assurance Organization (JQA)
KITA-KANSAI Testing Center Testing Department SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan
MINOH Test Site (KITA-KANSAI Testing Center)
7-7, Ishimaru, 1-chome, Minoh-shi, Osaka, 562-0027, Japan
KAMEOKA EMC Branch
9-1, Ozaki, Inukanno, Nishibetsuin-cho, Kameoka-shi, Kyoto, 621-0126, Japan

3 Recognition of Test Laboratory

JQA KITA-KANSAI Testing Center Testing Dept. SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility of Testing Division is registered by the following bodies.

VLAC Code : VLAC-001-2 (Effective through : March 30, 2012)
BSMI Recognition No. : SL2-IS-E-6006, SL2-IN-E-6006, SL2-AI-E-6006
(Effective through : September 14, 2013)
IC Registration No. : 2079E-2 (Effective through : January 25, 2014)
2079E-3, 2079E-4 (Effective through : July 20, 2014)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI.
(Effective through : February 22, 2012)

4 Description of the Equipment Under Test

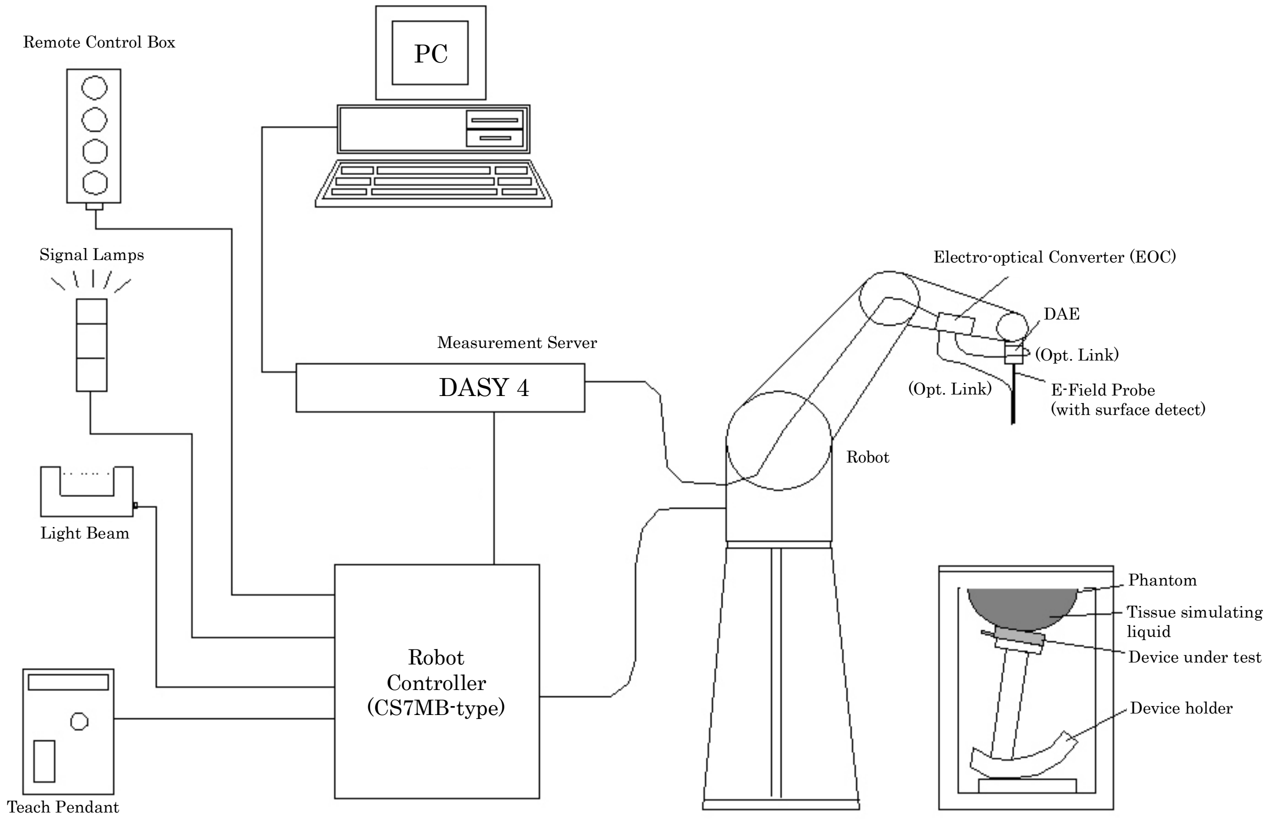
1. Manufacturer : Sharp Corporation, Communication Systems Group
2-13-1, Iida, Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
2. Products : Cellular Phone
3. Model No. : 102SH
4. Serial No. : 004401/11/359847/4
5. Product Type : Pre-production
6. Date of Manufacture : August, 2011
7. Transmitting Frequency : 1850.20 MHz – 1909.80 MHz (PCS 1900)
2412 MHz – 2462 MHz (WLAN 802.11b/g/n)
2402 MHz – 2480 MHz (Bluetooth)
8. Battery Option : Lithium-ion Battery Pack SHBED1 (1520mAh)
9. Power Rating : 4.0VDC
10. EUT Grounding : None
11. Device Category : Portable Device (§2.1093)
12. Exposure Category : General Population/Uncontrolled Exposure
13. FCC Rule Part(s) : 24(E), 15.247
14. EUT Authorization : Certification
15. Received Date of EUT : September 30, 2011

5 Test Results

Mode	CH	Freq. (MHz)	Test Position	1g SAR (mW/g)	Results
PCS 1900 GPRS 4slot	810	1909.8	Right Head Touched	0.315	PASSED
	810	1909.8	Body Rear w/ 1.0cm	0.576	PASSED
WLAN 802.11b 1 Mbps	11	2462	Right Head Touched	0.247	PASSED
	11	2462	Left Edge w/ 1.0cm	0.057	PASSED

6 Measurement System Diagram

These measurements are performed using the DASY4 automated dosimetric assessment system (manufactured by Schmid & Partner Engineering AG (SPEAG) in Zürich, Switzerland). It consists of high precision robotics system, cell controller system, DASY4 measurement server, personal computer with DASY4 software, data acquisition electronic (DAE) circuit, the Electro-optical converter (EOC), near-field probe, and the twin SAM phantom containing the equivalent tissue. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF).
The Robot is connected to the cell controller to allow software manipulation of the robot. The DAE is connected to the EOC. The DAE performs the signal amplification, signal multiplexing, A/D conversion, offset measurements, mechanical surface detection, collision detection, etc. The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server.



7 System Components

7.1 Probe Specification ET3DV6

Construction : Symmetrical design with triangular core
Built-in optical fiber for surface detection system
Built-in shielding against static changes
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration : In air form 10 MHz to 2.3 GHz
In head tissue simulating liquid (HSL) and
muscle tissue simulating liquid
835 MHz (accuracy ± 12.0%; k=2)
900 MHz (accuracy ± 12.0%; k=2)
1450 MHz (accuracy ± 12.0%; k=2)
1750 MHz (accuracy ± 12.0%; k=2)
1900 MHz (accuracy ± 12.0%; k=2)
1950 MHz (accuracy ± 12.0%; k=2)

Frequency : 10 MHz to 2.3 GHz
Linearity: ± 0.2 dB (30 MHz to 2.3 GHz)

Directivity : ± 0.2 dB in HSL (rotation around probe axis)
± 0.4 dB in HSL (rotation normal to probe axis)

Dynamic Range : 5 µW/g to >100 mW/g; Linearity: ± 0.2 dB

Surface Detection : ± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces

Dimensions : Overall length 337 mm
Tip length 16 mm
Body diameter 12 mm
Tip diameter 6.8 mm
Distance from probe tip to dipole centers 2.7 mm

7.2 Probe Specification EX3DV4

Construction : Symmetrical design with triangular core
Built-in shielding against static changes
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration : In air form 10 MHz to 6 GHz
In head tissue simulating liquid (HSL) and
muscle tissue simulating liquid
2300 MHz (accuracy ± 12.0%; k=2)
2450 MHz (accuracy ± 12.0%; k=2)
2600 MHz (accuracy ± 12.0%; k=2)
3500 MHz (accuracy ± 13.1%; k=2)
5200 MHz (accuracy ± 13.1%; k=2)
5300 MHz (accuracy ± 13.1%; k=2)
5500 MHz (accuracy ± 13.1%; k=2)
5600 MHz (accuracy ± 13.1%; k=2)
5800 MHz (accuracy ± 13.1%; k=2)

Frequency : 10 MHz to 6 GHz
Linearity: ± 0.2 dB (30 MHz to 6 GHz)

Directivity : ± 0.3 dB in HSL (rotation around probe axis)
± 0.5 dB in tissue material (rotation normal to probe axis)

Dynamic Range : 10 μW/g to >100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μW/g)

Dimensions : Overall length 337 mm
Tip length 20 mm
Body diameter 12 mm
Tip diameter 2.5 mm
Distance from probe tip to dipole centers 1 mm

7.3 Twin SAM Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Shell Thickness	:	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	:	Volume Approx. 25 liters
Dimensions	:	810 × 1000 × 500 mm (H × L × W)

7.4 ELI4 Flat Phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

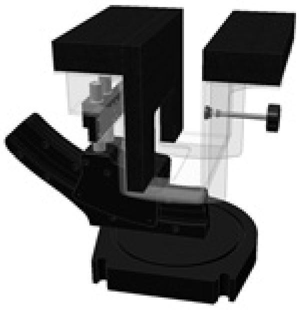
Shell Thickness	:	2 ± 0.2 mm (sagging: <1%)
Filling Volume	:	Volume Approx. 30 liters
Dimensions	:	Major ellipse axis : 600 mm
		Minor axis : 400 mm

7.5 Mounting Device for Transmitters

In combination with the Twin SAM Phantom V4.0/V4.0c or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat point).

7.6 Laptop Extensions Kit for Mounting Device

Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.) It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI4 and SAM v6.0 Phantoms.



7.7 Typical Composition of Ingredients for Liquid Tissue

Ingredients (% by weight)	Frequency (MHz)					
	835		1900		2450	
	Head	Body	Head	Body	Head	Body
Water	41.45	52.40	54.90	40.40	62.70	73.20
Salt (NaCl)	1.45	1.40	0.18	0.50	0.50	0.04
Sugar	56.00	45.00	0.00	58.00	0.00	0.00
HEC	1.00	1.00	0.00	1.00	0.00	0.00
Bactericide	0.10	0.10	0.00	0.10	0.00	0.00
Triton X-100	0.00	0.00	0.00	0.00	36.80	0.00
DGBE	0.00	0.00	44.92	0.00	0.00	26.70

Salt : 99^{+}% Pure Sodium Chloride Sugar : 98^{+}% Pure Sucrose
Water : De-ionized, 16 $M\Omega^{+}$ resistivity HEC : Hydroxyethyl Cellulose
DGBE : 99^{+}% Di (ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure) : Polyethylene glycol mono [4-(1,1,3,3-tetramethylbuthyl)phenyl]ether

The composition of ingredients is according to FCC/OET Bulletin 65 Supplement C.

8 Measurement Process

Area Scan for Maximum Search :

The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15 mm × 15 mm. The evaluation on the measured area scan gives the interpolated maximum (hot spot) of the measured area.

Cube Scan for Spatial Peak SAR Evaluation :

The 1g and 10g peak evaluations were available for the predefined cube 5×5×7 scans. The grid spacing was 8 mm × 8 mm × 5 mm. The first procedure is an extrapolation to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid (35000 points). In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is moved around until the highest averaged SAR is found. This last procedure is repeated for a 10g cube. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

Extrapolation :

The extrapolation is based on a least square algorithm. Through the points in the first 3 cm in all z-axis, polynomials of order four are calculated. This polynomial is then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from one another.

Interpolation :

The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) are computed by the 3D spline algorithm. The 3D spline is composed of three one-dimensional splines with the “Not a knot” –condition (x, y and z –directions). The volume is integrated with the trapezoidal algorithm.

9 Measurement Uncertainties

Uncertainty Component	Tol. (± %)	Prob. Dist.	Div.	c_i (1g)	c_i (10g)	Std. Unc. (± %)		v_i
						1g	10g	
Measurement System								
Probe calibration	6.0	N	1	1	1	6.0	6.0	∞
Axial isotropy	4.7	R	√3	0.7	0.7	1.9	1.9	∞
Hemispherical isotropy	9.6	R	√3	0.7	0.7	3.9	3.9	∞
Boundary effect	1.0	R	√3	1	1	0.6	0.6	∞
Linearity	4.7	R	√3	1	1	2.7	2.7	∞
System detection limits	1.0	R	√3	1	1	0.6	0.6	∞
Readout electronics	0.3	N	1	1	1	0.3	0.3	∞
Response time	0.8	R	√3	1	1	0.5	0.5	∞
Integration time	2.6	R	√3	1	1	1.5	1.5	∞
RF ambient conditions – noise	3.0	R	√3	1	1	1.7	1.7	∞
RF ambient conditions – reflections	3.0	R	√3	1	1	1.7	1.7	∞
Probe positioner mechanical tolerance	0.4	R	√3	1	1	0.2	0.2	∞
Probe positioning with respect to phantom shell	2.9	R	√3	1	1	1.7	1.7	∞
Extrapolation, interpolation and integration algorithms for max. SAR evaluation	1.0	R	√3	1	1	0.6	0.6	∞
Test Sample Related								
Test sample positioning	3.4	N	1	1	1	3.4	3.4	23
Device holder uncertainty	2.9	N	1	1	1	2.9	2.9	5
Output power variation – SAR drift measurement	5.0	R	√3	1	1	2.9	2.9	∞
Phantom and Tissue Parameters								
Phantom uncertainty	4.0	R	√3	1	1	2.3	2.3	∞
Liquid conductivity – deviation from target	5.0	R	√3	0.64	0.43	1.8	1.2	∞
Liquid Conductivity – measurement uncertainty	3.2	N	1	0.64	0.43	2.0	1.4	5
Liquid Permittivity – deviation from target	5.0	R	√3	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – measurement uncertainty	3.0	N	1	0.6	0.49	1.8	1.5	5
Combined Standard Uncertainty		RSS				11.0	10.8	
Expanded Uncertainty (95% Confidence Interval)		k=2				22.1	21.5	

NOTES
1. Tol. : tolerance in influence quantity
2. Prob. Dist. : probability distributions
3. N, R : normal, rectanglar
4. Div. : divisor used to obtain standard uncertainty
5. c_i : sensitivity coefficient
6. Std. Unc. : standard uncertainty
7. Measurement uncertainties are according to IEEE Std. 1528 and IEC 62209-1.

10 Equipment Under Test Modification

☒ - No modifications were conducted by JQA to achieve compliance to the limitations.
☐ - To achieve compliance to the limitations, the following changes were made by JQA during the compliance test.

The modifications will be implemented in all production models of this equipment.

Applicant : Not Applicable
Date : Not Applicable
Typed Name : Not Applicable
Position : Not Applicable Signatory : Not Applicable

11 Responsible Party

Responsible Party of Test Item (Product)

Responsible Party :

Contact Person :

Signatory

12 Deviation from Standard

☒ - No deviations from the standard described in clause 1.
☐ - The following deviations were employed from the standard described in clause 1.

13 Summary

General Remarks :

The EUT was tested according to the requirements of the following standard.
FCC/OET Bulletin 65 Supplement C (Edition 01-01)
The test configuration is shown in clause 14 to 15.
The conclusion for the test items of which are required by the applied regulation is indicated under the test results.
Determining compliance with the limits in this report was based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Test Results :

The "as received" sample;

☒ - fulfill the test requirements of the regulation mentioned on clause 1.
☐ - doesn't fulfill the test requirements of the regulation mentioned on clause 1.

Reviewed by:

S. Kino

Shigeru Kinoshita
Deputy Manager
JQA KITA-KANSAI Testing Center
Testing Dept. SAITO EMC Branch

Tested by:

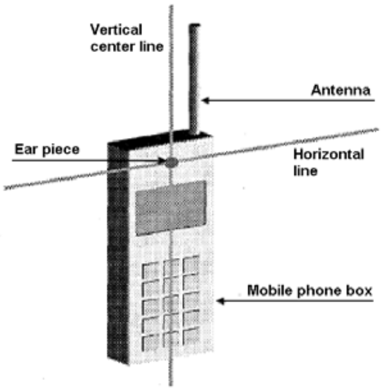
Y. Sakai

Yasuhisa Sakai
Deputy Manager
JQA KITA-KANSAI Testing Center
Testing Dept. SAITO EMC Branch

14 Test Arrangement

14.1 Cheek-Touch Position

1. Position the device with the vertical center line of the body of the device and the horizontal line crossing the center of the ear piece in a plane parallel to the sagittal plane of the phantom.
2. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference points (M, RE and LE) and align the center of the ear piece with the line RE-LE.
3. Translate the mobile phone box towards the phantom with the ear piece aligned with the line RE-LE until the phone touches the ear.
4. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the box until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.

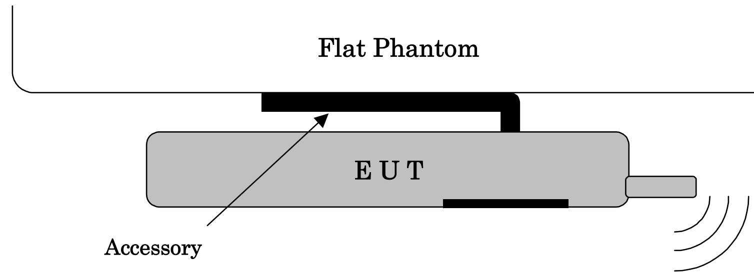


14.2 Ear-Tilt Position

1. Position the device in the "Cheek/Touch Position".
2. While maintaining the device in the reference plane and pivoting against the ear, move it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.

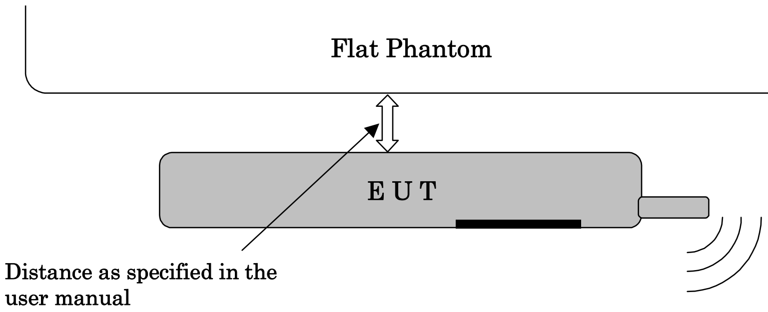
14.3 Body-worn Configuration

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. Both the physical spacing to the body of the user as dictated by the accessory and the materials used in an accessory affect the SAR produced by the transmitting device. For purpose of determining test requirements, accessories may be divided into two categories: those that do not contain metallic components and those that do.



When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.



Lap-held device (e.g. laptop computer)
SAR is tested for a lap-held position with the bottom of the computer in direct contact against a flat phantom.

15 Procedures used to Establish Test Signal

The following procedures had been used to prepare the EUT for the SAR test.

15.1 PCS 1900

To setup the desire channel frequency and the maximum output power, a Radio Communication Tester "Rohde & Schwarz, CMU-200" was used to program the EUT.

SM Mobile Station : GSM 1900
Network Support : GSM+GPRS
Power Setting : PCL 0 (30 dBm)
GSM mode
Main Service : Circuit Switched
GPRS mode
Main Service : Packet Data
Service Selection : Test Mode A
Slot Configuration : GPRS Class 12 (4 down / 4 up / 5 sum)
Coding Scheme : CS1 (GMSK)

Conducted power measurement results

Mode		Conducted Power (dBm)		
		512 ch (1850.20 MHz)	661 ch (1880.00 MHz)	810 ch (1909.80 MHz)
GSM	Burst Avg.	29.18	29.15	29.05
	Frame Avg.	20.15	20.12	20.02
GPRS (1 slot)	Burst Avg.	29.18	29.15	29.05
	Frame Avg.	20.15	20.12	20.02
GPRS (2 slot)	Burst Avg.	27.21	27.19	27.05
	Frame Avg.	21.19	21.17	21.03
GPRS (3 slot)	Burst Avg.	25.74	25.72	25.64
	Frame Avg.	21.48	21.46	21.38
GPRS (4 slot)	Burst Avg.	24.74	24.72	24.67
	Frame Avg.	**21.73**	**21.71**	**21.66**

Based on output power above and time slots, the worst-case configuration is chosen as GPRS 4 time slots for Body SAR testing.

Because of the VoIP function using GPRS multi-slot, Head SAR is measured for the same mode as the Body SAR testing.

Maximum conducted power was measured by replacing the antenna with an adapter for conductive measurements, before and after the SAR measurements was done.

15.2 WLAN

To setup the desire channel frequency and the maximum output power, RF test mode prepared by the manufacturer was used to program the EUT.

Conducted power measurement results

Mode		Conducted Power (dBm)		
		1 ch (2412 MHz)	6 ch (2437 MHz)	11 ch (2462 MHz)
802.11b	1 Mbps	13.90	14.29	14.24
	2 Mbps	13.88	14.22	14.17
	5.5 Mbps	13.34	13.42	13.52
	11 Mbps	13.07	13.34	13.60
802.11g	6 Mbps	8.65	8.90	9.27
	9 Mbps	8.52	8.97	9.30
	12 Mbps	8.61	9.04	9.31
	18 Mbps	8.54	9.04	9.30
	24 Mbps	8.09	8.77	8.88
	36 Mbps	8.31	8.77	8.92
	48 Mbps	7.96	8.55	8.94
	54 Mbps	8.00	8.56	9.00
802.11n	6.5 Mbps	8.27	9.00	9.07
	13 Mbps	8.31	8.92	9.04
	19.5 Mbps	8.19	8.94	9.08
	26 Mbps	8.26	8.79	9.07
	39 Mbps	8.41	8.90	9.07
	52 Mbps	8.32	9.04	9.07
	58.5 Mbps	8.31	8.94	9.12
	65 Mbps	8.47	9.13	9.15

The output of WLAN transmitter is > $2 \cdot P_{ref}$ (its antenna is >5.0 cm from GSM antenna), so the stand-alone SAR evaluation for WLAN is required. ($P_{ref} = ½ \cdot 60 / f_{(GHz)}$ [mW])

SAR is not required for 802.11g/n channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding 802.11b channels.

SAR testing at higher data rates is not required when the maximum average output power for each of these configurations is less than ¼ dB higher than those measured at the lowest data rate.

Maximum conducted power was measured by replacing the antenna with an adapter for conductive measurements, before and after the SAR measurements was done.

15.3 Bluetooth

For the Bluetooth operation, the client supplied a special driving program to program the EUT to continually transmit the specified maximum power.

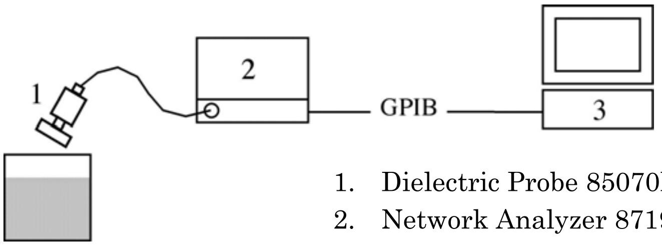
Modulation type	:	Frequency Hopping Spread Spectrum (FHSS)
Transmitting Frequency	:	2402 MHz (0 ch) – 2480 MHz (78 ch)
RF Output Power	:	Max. 2.5 mW (Class 2)

The output of Bluetooth transmitter is ≤ P_{ref} and its antenna is >2.5 cm from GSM antenna, so the stand-alone SAR evaluation for Bluetooth is not required. (P_{ref} = ½ • 60 / f $_{(GHz)}$ [mW])

Appendix A: Test Data

A.1 Tissue Verification

The tissue dielectric parameters of the tissue medium at the middle of a device transmission band should be within ±5% of the parameters specified at that target frequency. It is verified by using the dielectric probe and the network analyzer.



1. Dielectric Probe 85070D
2. Network Analyzer 8719ET
3. Personal Computer

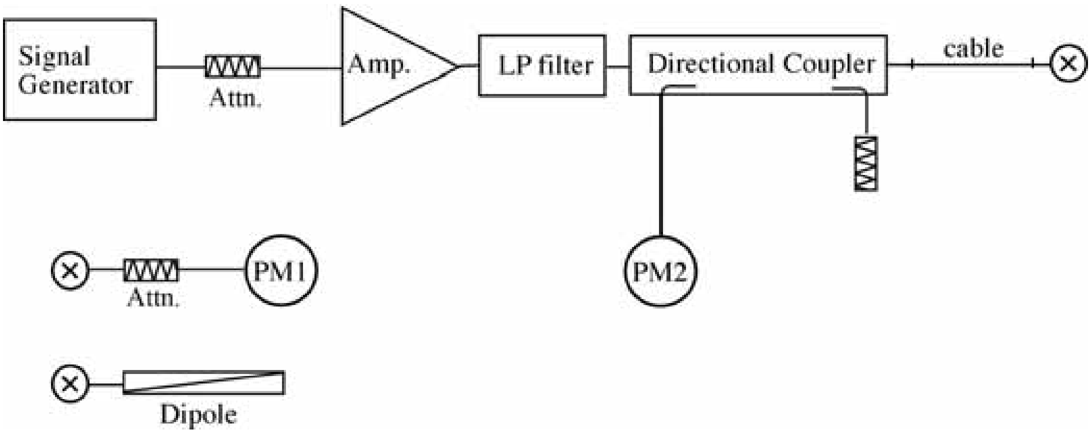
Tissue Verification Results :

Ambient Conditions : 22°C 79%						Date : September 30, 2011	
Liquid	Freq. [MHz]	Temp. [°C]	Parameters	Target	Measured	Deviation [%]	Limit [%]
Head	1900	22.0	Permittivity	40.0	40.13	+0.33	± 5
			Conductivity	1.40	1.443	+3.07	± 5
Ambient Conditions : 22°C 44%						Date : October 3, 2011	
Body	1900	22.0	Permittivity	53.3	52.75	-1.03	± 5
			Conductivity	1.52	1.548	+1.84	± 5
Ambient Conditions : 23°C 60%						Date : October 14, 2011	
Head	2450	23.0	Permittivity	39.2	39.28	+0.20	± 5
			Conductivity	1.80	1.866	+3.67	± 5
Ambient Conditions : 23°C 51%						Date : October 13, 2011	
Body	2450	23.0	Permittivity	52.7	50.81	-3.59	± 5
			Conductivity	1.95	1.999	+2.51	± 5

A.2 System Validation

The power meter PM1 (including Attenuator) measures the forward power at the location of the validation dipole connector. The signal generator is adjusted for 250 mW at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

The dipole antenna is matched to be used near flat phantom filled with tissue simulating solution. A specific distance holder is used in the positioning of the antenna to ensure correct spacing between the phantom and the dipole.



A.2.1 System Validation Results for 1900 MHz

Liquid	Freq. [MHz]	Temp. [°C]	Measured SAR (mW/g)		Normalized to 1 W	Target	Deviation [%]	Limit [%]
System Validation Dipole : D1900V2, S/N: 5d112								
Ambient Conditions : 22°C 79%			Depth of Liquid : 15.0 cm			Date : September 30, 2011		
Head	1900	22.0	1g	9.92	39.68	40.3	-1.54	± 10
			10g	5.21	20.84	21.1	-1.23	± 10
Ambient Conditions : 22°C 44%			Depth of Liquid : 15.0 cm			Date : October 3, 2011		
Body	1900	22.0	1g	11.2	44.80	41.3	+8.47	± 10
			10g	5.88	23.52	21.8	+7.89	± 10

NOTES :
1. The results were normalized to 1 W forward power.
2. The target SAR values of SPEAG validation dipoles are given in the calibration data.
3. Please refer to attachment for the result presentation in plot format.

A.2.2 System Validation Results for 2450 MHz

<table>
<tr><td colspan="9">System Validation Dipole : D2450V2, S/N: 714
Ambient Conditions : 23°C 60% Depth of Liquid : 15.0 cm Date : October 14, 2011</td></tr>
<tr><td>Liquid</td><td>Freq.
[MHz]</td><td>Temp.
[°C]</td><td colspan="2">Measured SAR
(mW/g)</td><td>Normalized
to 1 W</td><td>Target</td><td>Deviation
[%]</td><td>Limit
[%]</td></tr>
<tr><td rowspan="2">Head</td><td rowspan="2">2450</td><td rowspan="2">23.0</td><td>1g</td><td>14.0</td><td>56.00</td><td>53.8</td><td>+4.09</td><td>± 10</td></tr>
<tr><td>10g</td><td>6.36</td><td>25.44</td><td>24.9</td><td>+2.17</td><td>± 10</td></tr>
<tr><td colspan="9">Ambient Conditions : 23°C 51% Depth of Liquid : 15.0 cm Date : October 13, 2011</td></tr>
<tr><td rowspan="2">Body</td><td rowspan="2">2450</td><td rowspan="2">23.0</td><td>1g</td><td>13.4</td><td>53.60</td><td>50.7</td><td>+5.72</td><td>± 10</td></tr>
<tr><td>10g</td><td>6.13</td><td>24.52</td><td>23.4</td><td>+4.79</td><td>± 10</td></tr>
<tr><td colspan="9">NOTES :
1. The results were normalized to 1 W forward power.
2. The target SAR values of SPEAG validation dipoles are given in the calibration data.
3. Please refer to attachment for the result presentation in plot format.</td></tr>
</table>

A.3 SAR Measurement Data

A.3.1 PCS 1900

A.3.1.1 Left Head

GPRS 4 slot (Duty Cycle: 48.0 %, Crest Factor: 2.075)						Date : September 30, 2011	
Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	1g SAR [mW/g]	Tissue Temp. [°C]
Cheek/Touch	661	1880.00	24.72	-0.013	1.6	0.157	22.0
Ear/Tilt	661	1880.00	24.72	-0.013	1.6	0.109	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. Please refer to attachment for the result presentation in plot format.

A.3.1.2 Right Head

GPRS 4 slot (Duty Cycle: 48.0 %, Crest Factor: 2.075)						Date : September 30, 2011	
Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	1g SAR [mW/g]	Tissue Temp. [°C]
Cheek/Touch	512	1850.20	24.74	-0.005	1.6	0.256	22.0
	661	1880.00	24.72	0.014		0.279	22.0
	810	1909.80	24.67	-0.017		0.315	22.0
Ear/Tilt	661	1880.00	24.72	-0.003	1.6	0.091	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. Please refer to attachment for the result presentation in plot format.

A.3.1.3 Body w/ 1.0 cm (hotspot mode)

GPRS 4 slot (Duty Cycle: 48.0 %, Crest Factor: 2.075)						Date : October 3, 2011	
Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	1g SAR [mW/g]	Tissue Temp. [°C]
Bottom Edge	661	1880.00	24.72	-0.018	1.6	0.355	22.0
Left Edge	661	1880.00	24.72	-0.021	1.6	0.064	22.0
Right Edge	661	1880.00	24.72	-0.002	1.6	0.184	22.0
Front Side	661	1880.00	24.72	-0.033	1.6	0.280	22.0
Rear Side	512	1850.20	24.74	-0.028	1.6	0.447	22.0
	661	1880.00	24.72	-0.041		0.496	22.0
	810	1909.80	24.67	-0.005		0.576	22.0
Rear Side w/ headset	810	1909.80	24.67	-0.024	1.6	0.571	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. SAR is tested with a transmitting antenna located within 2.5 cm from that surface or edge.
4. Please refer to attachment for the result presentation in plot format.

A.3.2 WLAN

A.3.2.1 Left Head

802.11b (1 Mbps) – Duty Cycle: 100 %						Date : October 14, 2011	
Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	1g SAR [mW/g]	Tissue Temp. [°C]
Cheek/Touch	6	2437	14.29	-0.131	1.6	0.064	23.0
Ear/Tilt	6	2437	14.29	0.022	1.6	0.031	23.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. Please refer to attachment for the result presentation in plot format.

A.3.2.2 Right Head

802.11b (1 Mbps) – Duty Cycle: 100 %						Date : October 14, 2011	
Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	1g SAR [mW/g]	Tissue Temp. [°C]
Cheek/Touch	1	2412	13.90	-0.084	1.6	0.166	23.0
	6	2437	14.29	-0.081		0.196	23.0
	11	2462	14.24	-0.110		0.247	23.0
Ear/Tilt	6	2437	14.29	0.112	1.6	0.145	23.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. Please refer to attachment for the result presentation in plot format.

A.3.2.3 Body w/ 1.0 cm (hotspot mode)

802.11b (1 Mbps) – Duty Cycle: 100 % Date : October 13, 2011

Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	1g SAR [mW/g]	Tissue Temp. [°C]
Top Edge	6	2437	14.29	0.031	1.6	0.015	23.0
Left Edge	1	2412	13.90	-0.038	1.6	0.030	23.0
	6	2437	14.29	0.000		0.035	23.0
	11	2462	14.24	-0.080		0.057	23.0
Front Side	6	2437	14.29	0.085	1.6	0.031	23.0
Front Side w/ headset	6	2437	14.29	-0.017	1.6	0.016	22.0
Rear Side	6	2437	14.29	-0.003	1.6	0.030	23.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. SAR is tested with a transmitting antenna located within 2.5 cm from that surface or edge.
4. Please refer to attachment for the result presentation in plot format.

A.3.3 SAR Handsets Multiple Transmitters Assessment

Simultaneous Transmission

GSM with WLAN : Yes
GSM with Bluetooth : Yes
WLAN with Bluetooth : No

Antenna Separation Distances

GSM to WLAN : 110 mm
GSM to Bluetooth : 110 mm

Stand-alone SAR Requirements for Unlicensed Transmitters

WLAN : Required
The output of WLAN transmitter is > $2 \cdot P_{ref}$.

Bluetooth : Not required
The output of Bluetooth transmitter is ≤ P_{ref} and its antenna is > 2.5 cm from main antenna.

Sum of the 1g SAR for GSM vs. WLAN

Test Position	Highest 1g SAR (mW/g)			Σ 1g SAR (mW/g)
	GSM Band		WLAN	
Right Head Touched	PCS 1900	0.315	0.247	0.562
Body Rear w/ 1.0cm	PCS 1900	0.576	0.030	0.606

Sum of the 1g SAR for WLAN vs. GSM

Test Position	Highest 1g SAR (mW/g)			Σ 1g SAR (mW/g)
	WLAN	GSM Band		
Right Head Touched	0.247	PCS 1900	0.315	0.562
Body Left Edge w/ 1.0cm	0.057	PCS 1900	0.064	0.121

When the sum of the 1g SAR is < 1.6 W/kg, simultaneous SAR evaluation is not required.

Otherwise, the SAR to peak location separation ratio is calculated to determine if SAR evaluation for simultaneous transmission is necessary.

Appendix C: Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
E-Field Probe	ET3DV6	SPEAG	S-2	2011/8	1 Year
E-Field Probe	EX3DV4	SPEAG	S-17	2011/9	1 Year
DAE	DAE3 V1	SPEAG	S-3	2010/11	1 Year
Robot	RX60L	SPEAG	S-7	------	N/A
Probe Alignment Unit	LB1RX60L	SPEAG	S-13	------	N/A
Network Analyzer	8719ET	Agilent	B-53	2011/9	1 Year
Dielectric Probe Kit	85070D	Agilent	B-54	------	N/A
1900MHz Dipole	D1900V2	SPEAG	S-25	2011/8	1 Year
2450MHz Dipole	D2450V2	SPEAG	S-6	2010/11	1 Year
Signal Generator	MG3681A	Anritsu	B-3	2011/9	1 Year
RF Power Amplifier	A0840-3833-R	R&K	A-34	------	N/A
Low Pass Filter	LSM2200-4BA	LARK	D-91	2010/11	1 Year
Low Pass Filter	LSM2700-3BA	LARK	D-92	2010/11	1 Year
Universal Radio Communication Tester	CMU200	Rohde & Schwarz	B-21	2011/4	1 Year
Power Meter	E4417A	Agilent	B-51	2011/6	1 Year
Power Sensor	E9323A	Agilent	B-59	2011/6	1 Year
Attenuator	2-20	Weinschel	D-36	2011/9	1 Year

Appendix D: Attachments

Exhibit	Contents	No. of page(s)
1	System Validation Plots	4
2-1	SAR Test Plots (PCS 1900)	16
2-2	SAR Test Plots (WLAN)	15
3-1	Dosimetric E-Field Probe – ET3DV6, S/N: 1679	11
3-2	Dosimetric E-Field Probe – EX3DV4, S/N: 3808	11
4-1	System Validation Dipole – D1900V2, S/N: 5d112	9
4-2	System Validation Dipole – D2450V2, S/N: 714	9