JQA File No. : KL80120196R
Issue Date : July 18, 2012

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-10D
Serial No.	:	004401114085133
FCC ID	:	APYHRO00173
Test Standard	:	FCC/OET Bulletin 65 Supplement C (Edition 01-01)
Test Results	:	Passed
Date of Test	:	July 5 ~ 7, 2012

VLAC-001-2

Kousei Shibata
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- 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.
- VLAC does not approve, certify or warrant the product by this test report.

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1 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-10D
4.	Serial No.	: 004401114085133
5.	Product Type	: Pre-production
6.	Date of Manufacture	: June, 2012
7.	Transmitting Frequency	: 826.4 MHz – 846.6 MHz (WCDMA Band V) 824.2 MHz – 848.8 MHz (GSM 850) 1850.2 MHz – 1909.8 MHz (PCS 1900) 2412 MHz – 2462 MHz (WLAN 802.11b/g/n) 2402 MHz – 2480 MHz (Bluetooth)
8.	Battery Option	: Lithium-ion Battery Pack SH38 (1900mAh)
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	: June 30, 2012

2 Summary of Test Results

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

Band	CH	Freq. (MHz)	Region	Test Position	1g SAR (mW/g)	Results
WCDMA Band V	4233	846.6	Head	Left Touched	0.465	PASSED
	4233	846.6	Body	Rear Side	0.666	PASSED
GSM 850	189	836.4	Head	Left Touched	0.636	PASSED
	189	836.4	Body	Rear Side	0.812	PASSED
PCS 1900	661	1880.0	Head	Right Touched	0.341	PASSED
	661	1880.0	Body	Rear Side	0.630	PASSED

In the approval of 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.
- No deviations were employed from the applied standard.
- No modifications were conducted by JQA to achieve compliance to the limitations.

Reviewed by:

S. Kino

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3 Test Procedure

The tests documented in this report were performed in accordance with FCC/OET Bulletin 65 Supplement C (Edition 01-01), IEEE Std.1528–2003 and the following KDB Procedures.

648474 D01 SAR Handsets Multi Xmiter and Ant v01r05
248227 D01 SAR meas for 802 11 a b g v01r02
941225 D01 SAR test for 3G devices v02
941225 D02 Guidance PBA for 3GPP R6 HSPA v02r01
941225 D03 SAR Test Reduction GSM GPRS EDGE v01
941225 D06 Hot Spot SAR v01

Exposure limits are specified in ANSI/IEEE Std. C95.1–1991.

4 Test Location

Japan Quality Assurance Organization (JQA)
KITA-KANSAI Testing Center
7-7, Ishimaru, 1-chome, Minoh-shi, Osaka, 562-0027, Japan
SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

5 Recognition of Test Laboratory

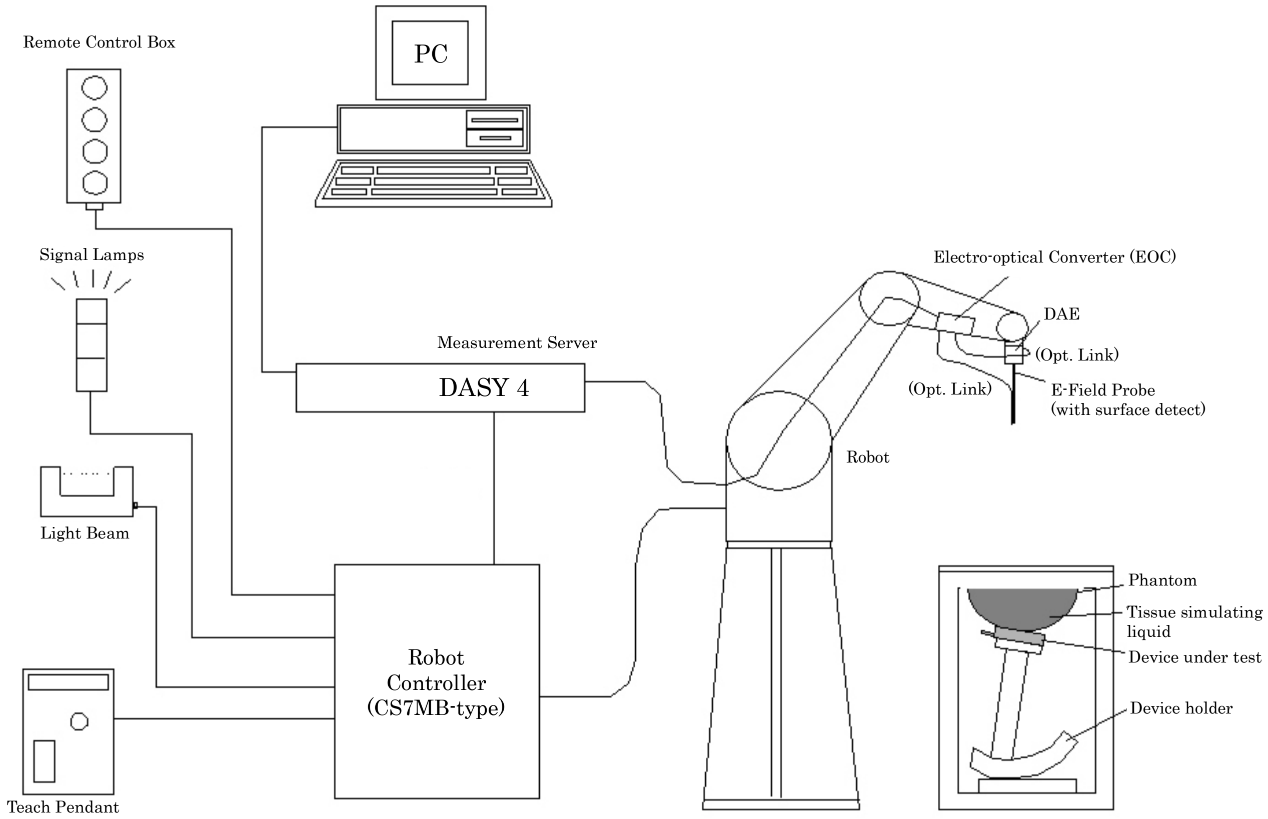
JQA KITA-KANSAI Testing Center SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility is registered by the following bodies.

VLAC Accreditation No.	:	VLAC-001-2 (Expiry date : March 30, 2014)
VCCI Registration No.	:	A-0002 (Expiry date : March 30, 2014)
BSMI Registration No.	:	SL2-IS-E-6006, SL2-IN-E-6006, SL2-AI-E-6006 (Expiry date : September 14, 2013)
IC Registration No.	:	2079E-3, 2079E-4 (Expiry date : July 20, 2014)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI.
(Expiry date : February 22, 2013)

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.

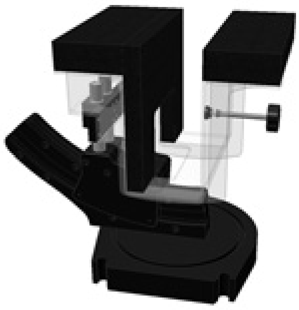
Shell Thickness : 2 ± 0.2 mm (sagging: <1%)
Filling Volume : Volume Approx. 30 liters
Dimensions : Major ellipse axis : 600 mm
Minor axis : 400 mm

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 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.

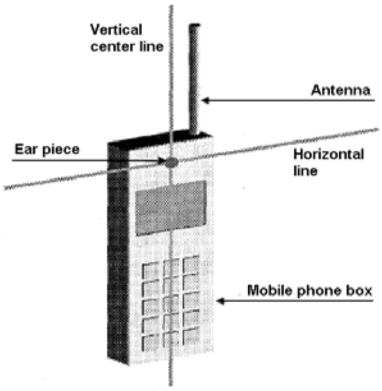
9 Measurement Uncertainties

Uncertainty Component	Tol. (± %)	Prob. Dist.	Div.	c_i (1g)	c_i (10g)	Std. Unc. (± %)		v_i
						1g	10g	
Measurement System								
Probe calibration	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 Test Arrangement

10.1 Cheek-Touch Position



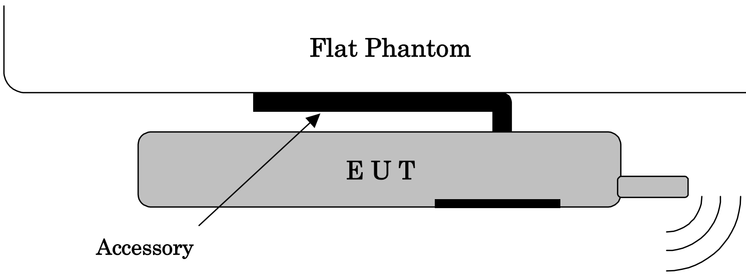
1. Position the device with the vertical center line of the body of the device and the horizontal line crossing the center of the ear piece in a plane parallel to the sagittal plane of the phantom.
2. While maintaining the device in this plane, align the vertical center line with the reference plane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

10.2 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.

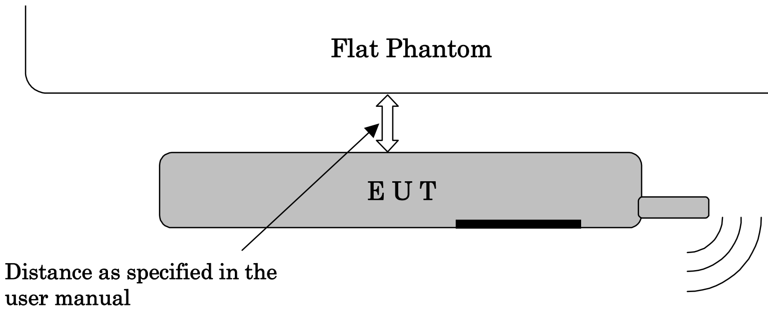
10.3 Body-worn Configuration

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.

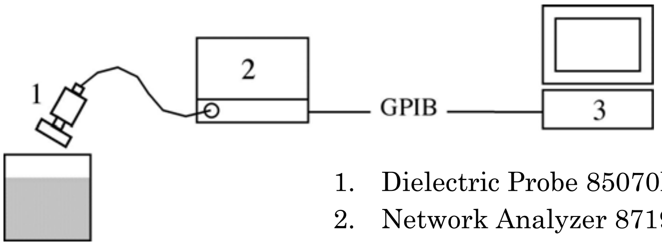
Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. 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.

11 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

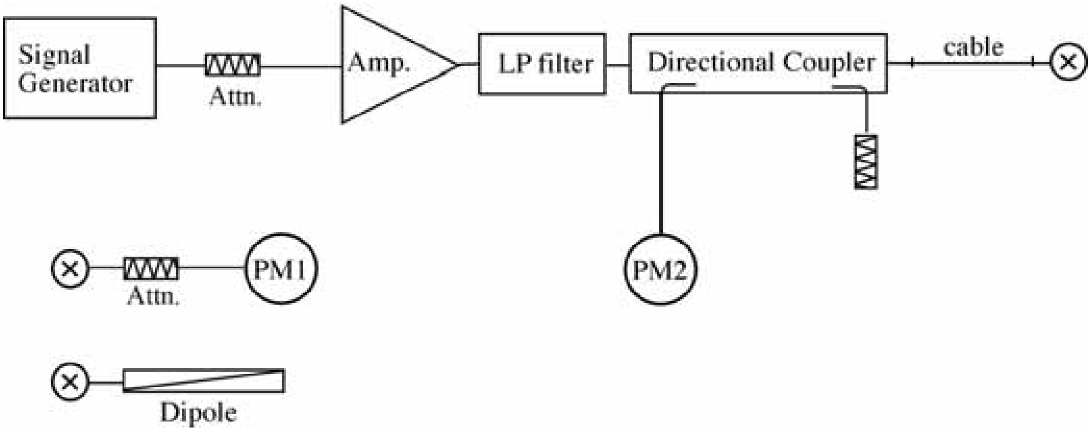
Tissue Verification Results :

Liquid	Freq. [MHz]	Temp. [°C]	Parameters	Target	Measured	Deviation [%]	Limit [%]
Ambient Conditions : 22°C 76%					Date : July 5, 2012		
Head	835	22.0	Permittivity	41.5	41.60	+0.24	± 5
			Conductivity	0.90	0.908	+0.89	± 5
Ambient Conditions : 22°C 75%					Date : July 6, 2012		
Body	835	22.0	Permittivity	55.2	55.16	-0.07	± 5
			Conductivity	0.97	0.963	-0.72	± 5
Ambient Conditions : 22°C 71%					Date : July 7, 2012		
Head	1900	22.0	Permittivity	40.0	40.51	+1.28	± 5
			Conductivity	1.40	1.408	+0.57	± 5
Body	1900	22.0	Permittivity	53.3	52.36	-1.76	± 5
			Conductivity	1.52	1.550	+1.97	± 5

12 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.



12.1 System Validation Results for 835 MHz

System Validation Dipole : D835V2, S/N: 4d081								
Ambient Conditions : 22°C 76%			Depth of Liquid : 15.0 cm			Date : July 5, 2012		
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	9.38	+2.35	± 10
			10g	1.59	6.36	6.11	+4.09	± 10
Ambient Conditions : 22°C 75%			Depth of Liquid : 15.0 cm			Date : July 6, 2012		
Body	835	22.0	1g	2.34	9.36	9.62	-2.70	± 10
			10g	1.57	6.28	6.38	-1.57	± 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.

12.2 System Validation Results for 1900 MHz

System Validation Dipole : D1900V2, S/N: 5d112
Ambient Conditions : 22°C 71%   Depth of Liquid : 15.0 cm   Date : July 7, 2012

Liquid	Freq. [MHz]	Temp. [°C]	Measured SAR (mW/g)		Normalized to 1 W	Target	Deviation [%]	Limit [%]
Head	1900	22.0	1g	9.80	39.20	40.3	-2.73	± 10
			10g	5.20	20.80	21.1	-1.42	± 10
Body	1900	22.0	1g	10.5	42.00	41.3	+1.69	± 10
			10g	5.55	22.20	21.8	+1.83	± 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.

13 RF Output Power Measurements

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

13.1 WCDMA Band V

To setup the desire channel frequency and the maximum output power, a Radio Communication Tester "Anritsu, MT8820C" was used to program the EUT.

System Configuration : W-CDMA (MX882000C 22.11 #014)

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	Fixed Reference Channel (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 Average Power (dBm)		
		4132 ch (826.4 MHz)	4182 ch (836.4 MHz)	4233 ch (846.6 MHz)
12.2 kbps RMC		**23.09**	**23.14**	**22.97**
64 kbps RMC		23.08	23.11	22.95
144 kbps RMC		23.09	23.12	22.97
384 kbps RMC		23.08	23.10	22.98
Voice AMR		23.08	23.13	22.97
R5 HSDPA	Sub-test 1	23.09	23.14	22.98
	Sub-test 2	23.07	23.12	22.98
	Sub-test 3	22.67	22.74	22.51
	Sub-test 4	22.66	22.74	22.52
R6 HSPA	Sub-test 1	22.78	22.89	22.69
	Sub-test 2	20.99	21.14	20.94
	Sub-test 3	21.95	22.07	21.87
	Sub-test 4	20.97	21.09	20.85
	Sub-test 5	23.06	23.13	22.96

Note(s):

1. KDB 941225 D01 – 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.
2. KDB 941225 D01 – 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.
3. KDB 941225 D01 – Head SAR for HSPA (VoIP applicable) 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.
4. KDB 941225 D02 – 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.

13.2 GSM 850

To setup the desire channel frequency and the maximum output power, a Radio Communication Tester “Anritsu, MT8820C” was used to program the EUT.

System Configuration : GSM (MX882001C 22.11 #028)

Band Indicator : GSM 850
MS Power Level : PCL 5 (33 dBm)
GPRS Settings
Connection Type : Test Mode A
Multi Slot Class : 12 (4 down / 4 up / 5 sum)
Coding Scheme : CS1 (GMSK)

Conducted power measurement results

Mode		Conducted Power (dBm)		
		128 ch (824.2 MHz)	189 ch (836.4 MHz)	251 ch (848.8 MHz)
GSM	Burst Avg.	32.11	32.19	31.96
	Frame Avg.	23.08	23.16	22.93
GPRS (1 slot)	Burst Avg.	32.11	32.19	31.96
	Frame Avg.	23.08	23.16	22.93
GPRS (2 slot)	Burst Avg.	29.91	29.67	29.76
	Frame Avg.	23.89	23.65	23.74
GPRS (3 slot)	Burst Avg.	28.58	28.32	28.28
	Frame Avg.	24.32	24.06	24.02
GPRS (4 slot)	Burst Avg.	27.38	27.37	27.16
	Frame Avg.	**24.37**	**24.36**	**24.15**

Note(s):

1. KDB 941225 D03 – Based on output power above and time slots, the worst-case configuration is chosen as GPRS 4 time slots for Body SAR testing.
2. Because of the VoIP function using GPRS multi-slot, Head SAR is measured for the same mode as the Body SAR testing.

13.3 PCS 1900

To setup the desire channel frequency and the maximum output power, a Radio Communication Tester "Anritsu, MT8820C" was used to program the EUT.

System Configuration : GSM (MX882001C 22.11 #028)

Band Indicator : PCS 1900
MS Power Level : PCL 0 (30 dBm)
GPRS Settings
Connection Type : Test Mode A
Multi Slot Class : 12 (4 down / 4 up / 5 sum)
Coding Scheme : CS1 (GMSK)

Conducted power measurement results

Mode		Conducted Power (dBm)		
		512 ch (1850.2 MHz)	661 ch (1880.0 MHz)	810 ch (1909.8 MHz)
GSM	Burst Avg.	29.60	29.73	29.70
	Frame Avg.	20.57	20.70	20.67
GPRS (1 slot)	Burst Avg.	29.60	29.73	29.70
	Frame Avg.	20.57	20.70	20.67
GPRS (2 slot)	Burst Avg.	27.48	27.60	27.50
	Frame Avg.	21.46	21.58	21.48
GPRS (3 slot)	Burst Avg.	26.04	25.98	25.97
	Frame Avg.	21.78	21.72	21.71
GPRS (4 slot)	Burst Avg.	24.86	25.06	24.79
	Frame Avg.	21.85	22.05	21.78

Note(s):
1. KDB 941225 D03 – Based on output power above and time slots, the worst-case configuration is chosen as GPRS 4 time slots for Body SAR testing.
2. Because of the VoIP function using GPRS multi-slot, Head SAR is measured for the same mode as the Body SAR testing.

13.4 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 Average Power (dBm)		
		1 ch (2412 MHz)	6 ch (2437 MHz)	11 ch (2462 MHz)
802.11b	1 Mbps	10.86	10.65	9.86
	2 Mbps	10.96	10.67	9.76
	5.5 Mbps	11.08	10.86	10.05
	11 Mbps	11.30	10.90	10.15
802.11g	6 Mbps	10.56	10.62	9.61
	9 Mbps	10.56	10.47	9.47
	12 Mbps	10.58	10.53	9.38
	18 Mbps	10.42	10.52	9.40
	24 Mbps	10.38	10.56	9.38
	36 Mbps	10.35	10.40	9.30
	48 Mbps	10.33	10.43	9.38
	54 Mbps	10.34	10.37	9.30
802.11n	6.5 Mbps	10.55	10.52	9.48
	13 Mbps	10.43	10.54	9.40
	19.5 Mbps	10.48	10.56	9.38
	26 Mbps	10.38	10.45	9.39
	39 Mbps	10.42	10.52	9.28
	52 Mbps	10.38	10.29	9.38
	58.5 Mbps	10.66	10.27	9.24
	65 Mbps	10.43	10.38	9.32

Note(s):
According to KDB 648474 D01, the output of WLAN transmitter is $\leq 2 \cdot P_{ref}$ (24mW) and its antenna is > 5.0cm from other antennas, so the stand-alone SAR evaluation for WLAN is not required.
($P_{ref} = ½ \cdot 60 / f_{(GHz)}$ [mW])

13.5 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)

According to KDB 648474 D01, the output of Bluetooth transmitter is $\leq P_{ref}$ (12mW) and its antenna is > 2.5cm from other antennas, so the stand-alone SAR evaluation for Bluetooth is not required.
($P_{ref} = ½\cdot 60 / f_{(GHz)}$ [mW])

14 SAR Measurements

14.1 WCDMA Band V

14.1.1 Head

R99 12.2kbps RMC – Duty Cycle 100%						Date : July 5, 2012	
Test Position	Ch#	Frequency [MHz]	Tx Power [dBm]	Limit [mW/g]	1g SAR [mW/g]		Tissue Temp. [°C]
					Measured	Scaled	
Left Touched	4132	826.4	23.09	1.6	0.323	0.417	22.0
	4182	836.4	23.14		0.395	0.504	22.0
	4233	846.6	22.97		0.465	0.617	22.0
Left Tilted	4182	836.4	23.14	1.6	0.207	0.264	22.0
Right Touched	4182	836.4	23.14	1.6	0.371	0.474	22.0
Right Tilted	4182	836.4	23.14	1.6	0.218	0.278	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. SAR test was performed in the middle channel only as the measured level was <50% (0.8 mW/g) of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
4. The SAR reported at the measured power is scaled up by the maximum power (24.2dBm) of the product spec.
5. Please refer to attachment for the result presentation in plot format.

14.1.2 Body w/ 1.0 cm (hotspot mode)

R99 12.2kbps RMC – Duty Cycle 100%						Date : July 6, 2012	
Test Position	Ch#	Frequency [MHz]	Tx Power [dBm]	Limit [mW/g]	1g SAR [mW/g]		Tissue Temp. [°C]
					Measured	Scaled	
Bottom Edge	4182	836.4	23.14	1.6	**0.089**	0.114	22.0
Left Edge	4182	836.4	23.14	1.6	**0.394**	0.503	22.0
Right Edge	4182	836.4	23.14	1.6	**0.378**	0.482	22.0
Front Side	4182	836.4	23.14	1.6	**0.439**	0.560	22.0
Rear Side	4132	826.4	23.09	1.6	**0.657**	0.848	22.0
	4182	836.4	23.14		**0.654**	0.835	22.0
	4233	846.6	22.97		0.666	0.884	22.0
Rear Side w/ headset	4233	846.6	22.97	1.6	**0.508**	0.674	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. SAR test was performed in the middle channel only as the measured level was <50% (0.8 mW/g) of the SAR limit as stated in FCC “Public Notice DA 02-1438” by the SCC-34/SC-2. Testing in the low and high channel is optional.
4. SAR is tested with a transmitting antenna located within 2.5 cm from that surface or edge (KDB 941225 D06 Hot Spot SAR).
5. The SAR reported at the measured power is scaled up by the maximum power (24.2dBm) of the product spec.
6. Please refer to attachment for the result presentation in plot format.

14.2 GSM 850

14.2.1 Head

GPRS 4 slot (CS1) – Duty Cycle 48.0%							Date : July 5, 2012
Test Position	Ch#	Frequency [MHz]	Tx Power [dBm]	Limit [mW/g]	1g SAR [mW/g]		Tissue Temp. [°C]
					Measured	Scaled	
Left Touched	128	824.2	27.38	1.6	0.448	0.651	22.0
	189	836.4	27.37		0.636	0.926	22.0
	251	848.8	27.16		0.617	0.943	22.0
Left Tilted	189	836.4	27.37	1.6	0.309	0.450	22.0
Right Touched	189	836.4	27.37	1.6	0.541	0.787	22.0
Right Tilted	189	836.4	27.37	1.6	0.314	0.457	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. SAR test was performed in the middle channel only as the measured level was <50% (0.8 mW/g) of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
4. The SAR reported at the measured power is scaled up by the maximum power (29.0dBm) of the product spec.
5. Please refer to attachment for the result presentation in plot format.

14.2.2 Body w/ 1.0 cm (hotspot mode)

GPRS 4 slot (CS1) – Duty Cycle 48.0%							Date : July 6, 2012
Test Position	Ch#	Frequency [MHz]	Tx Power [dBm]	Limit [mW/g]	1g SAR [mW/g]		Tissue Temp. [°C]
					Measured	Scaled	
Bottom Edge	189	836.4	27.37	1.6	**0.099**	0.144	22.0
Left Edge	189	836.4	27.37	1.6	**0.449**	0.654	22.0
Right Edge	189	836.4	27.37	1.6	**0.496**	0.722	22.0
Front Side	189	836.4	27.37	1.6	**0.580**	0.844	22.0
Rear Side	128	824.2	27.38	1.6	**0.751**	1.091	22.0
	189	836.4	27.37		**0.812**	1.182	22.0
	251	848.8	27.16		**0.712**	1.088	22.0
Rear Side w/ headset	189	836.4	27.37	1.6	**0.670**	0.975	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. SAR test was performed in the middle channel only as the measured level was <50% (0.8 mW/g) of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
4. SAR is tested with a transmitting antenna located within 2.5 cm from that surface or edge (KDB 941225 D06 Hot Spot SAR).
5. The SAR reported at the measured power is scaled up by the maximum power (29.0dBm) of the product spec.
6. Please refer to attachment for the result presentation in plot format.

14.3 PCS 1900

14.3.1 Head

GPRS 4 slot (CS1) – Duty Cycle 48.0%							Date : July 7, 2012
Test Position	Ch#	Frequency [MHz]	Tx Power [dBm]	Limit [mW/g]	1g SAR [mW/g]		Tissue Temp. [°C]
					Measured	Scaled	
Left Touched	661	1880.0	25.06	1.6	**0.249**	0.309	22.0
Left Tilted	661	1880.0	25.06	1.6	**0.127**	0.158	22.0
Right Touched	512	1850.2	24.86	1.6	**0.294**	0.382	22.0
	661	1880.0	25.06		0.341	0.423	22.0
	810	1909.8	24.79		**0.331**	0.437	22.0
Right Tilted	661	1880.0	25.06	1.6	**0.143**	0.178	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. SAR test was performed in the middle channel only as the measured level was <50% (0.8 mW/g) of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
4. The SAR reported at the measured power is scaled up by the maximum power (26.0dBm) of the product spec.
5. Please refer to attachment for the result presentation in plot format.

14.3.2 Body w/ 1.0 cm (hotspot mode)

GPRS 4 slot (CS1) – Duty Cycle 48.0%					Date : July 7, 2012		
Test Position	Ch#	Frequency [MHz]	Tx Power [dBm]	Limit [mW/g]	1g SAR [mW/g]		Tissue Temp. [°C]
					Measured	Scaled	
Bottom Edge	661	1880.0	25.06	1.6	**0.260**	0.323	22.0
Left Edge	661	1880.0	25.06	1.6	**0.128**	0.159	22.0
Right Edge	661	1880.0	25.06	1.6	**0.230**	0.286	22.0
Front Side	661	1880.0	25.06	1.6	**0.497**	0.617	22.0
Rear Side	512	1850.2	24.86	1.6	**0.569**	0.740	22.0
	661	1880.0	25.06		0.630	0.782	22.0
	810	1909.8	24.79		**0.616**	0.814	22.0
Rear Side w/ headset	661	1880.0	25.06	1.6	**0.590**	0.733	22.0

NOTES :
1. Depth of Liquid : 15.0 cm
2. Transmitter power was measured at the antenna-conducted terminal.
3. SAR test was performed in the middle channel only as the measured level was <50% (0.8 mW/g) of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
4. SAR is tested with a transmitting antenna located within 2.5 cm from that surface or edge (KDB 941225 D06 Hot Spot SAR).
5. The SAR reported at the measured power is scaled up by the maximum power (26.0dBm) of the product spec.
6. Please refer to attachment for the result presentation in plot format.

14.4 SAR Handsets Multiple Transmitters Assessment (KDB 648474 D01)

Simultaneous Transmission

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

Antenna Separation Distances

3G/GSM to WLAN : 108.5 mm
3G/GSM to Bluetooth : 108.5 mm

Stand-alone SAR Requirements for Unlicensed Transmitters

WLAN : Not required
The output of WLAN transmitter is ≤ $2 \cdot P_{ref}$ and its antenna is > 5.0 cm from main antenna.

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

16 Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
E-Field Probe	ET3DV6	SPEAG	S-2	2011/8	1 Year
DAE	DAE4	SPEAG	S-3	2011/11	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
835MHz Dipole	D835V2	SPEAG	S-23	2011/8	1 Year
1900MHz Dipole	D1900V2	SPEAG	S-25	2011/8	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	LSM1000-4BA	LARK	D-90	2011/11	1 Year
Low Pass Filter	LSM2200-4BA	LARK	D-91	2011/11	1 Year
Radio Communication Analyzer	MT8820C	Anritsu	B-5	2012/2	1 Year
Power Meter	E4417A	Agilent	B-51	2012/6	1 Year
Power Sensor	E9321A	Agilent	B-52	2012/6	1 Year
Power Sensor	E9323A	Agilent	B-59	2012/6	1 Year
Attenuator	2-20	Weinschel	D-36	2011/9	1 Year

17 Appendix

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