JQA File No. : KL80100549
Issue Date : April 8, 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.	:	SH-10C
SERIAL NO.	:	004401113245134
FCC ID	:	APYHRO00145
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	:	March 29, 2011 ~ April 5, 2011

This report must not used by the client to claim product endorsement by NVLAP or NIST or any agency of the U.S. Government.

NVLAP LAB CODE 200191-0

Kousei Shibata
Manager
Japan Quality Assurance Organization
KITA-KANSAI Testing Center
Testing Dept. EMC Division
1-7-7, Ishimaru, Minoh-shi, Osaka 562-0027, Japan

- The measurement values stated in Test Report was made with traceable to National Institute of Advanced Industrial Science and Technology (AIST) of Japan, National Institute of Information and Communications Technology (NICT) of Japan , and Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zürich, Switzerland.
- The applicable standard, testing condition and testing method which were used for the tests are based on the request of the applicant.
- The test results presented in this report relate only to the offered test sample.
- The contents of this test report cannot be used for the purposes, such as advertisement for consumers.
- This test report shall not be reproduced except in full without the written approval of JQA.

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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 D01 v02 (October 2007)
KDB Publication #941225 D02 v02r01 (December 2009)
KDB Publication #941225 D03 v01 (December 2008)
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

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 Department EMC Division 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)
NVLAP Lab Code : 200191-0 (Effective through : June 30, 2011)
BSMI Recognition No. : SL2-IS-E-6006, SL2-IN-E-6006, SL2-AI-E-6006
(Effective through : September 14, 2013)

VCCI Registration No. : R-008, C-006, C-007, C-1674, C-2143, C-3685, T-1418, T-1419, T-1819, T-1820, T-1821, G-172, G-173 (Effective through : March 30, 2012)
IC Registration No. : 2079E-2 (Effective through : January 25, 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

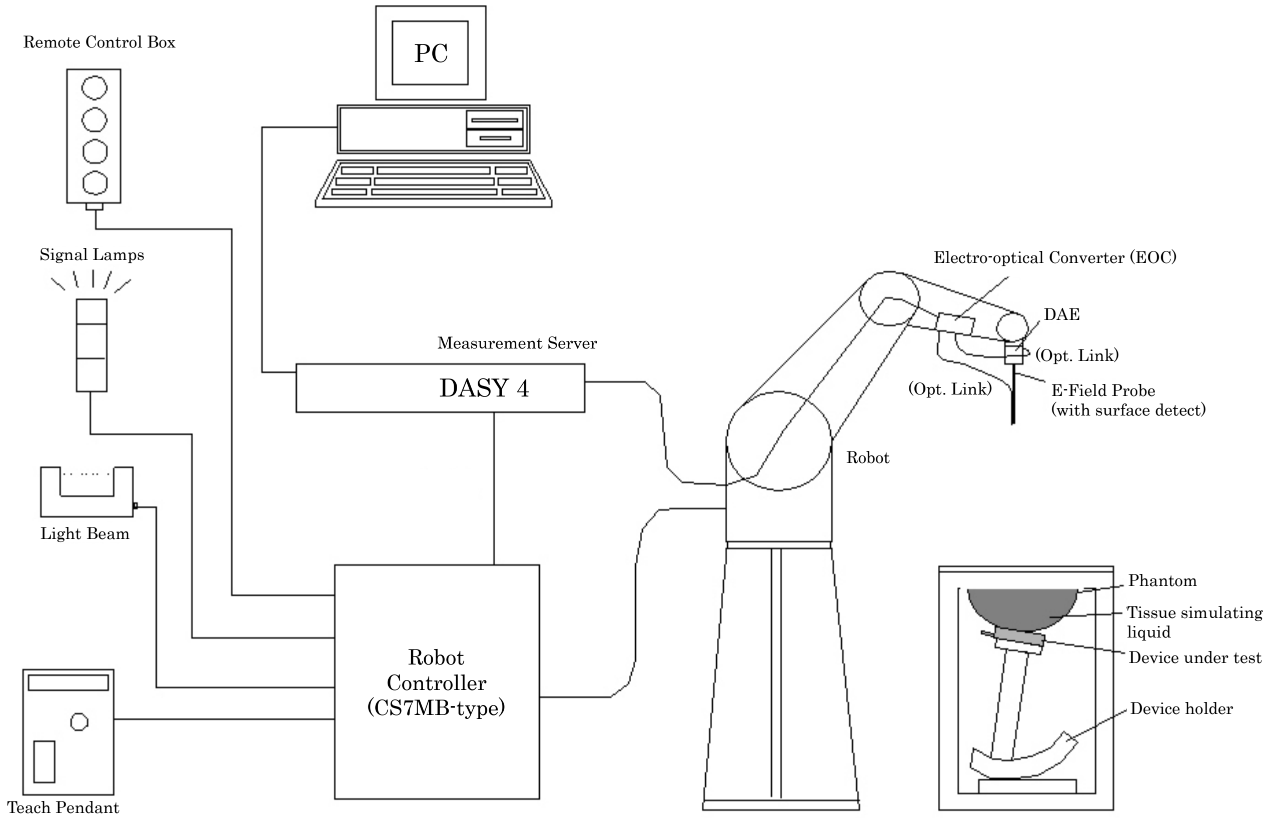
1. Manufacturer	:	Sharp Corporation, Communication Systems Group 2-13-1, Iida, Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
2. Products	:	Cellular Phone
3. Model No.	:	SH-10C
4. Serial No.	:	004401113245134
5. Product Type	:	Pre-production
6. Date of Manufacture	:	March, 2011
7. Transmitting Frequency	:	826.40 MHz – 846.60 MHz (WCDMA Band V) 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 SH27 (800mAh)
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)	:	22(H), 24(E), 15.247
14. EUT Authorization	:	Certification
15. Received Date of EUT	:	March 24, 2011

5 Test Results

Mode	CH	Freq. (MHz)	Test Position	1g SAR (mW/g)	Results
WCDMA Band V 12.2kbps RMC	4132	826.4	Right Head Touched	0.522	PASSED
	4233	846.6	Body Rear w/ 1.5cm Viewer Style	0.875	PASSED
PCS 1900 GSM Voice	661	1880.0	Right Head Touched	0.433	PASSED
	512	1850.2	Body Rear w/ 1.5cm Close Style	0.507	PASSED
WLAN 802.11b 1 Mbps	11	2462	Right Head Touched	0.014	PASSED
	11	2462	Body Rear w/ 1.5cm Viewer Style	0.069	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

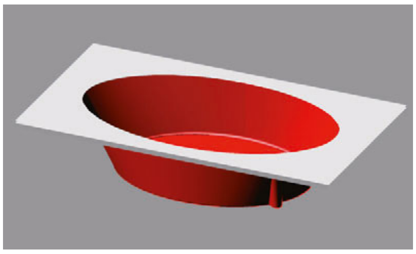
Construction	: Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static changes
Calibration	: In air form 10 MHz to 2.5 GHz In head tissue simulating liquid (HSL) and muscle tissue simulating liquid 835 MHz (accuracy ± 11.0%; k=2) 900 MHz (accuracy ± 11.0%; k=2) 1450 MHz (accuracy ± 11.0%; k=2) 1750 MHz (accuracy ± 11.0%; k=2) 1900 MHz (accuracy ± 11.0%; k=2) 1950 MHz (accuracy ± 11.0%; k=2) 2450 MHz (accuracy ± 11.0%; k=2)
Frequency	: 10 MHz to 3 GHz (dosimetry); Linearity: ±0.2 dB (30 MHz to 3 GHz)
Directivity	: ± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal 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 10 mm Body diameter 10 mm Tip diameter 6.8 mm Distance from probe tip to dipole centers 2.7 mm

7.2 Twin SAM Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, CENELEC 50361 and IEC 62209. 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)

7.3 ELI4 Flat Phantom



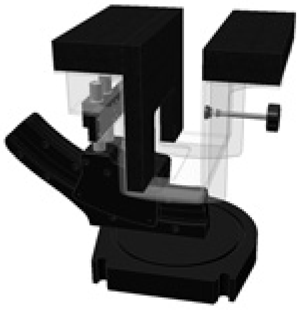
Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be 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 supported by software version DASY4.5 and higher and 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
Compatibilities : Standard: IEC 62209 Part II (Draft 0.9 and higher)
Software release: DASY 4.5 or higher
SPEAG standard phantom table
all SPEAG dosimetric probes and dipoles

7.4 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).

7.5 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.

7.6 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 MΩ+ 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	5.9	N	1	1	1	5.9	5.9	∞
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	0.4	N	1	1	1	0.4	0.4	∞
Response time	0.0	R	√3	1	1	0.0	0.0	∞
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	10.7	
Expanded Uncertainty (95% Confidence Interval)		k=2				**22.0**	**21.4**	

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 :

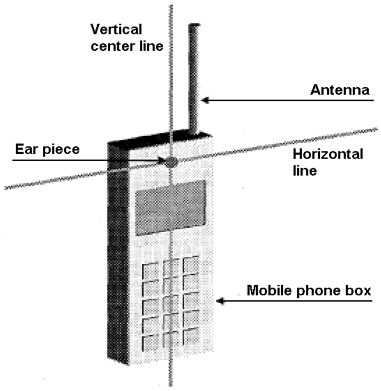
The "as received" sample;

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

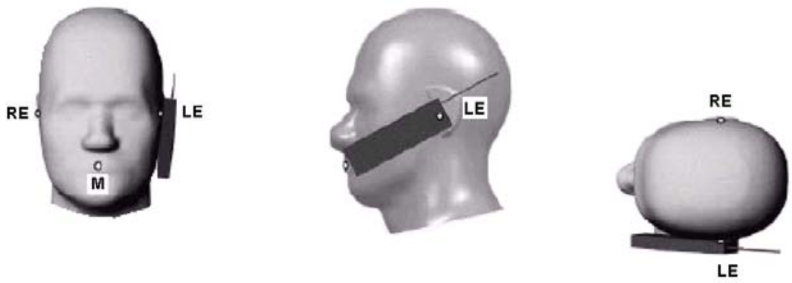
Reviewed by:	Tested by:
S. Kino	Y. Sakai
Shigeru Kinoshita	Yasuhisa Sakai
Deputy Manager	Deputy Manager
Testing Dept. EMC Div.	Testing Dept. EMC Div.
JQA KITA-KANSAI Testing Center	JQA KITA-KANSAI Testing Center

14 Test Arrangement

14.1 Cheek-Touch Position

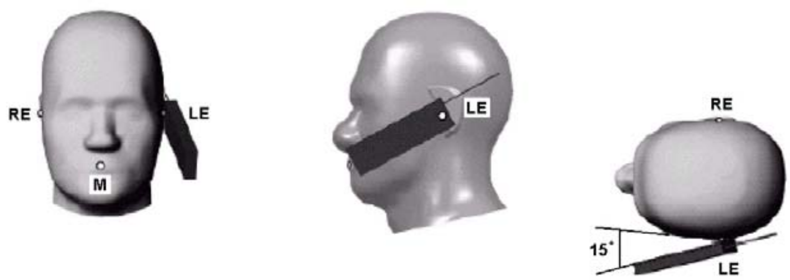


1. Position the device with the vertical center line of the body of the device and the horizontal line crossing the center of the ear piece in a plane parallel to the sagittal plane of the phantom.
2. While maintaining the device in this plane, align the vertical center line with the reference plane 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.



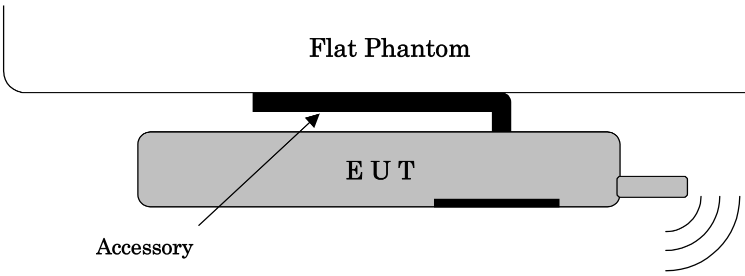
14.2 Ear-Tilt Position

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.



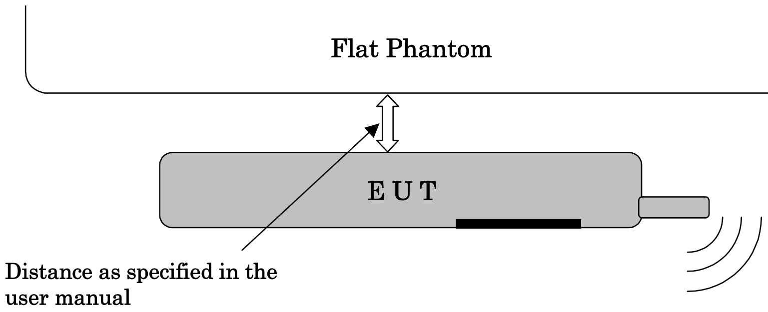
14.3 Body-worn Configuration

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 WCDMA Band V

To setup the desire channel frequency and the maximum output power, a Radio Communication Tester "Anritsu, MT8815B" was used to program the EUT.

System Configuration : W-CDMA (MX882000C 10.23 #002)

3GPP Release 99 WCDMA Settings

Settings	Release 99	
Loopback Mode	Mode 1	OFF
Channel Coding	12.2k / 64k / 144k / 384kbps RMC	Voice AMR
TPC Bit Pattern	All 1	
Power Tolerance (dB)	+1.7/-3.7	

3GPP Release 5 HSDPA Settings

Settings	Release 5 HSDPA			
Sub-test	1	2	3	4
Loopback Mode	Mode 1			
Channel Coding	FRC with H-Set 1 (QPSK)			
TPC Algorithm	2			
TPC Bit Pattern	All 1			
Beta C	2	11	15	15
Beta D	15	15	8	4
MPR (dB)	0	0	0.5	0.5
Power Tolerance (dB)	+1.7/-3.7	+1.7/-3.7	+2.7/-3.7	+3.7/-3.7

3GPP Release 6 HSPA Settings

Settings	Release 6 HSPA				
Sub-test	1	2	3	4	5
Loopback Mode	Mode 1				
Channel Coding	E-DCH RF Test with TTI 10ms (QPSK)				
TPC Algorithm	2				1
TPC Bit Pattern	Inner Loop Power Control				All 1
Beta C	10	6	15	2	15
Beta D	15	15	9	15	0
Absolute Grant Value	20	12	15	17	12
MPR (dB)	0	2	1	2	0
Power Tolerance (dB)	+1.7/-6.7	+3.7/-5.2	+2.7/-5.2	+3.7/-5.2	+1.7/-3.7

Conducted power measurement results

Mode		Conducted Power (dBm)		
		4132 ch (826.40 MHz)	4182 ch (836.40 MHz)	4233 ch (846.60 MHz)
12.2 kbps RMC		**22.72**	**22.98**	**22.98**
64 kbps RMC		22.72	22.98	22.97
144 kbps RMC		22.72	22.96	22.97
384 kbps RMC		22.71	22.96	22.96
Voice AMR		22.72	22.99	23.00
R5 HSDPA	Sub-test 1	22.70	22.98	22.99
	Sub-test 2	22.70	22.98	22.98
	Sub-test 3	22.29	22.58	22.57
	Sub-test 4	22.23	22.54	22.53
R6 HSPA	Sub-test 1	21.09	21.26	21.29
	Sub-test 2	20.86	21.08	21.08
	Sub-test 3	21.42	21.68	21.65
	Sub-test 4	20.83	21.03	21.05
	Sub-test 5	22.69	22.98	22.97

SAR in voice and data modes is measured using a 12.2 kbps RMC. SAR in voice AMR configurations and for other spreading codes are not required when the maximum average output of each channel is less than ¼ dB higher than that measured in 12.2 kbps RMC.

Body SAR for HSPA (HSDPA/HSUPA) is not required when the maximum average output with HSPA active is less than ¼ dB higher than that measured without HSPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75% of the SAR limit.

The maximum power reduction (MPR) on the order of 0, 2, 1, 2, 0 dB are expected for the subtests specified in R6 HSPA. Conducted power measurement results are set within 24 dBm +/- expected power tolerance.

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 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 8 (4 down / 1 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.	29.46	29.46	29.42
	Frame Avg.	**20.43**	**20.43**	**20.39**
GPRS (1 slot)	Burst Avg.	29.46	29.46	29.42
	Frame Avg.	20.43	20.43	20.39

SAR test for GPRS mode is reduced when the source-based time-averaged output power for GPRS mode is lower than that in the normal GSM voice mode.

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 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**	**14.37**	**14.90**	**15.24**
	2 Mbps	14.67	15.19	15.26
	5.5 Mbps	14.55	14.69	15.09
	11 Mbps	14.21	14.64	15.07
802.11g	6 Mbps	10.64	10.90	11.39
	9 Mbps	10.45	10.94	11.33
	12 Mbps	10.59	10.92	11.26
	18 Mbps	10.65	10.83	11.17
	24 Mbps	10.67	10.93	11.27
	36 Mbps	10.30	10.77	11.15
	48 Mbps	10.29	10.72	11.07
	54 Mbps	10.33	10.77	11.09
802.11n	6.5 Mbps	10.27	10.83	11.10
	13 Mbps	10.17	10.83	11.08
	19.5 Mbps	10.23	10.66	11.27
	26 Mbps	10.27	10.78	11.19
	39 Mbps	10.29	10.83	11.19
	52 Mbps	10.37	10.96	11.07
	58.5 Mbps	10.21	10.60	10.95
	65 Mbps	10.24	10.65	10.91

The output of WLAN transmitter is > $2 \cdot P_{ref}$ (its antenna is >5.0 cm from 3G/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.

15.4 Bluetooth

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

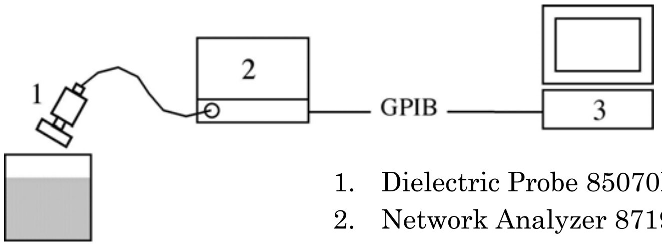
Modulation type	:	Frequency Hopping Spread Spectrum (FHSS)
Transmitting Frequency	:	2402 MHz (0 ch) – 2480 MHz (78 ch)
RF Output Power	:	Max. 2.5 mW (Class 2)

The output of Bluetooth transmitter is ≤ P_{ref} and its antenna is >2.5 cm from 3G/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

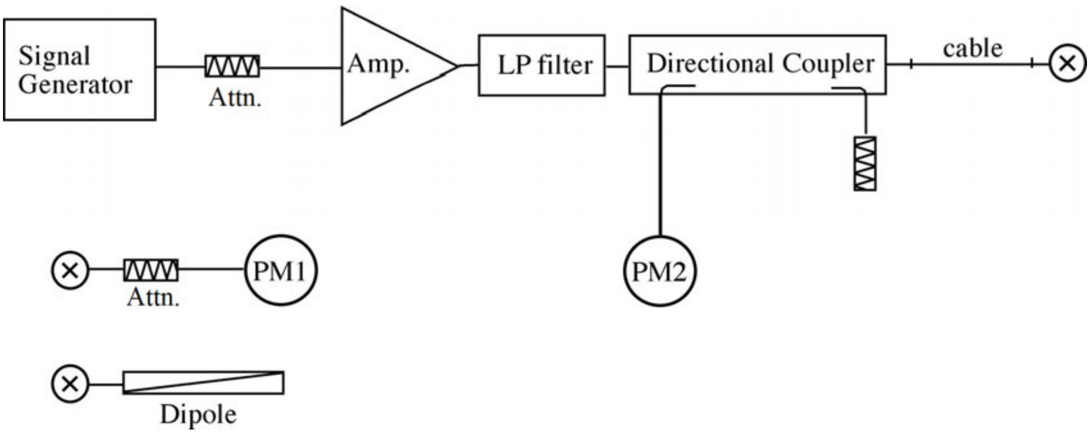
Tissue Verification Results :

Liquid	Freq. [MHz]	Temp. [°C]	Parameters	Target	Measured	Deviation [%]	Limit [%]
Ambient Conditions : 22°C 31%					Date : March 31, 2011		
Head	835	22.0	Permittivity	41.5	40.64	-2.07	± 5
			Conductivity	0.90	0.900	+0.00	± 5
Ambient Conditions : 22°C 27%					Date : April 1, 2011		
Body	835	22.0	Permittivity	55.2	53.97	-2.23	± 5
			Conductivity	0.97	0.946	-2.47	± 5
Ambient Conditions : 22°C 26%					Date : March 29, 2011		
Head	1900	22.0	Permittivity	40.0	39.41	-1.48	± 5
			Conductivity	1.40	1.447	+3.36	± 5
Ambient Conditions : 22°C 32%					Date : March 30, 2011		
Body	1900	22.0	Permittivity	53.3	51.97	-2.50	± 5
			Conductivity	1.52	1.564	+2.89	± 5
Ambient Conditions : 22°C 21%					Date : April 4, 2011		
Head	2450	22.0	Permittivity	39.2	39.24	+0.10	± 5
			Conductivity	1.80	1.835	+1.94	± 5
Ambient Conditions : 22°C 21%					Date : April 5, 2011		
Body	2450	22.0	Permittivity	52.7	52.36	-0.65	± 5
			Conductivity	1.95	1.947	-0.15	± 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 835 MHz

System Validation Dipole : D835V2, S/N: 4d081								
Ambient Conditions : 22°C 31%			Depth of Liquid : 15.0 cm			Date : March 31, 2011		
Liquid	Freq. [MHz]	Temp. [°C]	Measured SAR (mW/g)		Normalized to 1 W	Target	Deviation [%]	Limit [%]
Head	835	22.0	1g	2.40	9.60	9.67	-0.72	± 10
			10g	1.57	6.28	6.29	-0.16	± 10
Ambient Conditions : 22°C 27%			Depth of Liquid : 15.0 cm			Date : April 1, 2011		
Body	835	22.0	1g	2.45	9.80	10.0	-2.00	± 10
			10g	1.62	6.48	6.64	-2.41	± 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 1900 MHz

System Validation Dipole : D1900V2, S/N: 5d112								
Ambient Conditions : 22°C 26%			Depth of Liquid : 15.0 cm			Date : March 29, 2011		
Liquid	Freq. [MHz]	Temp. [°C]	Measured SAR (mW/g)		Normalized to 1 W	Target	Deviation [%]	Limit [%]
Head	1900	22.0	1g	10.1	40.40	40.4	+0.00	± 10
			10g	5.31	21.24	21.2	+0.19	± 10
Ambient Conditions : 22°C 32%			Depth of Liquid : 15.0 cm			Date : March 30, 2011		
Body	1900	22.0	1g	10.1	40.40	42.2	-4.27	± 10
			10g	5.41	21.64	22.9	-5.50	± 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.2.3 System Validation Results for 2450 MHz

System Validation Dipole : D2450V2, S/N: 714								
Ambient Conditions : 22°C 21%			Depth of Liquid : 15.0 cm			Date : April 4, 2011		
Liquid	Freq. [MHz]	Temp. [°C]	Measured SAR (mW/g)		Normalized to 1 W	Target	Deviation [%]	Limit [%]
Head	2450	22.0	1g	13.7	54.80	53.8	+1.86	± 10
			10g	6.21	24.84	24.9	-0.24	± 10
Ambient Conditions : 22°C 21%			Depth of Liquid : 15.0 cm			Date : April 5, 2011		
Body	2450	22.0	1g	12.8	51.2	50.7	+0.99	± 10
			10g	5.78	23.12	23.4	-1.20	± 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.3 SAR Measurement Data

A.3.1 WCDMA Band V

A.3.1.1 Left Head

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Cheek/Touch Position **Ear/Tilt Position**

R99 12.2kbps RMC (Duty Cycle: 100 %, Crest Factor: 1) Date : March 31, 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	4182	836.40	22.98	-0.024	1.6	0.469	22.0
Ear/Tilt	4182	836.40	22.98	-0.025	1.6	0.246	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

CONFIDENTIAL

Cheek/Touch Position **Ear/Tilt Position**

R99 12.2kbps RMC (Duty Cycle: 100 %, Crest Factor: 1) Date : March 31, 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	4132	826.40	22.72	-0.034	1.6	0.522	22.0
	4182	836.40	22.98	-0.016		0.477	22.0
	4233	846.60	22.98	-0.045		0.436	22.0
Ear/Tilt	4182	836.40	22.98	-0.048	1.6	0.241	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-worn Position – Close Style

CONFIDENTIAL

Rear Position **Front Position**

R99 12.2kbps RMC (Duty Cycle: 100 %, Crest Factor: 1) Date : April 1, 2011

Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	**1g SAR [mW/g]**	Tissue Temp. [°C]
Rear	4132	826.40	22.72	0.000	1.6	0.760	22.0
	4182	836.40	22.98	-0.019		0.823	22.0
	4233	846.60	22.98	-0.029		0.867	22.0
Front	4182	836.40	22.98	-0.032	1.6	0.238	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. The earphone wire connected to the EUT to simulate hand-free operation in a body-worn configuration.
4. Please refer to attachment for the result presentation in plot format.

A.3.1.4 Body-worn Position – Viewer Style

CONFIDENTIAL

Rear Position **Front Position**

R99 12.2kbps RMC (Duty Cycle: 100 %, Crest Factor: 1) Date : April 1, 2011

Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	**1g SAR [mW/g]**	Tissue Temp. [°C]
Rear	4132	826.40	22.72	-0.003	1.6	0.809	22.0
	4182	836.40	22.98	-0.023		0.844	22.0
	4233	846.60	22.98	-0.028		0.875	22.0
Front	4182	836.40	22.98	-0.018	1.6	0.233	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. The earphone wire connected to the EUT to simulate hand-free operation in a body-worn configuration.
4. Please refer to attachment for the result presentation in plot format.

A.3.2 PCS 1900

A.3.2.1 Left Head

CONFIDENTIAL

Cheek/Touch Position **Ear/Tilt Position**

GSM (Duty Cycle: 12.0 %, Crest Factor: 8.3) Date : March 29, 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	29.46	-0.055	1.6	0.224	22.0
Ear/Tilt	661	1880.00	29.46	-0.047	1.6	0.174	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.3.2.2 Right Head

CONFIDENTIAL

Cheek/Touch Position **Ear/Tilt Position**

GSM (Duty Cycle: 12.0 %, Crest Factor: 8.3) Date : March 29, 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	29.46	-0.038	1.6	0.407	22.0
	661	1880.00	29.46	-0.054		0.433	22.0
	810	1909.80	29.42	-0.073		0.428	22.0
Ear/Tilt	661	1880.00	29.46	-0.090	1.6	0.185	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.3.2.3 Body-worn Position – Close Style

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Rear Position **Front Position**

GSM (Duty Cycle: 12.0 %, Crest Factor: 8.3) Date : March 30, 2011

Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	**1g SAR [mW/g]**	Tissue Temp. [°C]
Rear	512	1850.20	29.46	-0.042	1.6	0.507	22.0
	661	1880.00	29.46	-0.035		0.467	22.0
	810	1909.80	29.42	-0.004		0.432	22.0
Front	661	1880.00	29.46	-0.061	1.6	0.114	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. The earphone wire connected to the EUT to simulate hand-free operation in a body-worn configuration.
4. Please refer to attachment for the result presentation in plot format.

A.3.2.4 Body-worn Position – Viewer Style

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Rear Position **Front Position**

GSM (Duty Cycle: 12.0 %, Crest Factor: 8.3) Date : March 30, 2011

Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	**1g SAR [mW/g]**	Tissue Temp. [°C]
Rear	661	1880.00	29.46	-0.071	1.6	0.388	22.0
Front	661	1880.00	29.46	-0.046	1.6	0.192	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. The earphone wire connected to the EUT to simulate hand-free operation in a body-worn configuration.
4. Please refer to attachment for the result presentation in plot format.

A.3.3 WLAN

A.3.3.1 Left Head

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Cheek/Touch Position **Ear/Tilt Position**

802.11b (1 Mbps) – Duty Cycle: 100 % Date : April 4, 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	14.90	-0.078	1.6	0.00731	22.0
Ear/Tilt	6	2437	14.90	-0.053	1.6	0.00379	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.3.3.2 Right Head

CONFIDENTIAL

Cheek/Touch Position **Ear/Tilt Position**

802.11b (1 Mbps) – Duty Cycle: 100 % Date : April 4, 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	14.37	-0.052	1.6	0.012	22.0
	6	2437	14.90	-0.011		0.013	22.0
	11	2462	15.24	-0.038		0.014	22.0
Ear/Tilt	6	2437	14.90	-0.078	1.6	0.00484	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.3.3.3 Body-worn Position – Close Style

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Rear Position **Front Position**

802.11b (1 Mbps) – Duty Cycle: 100 % Date : April 5, 2011

Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	**1g SAR [mW/g]**	Tissue Temp. [°C]
Rear	6	2437	14.90	-0.036	1.6	0.050	22.0
Front	6	2437	14.90	-0.041	1.6	0.012	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. The earphone wire connected to the EUT to simulate hand-free operation in a body-worn configuration.
4. Please refer to attachment for the result presentation in plot format.

A.3.3.4 Body-worn Position – Viewer Style

CONFIDENTIAL

Rear Position **Front Position**

802.11b (1 Mbps) – Duty Cycle: 100 % Date : April 5, 2011

Test Position	Ch No.	Frequency [MHz]	Tx Power [dBm]	Power Drift [dB]	Limit [mW/g]	1g SAR [mW/g]	Tissue Temp. [°C]
Rear	1	2412	14.37	-0.016	1.6	0.060	22.0
	6	2437	14.90	-0.089		0.063	22.0
	11	2462	15.24	-0.070		0.069	22.0
Front	6	2437	14.90	-0.046	1.6	0.031	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. The earphone wire connected to the EUT to simulate hand-free operation in a body-worn configuration.
4. Please refer to attachment for the result presentation in plot format.

A.3.4 SAR Handsets Multiple Transmitters Assessment

Simultaneous Transmission

3G/GSM with WLAN : Yes
3G/GSM with Bluetooth : Yes
WLAN with Bluetooth : No

Antenna Separation Distances

3G/GSM to WLAN : 74 mm
3G/GSM to Bluetooth : 74 mm

Stand-alone SAR Requirements for Unlicensed Transmitters

WLAN : Required
The output of WLAN transmitter is > 2·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 3G/GSM vs. WLAN

Test Position	Highest 1g SAR (mW/g)			Σ 1g SAR (mW/g)
	3G/GSM Band		WLAN	
Right Head Touched	WCDMA Band V	0.522	0.014	0.536
	PCS 1900	0.433	0.014	0.447
Body Rear w/ 1.5cm Viewer Style	WCDMA Band V	0.875	0.069	0.944
Body Rear w/ 1.5cm Close Style	PCS 1900	0.507	0.050	0.557

Sum of the 1g SAR for WLAN vs. 3G/GSM

Test Position	Highest 1g SAR (mW/g)			Σ 1g SAR (mW/g)
	WLAN	3G/GSM Band		
Right Head Touched	0.014	WCDMA Band V	0.522	0.536
		PCS 1900	0.433	0.447
Body Rear w/ 1.5cm Viewer Style	0.069	WCDMA Band V	0.875	0.944
		PCS 1900	0.388	0.457

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

Appendix B: Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
E-Field Probe	ET3DV6	SPEAG	S-2	2010/8	1 Year
DAE	DAE3 V1	SPEAG	S-3	2010/11	1 Year
Robot	RX60L	SPEAG	S-7	N/A	N/A
Probe Alignment Unit	LB1RX60L	SPEAG	S-13	N/A	N/A
Network Analyzer	8719ET	Agilent	B-53	2010/10	1 Year
Dielectric Probe Kit	85070D	Agilent	B-54	N/A	N/A
835MHz Dipole	D835V2	SPEAG	S-23	2010/8	1 Year
1900MHz Dipole	D1900V2	SPEAG	S-25	2010/8	1 Year
2450MHz Dipole	D2450V2	SPEAG	S-6	2010/11	1 Year
Signal Generator	MG3681A	Anritsu	B-3	2010/10	1 Year
RF Amplifier	A0840-3833-R	R&K	A-34	N/A	N/A
Low Pass Filter	LSM1000-4BA	LARK	D-90	2010/11	1 Year
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	2010/4	1 Year
Radio Communication Analyzer	MT8815B	Anritsu	B-69	2010/10	1 Year
Power Meter	E4417A	Agilent	B-51	2010/6	1 Year
Power Sensor	E9300B	Agilent	B-32	2010/6	1 Year
Power Sensor	E9323A	Agilent	B-59	2010/6	1 Year
Power Meter	N1911A	Agilent	B-63	2010/6	1 Year
Power Sensor	N1921A	Agilent	B-64	2010/6	1 Year
Attenuator	54A-10	Weinschel	D-28	2010/9	1 Year
Attenuator	2-20	Weinschel	D-36	2010/9	1 Year

Appendix C: Attachments

Exhibit	Contents	No. of page(s)
1	System Validation Plots	6
2-1	SAR Test Plots (WCDMA Band V)	16
2-2	SAR Test Plots (PCS 1900)	14
2-3	SAR Test Plots (WLAN)	14
3	Dosimetric E-Field Probe – ET3DV6, S/N: 1679	11
4-1	System Validation Dipole – D835V2, S/N: 4d081	9
4-2	System Validation Dipole – D1900V2, S/N: 5d112	9
4-3	System Validation Dipole – D2450V2, S/N: 714	9