JQA File No. : KL80130721
Issue Date : April 10, 2014

TEST REPORT (SAR EVALUATION)

Applicant	:	Sharp Corporation, Communication Systems Division
Address	:	2-13-1, Iida, Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
Products	:	Cellular Phone
Model No.	:	SH-07F
Serial No.	:	004401115055242
FCC ID	:	APYHRO00209
Test Standard	:	CFR 47 FCC Rules and Regulations Part 2
Test Results	:	**Passed**
Date of Test	:	March 27 ~ April 1, 2014

VLAC Lab Accreditation
VLAC-001-2

Kousei Shibata
Manager
Japan Quality Assurance Organization
KITA-KANSAI Testing Center
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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 Device Under Test (DUT)

1.	Manufacturer	:	Sharp Corporation, Communication Systems Division 2-13-1, Iida, Hachihonmatsu, Higashi-Hiroshima City, Hiroshima, 739-0192, Japan
2.	Products	:	Cellular Phone
3.	Model No.	:	SH-07F
4.	Serial No.	:	004401115055242
5.	Product Type	:	Pre-production
6.	Date of Manufacture	:	March, 2014
7.	Transmitting Frequency	:	GSM 850 (824 MHz – 849 MHz) PCS 1900 (1850 MHz – 1910 MHz) WCDMA Band V (824 MHz – 849 MHz)
8.	Battery Option	:	Lithium-ion Battery Pack SH39 (820mAh)
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)
14.	EUT Authorization	:	Certification
15.	Received Date of DUT	:	March 27, 2014

2 Summary of Test Results

Applied Standard : CFR 47 FCC Rules and Regulations Part 2 – Frequency Allocations and Radio Treaty Matters; General Rules and Regulations

Test Configuration	Reported 1 g SAR (W/kg)			Limit (W/kg)
	Licensed	DTS	U-NII	
Head	0.85	N/A	N/A	1.6
Body-worn Accessory	0.83	N/A	N/A	
Wireless Router (Hotspot)	N/A	N/A	N/A	
Simultaneous Transmission	N/A	N/A	N/A	

The test results are passed for exposure limits specified in ANSI/IEEE Std. C95.1–1991.

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

Shigeru Kinoshita
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JQA KITA-KANSAI Testing Center
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Tested by:

Y. Sakai

Yasuhisa Sakai
Deputy Manager
JQA KITA-KANSAI Testing Center
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3 Test Procedure

The tests documented in this report were performed in accordance with CFR 47 FCC Parts 1 and 2, IEEE Std.1528–2013 and the following KDB Procedures.

447498 D01 General RF Exposure Guidance v05r02
648474 D04 SAR Handset SAR v01r02
865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
865664 D02 RF Exposure Reporting v01r01
941225 D01 SAR test for 3G devices v02
941225 D02 HSPA and 1x Advanced v02r02
941225 D03 SAR Test Reduction GSM GPRS EDGE v01

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

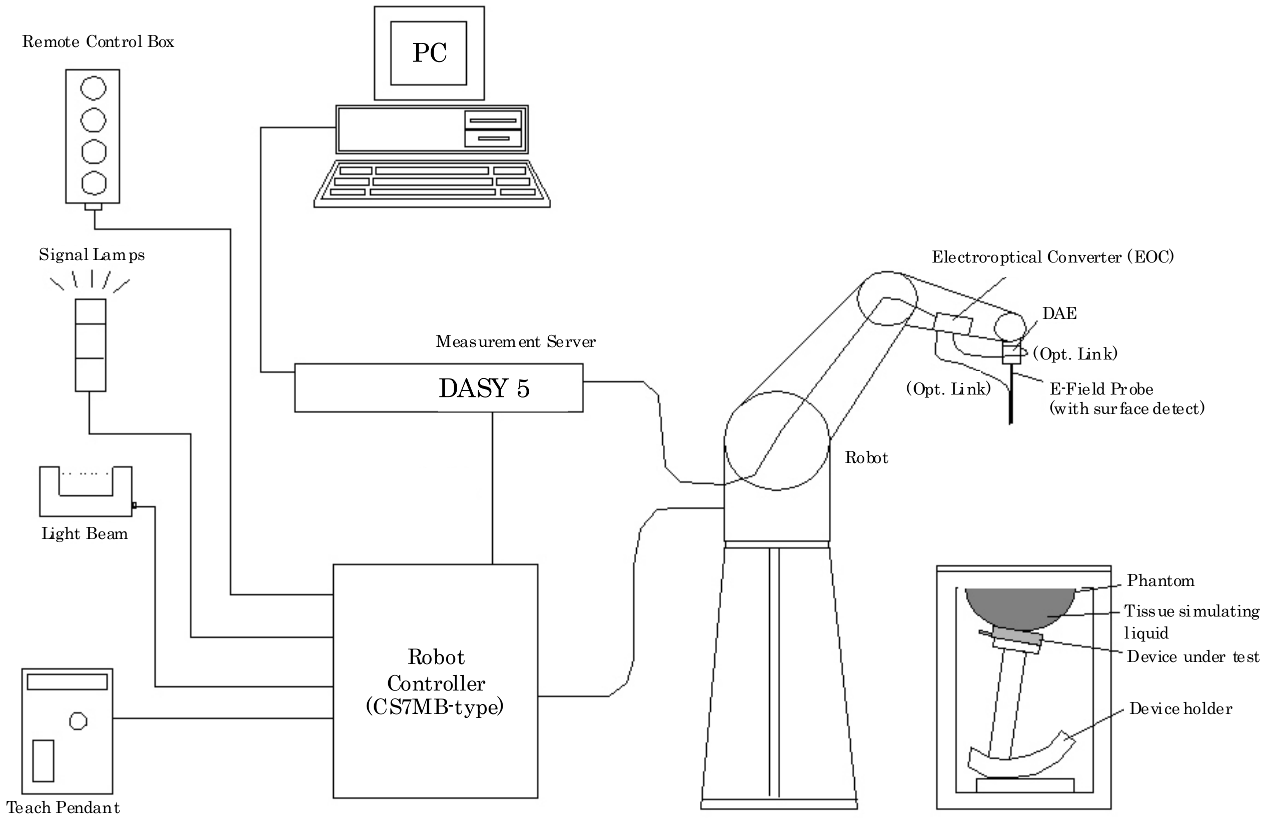
JQA KITA-KANSAI Testing Center SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility is registered by the following bodies.

VLAC Accreditation No.	:	VLAC-001-2 (Expiry date : March 30, 2016)
VCCI Registration No.	:	A-0002 (Expiry date : March 30, 2016)
BSMI Registration No.	:	SL2-IS-E-6006, SL2-IN-E-6006, SL2-R1/R2-E-6006, SL2-A1-E-6006 (Expiry date : September 14, 2016)
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, 2016)

6 Measurement System Diagram

These measurements are performed using the DASY5 automated dosimetric assessment system (manufactured by Schmid & Partner Engineering AG (SPEAG) in Zürich, Switzerland). It consists of high precision robotics system, cell controller system, DASY5 measurement server, personal computer with DASY5 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 DASY5 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 2450 MHz (accuracy ± 12.0%; k=2) 2600 MHz (accuracy ± 12.0%; 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)

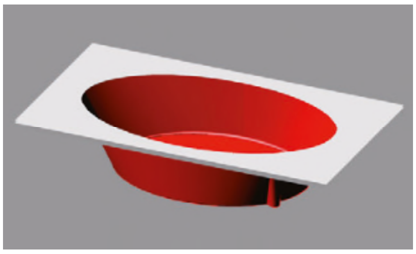
Frequency	:	10 MHz to 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	:	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	:	10 μW/g to >100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μW/g)
Dimensions	:	Overall length 337 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).

8 Measurement Process

Step 1 : Power Reference Measurement

The power reference job measures the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method. The minimum distance of probe sensors to surface set to 4 mm for an ET3DV6 probe, or 2 mm for EX3DV4 probe. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2 : Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations in relatively coarse grids. When an area scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. If only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maxima within 2 dB of the maximum SAR value are detected, the number of zoom scans has to be increased accordingly.

Step 3 : Zoom Scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The zoom scan measures points specified in standards within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure.

Step 4 : Z Scan

The Z scan measures points along a vertical straight line. The line runs along the Z axis of a one-dimensional grid. In order to get a reasonable extrapolation, the extrapolated distance should not be larger than the step size in Z-direction.

Step 5 : Power Drift Measurement

The power drift measurement measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The power drift measurement gives the field difference in dB from the reading conducted within the last power reference measurement. The power reference measurement and power drift measurement are for monitoring the power drift of the device under test in the batch process.

9 Measurement Uncertainties

9.1 300 MHz to 3 GHz

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 effects	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	∞
Modulation response	2.4	R	√3	1	1	1.4	1.4	∞
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	2.0	R	√3	1	1	1.2	1.2	∞
Test Sample Related								
Device holder uncertainty	2.9	N	1	1	1	2.9	2.9	5
Test sample positioning	3.4	N	1	1	1	3.4	3.4	23
Output power variation – SAR drift measurement	5.0	R	√3	1	1	2.9	2.9	∞
Power Scaling	0.0	R	√3	1	1	0.0	0.0	∞
Phantom and Tissue Parameters								
Phantom uncertainty	6.1	R	√3	1	1	3.5	3.5	∞
Algorithms for correcting SAR for deviations	1.9	R	√3	1	0.84	1.1	0.9	∞
Liquid Conductivity – measurement uncertainty	3.2	N	1	0.78	0.71	2.5	2.3	5
Liquid Permittivity – measurement uncertainty	3.0	N	1	0.26	0.26	0.8	0.8	5
Liquid Conductivity – temperature uncertainty	5.2	R	√3	0.78	0.71	2.3	2.1	∞
Liquid Permittivity – temperature uncertainty	0.8	R	√3	0.23	0.26	0.1	0.1	∞
Combined Standard Uncertainty		RSS				11.5	11.4	
Expanded Uncertainty (95% Confidence Interval)		k=2				22.9	22.7	

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.

9.2 3 GHz to 6 GHz

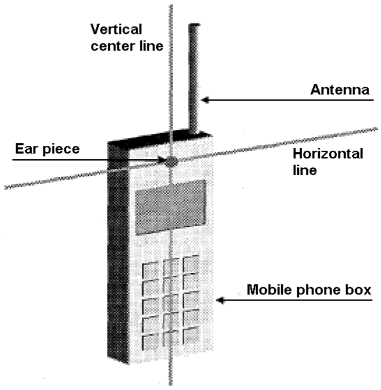
Uncertainty Component	Tol. (± %)	Prob. Dist.	Div.	c_i (1g)	c_i (10g)	Std. Unc. (± %) 1g	Std. Unc. (± %) 10g	v_i
Measurement System								
Probe calibration	6.6	N	1	1	1	6.6	6.6	∞
Axial isotropy	4.7	R	√3	0.7	0.7	1.9	1.9	∞
Hemispherical isotropy	9.6	R	√3	0.7	0.7	3.9	3.9	∞
Boundary effects	2.0	R	√3	1	1	1.2	1.2	∞
Linearity	4.7	R	√3	1	1	2.7	2.7	∞
System detection limits	1.0	R	√3	1	1	0.6	0.6	∞
Modulation response	2.4	R	√3	1	1	1.4	1.4	∞
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	0.8	R	√3	1	1	0.5	0.5	∞
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9	∞
Extrapolation, interpolation and integration algorithms for max. SAR evaluation	4.0	R	√3	1	1	2.3	2.3	∞
Test Sample Related								
Device holder uncertainty	2.9	N	1	1	1	2.9	2.9	5
Test sample positioning	3.4	N	1	1	1	3.4	3.4	23
Output power variation – SAR drift measurement	5.0	R	√3	1	1	2.9	2.9	∞
Power Scaling	0.0	R	√3	1	1	0.0	0.0	∞
Phantom and Tissue Parameters								
Phantom uncertainty	6.6	R	√3	1	1	3.8	3.8	∞
Algorithms for correcting SAR for deviations	1.9	R	√3	1	0.84	1.1	0.9	∞
Liquid Conductivity – measurement uncertainty	3.2	N	1	0.78	0.71	2.5	2.3	5
Liquid Permittivity – measurement uncertainty	3.0	N	1	0.26	0.26	0.8	0.8	5
Liquid Conductivity – temperature uncertainty	3.4	R	√3	0.78	0.71	1.5	1.4	∞
Liquid Permittivity – temperature uncertainty	0.4	R	√3	0.23	0.26	0.1	0.1	∞
Combined Standard Uncertainty		RSS				12.5	12.4	
Expanded Uncertainty (95% Confidence Interval)		k=2				24.9	24.8	

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.

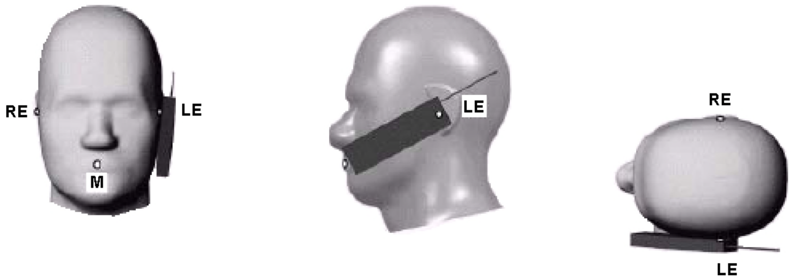
10 Test Arrangement

10.1 Head Exposure Conditions

10.1.1 Cheek-Touch Position

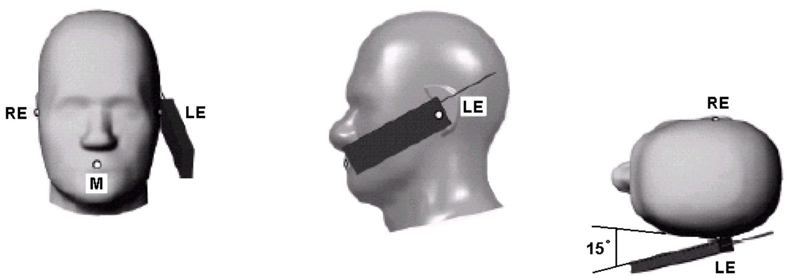


1. Position the device with the vertical center line of the body of the device and the horizontal line crossing the center of the ear piece in a plane parallel to the sagittal plane of the phantom.
2. While maintaining the device in this plane, align the vertical center line with the reference plane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



10.1.2 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.



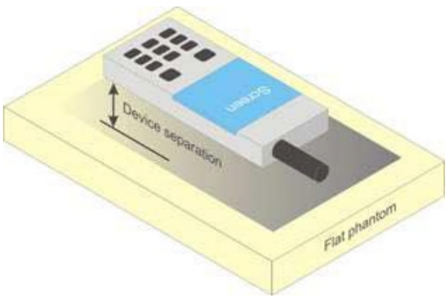
10.2 Body-worn Accessory Exposure Conditions

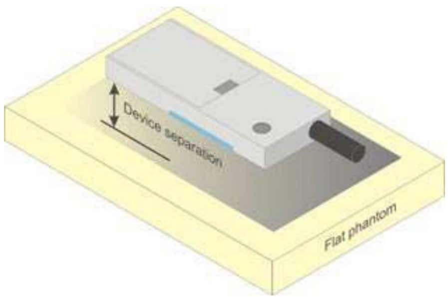
Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Both the physical spacing to the body of the user as dictated by the accessory and the materials used in an accessory affect 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 surface 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.

When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.





10.3 RF Exposure Conditions

10.3.1 Head Exposure Conditions

Test Position	SAR Required	Note
Left Touch	YES	
Left Tilt (15°)	YES	
Right Touch	YES	
Right Tilt (15°)	YES	

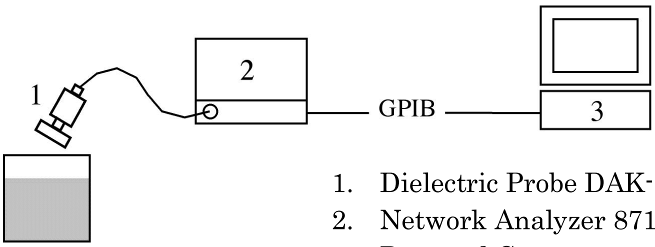
10.3.2 Body-worn Accessory Exposure Conditions

Test Position	SAR Required	Note
Rear	YES	
Front	YES	

11 Tissue Verification

11.1 Tissue Verification Measurement Condition

The tissue dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use, or earlier if dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
The temperature of the tissue-equivalent medium used during measurement must be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
It is verified by using the dielectric probe and the network analyzer.



1. Dielectric Probe DAK-3.5
2. Network Analyzer 8719ET
3. Personal Computer

11.2 Tissue Dielectric Properties

The tissue dielectric properties are specified in KDB 865664 D01.

Target Frequency [MHz]	Head		Body	
	Permittivity (ε_r)	Conductivity (σ)	Permittivity (ε_r)	Conductivity (σ)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

For tissue dielectric properties at other frequencies within the range, a linear interpolation method shall be used.

11.3 Composition of Ingredients for the Tissue Material Used in the SAR Tests

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.40	41.05	56.00	54.9	40.40	62.70	73.20
Salt (NaCl)	3.95	1.49	1.45	1.40	1.35	0.76	0.18	0.50	0.50	0.04
Sugar	56.32	46.78	56.00	45.00	56.50	41.76	0.00	58.00	0.00	0.00
HEC	0.98	0.52	1.00	1.00	1.00	1.21	0.00	1.00	0.00	0.00
Bactericide	0.19	0.04	0.10	0.10	0.10	0.27	0.00	0.10	0.00	0.00
Triton X-100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.80	0.00
DGBE	0.00	0.00	0.00	0.00	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

HBBL 3500-5800 (Head Liquids for 3 – 6 GHz)

Item	Head Broad Band Tissue Simulation Liquids HBBL 3500-5800
Water	50 – 65 %
Mineral oil	10 – 30 %
Emulsifiers	8 – 25 %
Sodium salt	0 – 1.5 %
Safety relevant ingredients according to EU directives: EINECS-No 203-489-0 1.0 – 2.8 % 2-Methyl-pentane-2,4-diol (Hexylene Glycol): CAS-No 107-41-5 (Xi irritant, R36/38 irritant for eyes and skin)	

MBBL 3500-5800 (Body Liquids for 3 – 6 GHz)

Item	Muscle Broad Band Tissue Simulation Liquids MBBL 3500-5800
Water	60 – 80 %
Esters, Emulsifiers, Inhibitors	20 – 40 %
Sodium salt	0 – 1.5 %
Safety relevant ingredients according to EU directives: none Safety relevant ingredients according to other directives: CAS-No 26399-02-0 10 – 28 % Oleic acid, alkylester	

11.4 Tissue Verification Results

Tissue dielectric parameters are measured at the low, middle and high frequency of each operating frequency range of the test device.

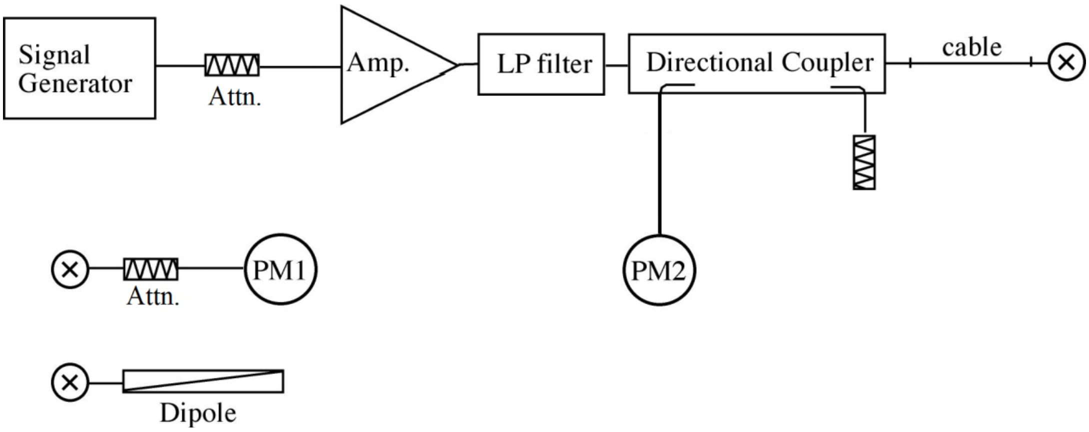
Date	Liquid	Frequency [MHz]	Parameters	Target	Measured	Deviation [%]	Limit [%]
3/27/2014	Body	820	Permittivity (ε_r)	55.3	55.40	+0.18	± 5
			Conductivity (σ)	0.97	0.970	+0.00	± 5
		835	Permittivity (ε_r)	55.2	55.27	+0.13	± 5
			Conductivity (σ)	0.97	0.985	+1.55	± 5
		850	Permittivity (ε_r)	55.2	55.09	-0.20	± 5
			Conductivity (σ)	0.99	1.000	+1.01	± 5
3/28/2014	Head	820	Permittivity (ε_r)	41.6	41.81	+0.50	± 5
			Conductivity (σ)	0.90	0.914	+1.56	± 5
		835	Permittivity (ε_r)	41.5	41.62	+0.29	± 5
			Conductivity (σ)	0.90	0.927	+3.00	± 5
		850	Permittivity (ε_r)	41.5	41.44	-0.14	± 5
			Conductivity (σ)	0.92	0.941	+2.28	± 5
4/1/2014	Head	1850	Permittivity (ε_r)	40.0	39.54	-1.15	± 5
			Conductivity (σ)	1.40	1.383	-1.21	± 5
		1900	Permittivity (ε_r)	40.0	39.34	-1.65	± 5
			Conductivity (σ)	1.40	1.435	+2.50	± 5
		1910	Permittivity (ε_r)	40.0	39.31	-1.72	± 5
			Conductivity (σ)	1.40	1.446	+3.29	± 5
4/1/2014	Body	1850	Permittivity (ε_r)	53.3	52.52	-1.46	± 5
			Conductivity (σ)	1.52	1.513	-0.46	± 5
		1900	Permittivity (ε_r)	53.3	52.40	-1.69	± 5
			Conductivity (σ)	1.52	1.570	+3.29	± 5
		1910	Permittivity (ε_r)	53.3	52.39	-1.71	± 5
			Conductivity (σ)	1.52	1.580	+3.95	± 5

12 System Performance Check

12.1 System Performance Check Measurement Condition

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.



12.2 Target SAR Values for System Performance Check

The target SAR values can be obtained from the calibration certificate of system validation dipoles.

System Dipole		Cal. Date	Frequency [MHz]	Target SAR Values [W/kg]		
Type	Serial			1g/10g	Head	Body
D835V2	4d081	8/15/2013	835	1g	9.48	9.40
				10g	6.16	6.20
D1900V2	5d112	8/22/2013	1900	1g	40.6	41.1
				10g	21.3	21.8

12.3 System Performance Check Results

The SAR measured with a system validation dipole, using the required tissue-equivalent medium at the test frequency, must be within 10 % of the manufacturer calibrated dipole SAR target.

Date	System Dipole		Liquid	Measured SAR [W/kg] (Normalized to 1 W)		Target	Deviation [%]	Limit [%]
	Type	Serial						
3/27/2014	D835V2	4d081	Body	1 g	9.60	9.40	+2.13	± 10
				10 g	6.36	6.20	+2.58	± 10
3/28/2014	D835V2	4d081	Head	1 g	9.24	9.48	-2.53	± 10
				10 g	6.04	6.16	-1.95	± 10
4/1/2014	D1900V2	5d112	Head	1 g	37.56	40.6	-7.49	± 10
				10 g	20.04	21.3	-5.92	± 10
4/1/2014	D1900V2	5d112	Body	1 g	39.08	41.1	-4.91	± 10
				10 g	20.88	21.8	-4.22	± 10

13 RF Output Power Measurements

13.1 GSM 850

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

GSM/GPRS Settings

Settings	Mode	Parameter
General Settings	Band Indicator	GSM 850
	Power Control Level	5 (33 dBm)
GPRS Specific Settings	Connection Type	Test Mode A
	Multi Slot Class	8 (4 down / 1 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.	31.85	32.00	32.15
	Frame Avg.	22.82	22.97	23.12
GPRS (1 slot)	Burst Avg.	31.85	32.00	32.15
	Frame Avg.	22.82	22.97	23.12

Note(s):
KDB 941225 D03 – The worst-case configuration for SAR testing is determined to be as follows.
1. Body : GSM voice mode, based on the output power above
2. Head : GSM voice mode (VoIP not applicable)

13.2 PCS 1900

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

GSM/GPRS Settings

Settings	Mode	Parameter
General Settings	Band Indicator	PCS 1900
	Power Control Level	0 (30 dBm)
GPRS Specific Settings	Connection Type	Test Mode A
	Multi Slot Class	8 (4 down / 1 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.	29.30	29.28	29.36
	Frame Avg.	20.27	20.25	20.33
GPRS (1 slot)	Burst Avg.	29.30	29.28	29.36
	Frame Avg.	20.27	20.25	20.33

Note(s):
KDB 941225 D03 – The worst-case configuration for SAR testing is determined to be as follows.
1. Body : GSM voice mode, based on the output power above
2. Head : GSM voice mode (VoIP not applicable)

13.3 WCDMA Band V

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification.

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

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 8 HSDPA Settings

Settings	Release 8 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 8 HSPA Settings

Settings	Release 8 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		23.01	23.00	22.96
64 kbps RMC		22.99	22.99	22.95
144 kbps RMC		23.01	22.99	22.94
384 kbps RMC		22.99	23.00	22.97
Voice AMR		22.96	22.97	22.94
HSDPA	Sub-test 1	22.98	23.00	22.92
	Sub-test 2	22.94	22.96	22.96
	Sub-test 3	22.49	22.47	22.41
	Sub-test 4	22.49	22.49	22.40
HSPA	Sub-test 1	20.64	20.63	20.60
	Sub-test 2	21.09	21.06	21.02
	Sub-test 3	21.55	21.66	21.61
	Sub-test 4	20.93	20.90	20.86
	Sub-test 5	22.99	22.96	22.91

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 HSDPA is not required when the maximum average output with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75% of the SAR limit.
3. 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.

14 SAR Measurements

14.1 GSM 850

<u>Head</u>

GSM Voice – Duty Cycle 12.0%							
Test Position	Ch#	Freq. [MHz]	Power [dBm]		1 g SAR [W/kg]		Plot No.
			Tune-up Limit	Meas.	Meas.	Scaled	
Left Touch	189	836.4	33.2	32.00	0.443	**0.584**	
Left Tilt	189	836.4	33.2	32.00	0.208	**0.274**	
Right Touch	128	824.2	33.2	31.85	0.591	**0.806**	
	189	836.4	33.2	32.00	0.645	**0.850**	1
	251	848.8	33.2	32.15	0.615	**0.783**	
Right Tilt	189	836.4	33.2	32.00	0.241	**0.318**	

<u>Body-worn Accessory</u>

GSM Voice – Duty Cycle 12.0%								
Test Position	Dist. [mm]	Ch#	Freq. [MHz]	Power [dBm]		1 g SAR [W/kg]		Plot No.
				Tune-up Limit	Meas.	Meas.	Scaled	
Rear	15	128	824.2	33.2	31.85	0.611	**0.834**	
		189	836.4	33.2	32.00	0.633	**0.834**	2
		251	848.8	33.2	32.15	0.629	**0.801**	
Front	15	189	836.4	33.2	32.00	0.275	**0.363**	

Note(s):
1. KDB 447498 D01 – Testing of other required channels within the operating mode of a frequency band is not required when the reported 1 g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg when the transmission band is ≥ 200 MHz

14.2 PCS 1900

Head

GSM Voice – Duty Cycle 12.0%							
Test Position	Ch#	Freq. [MHz]	Power [dBm]		1 g SAR [W/kg]		Plot No.
			Tune-up Limit	Meas.	Meas.	Scaled	
Left Touch	661	1880.0	29.7	29.28	0.273	0.301	3
Left Tilt	661	1880.0	29.7	29.28	0.104	**0.115**	
Right Touch	661	1880.0	29.7	29.28	0.271	**0.299**	
Right Tilt	661	1880.0	29.7	29.28	0.129	**0.142**	

Body-worn Accessory

GSM Voice – Duty Cycle 12.0%								
Test Position	Dist. [mm]	Ch#	Freq. [MHz]	Power [dBm]		1 g SAR [W/kg]		Plot No.
				Tune-up Limit	Meas.	Meas.	Scaled	
Rear	15	661	1880.0	29.7	29.28	0.301	0.332	4
Front	15	661	1880.0	29.7	29.28	0.141	**0.155**	

Note(s):

1. KDB 447498 D01 – Testing of other required channels within the operating mode of a frequency band is not required when the reported 1 g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg when the transmission band is ≥ 200 MHz

14.3 WCDMA Band V

Head

R99 12.2kbps RMC – Duty Cycle 100%							
Test Position	Ch#	Freq. [MHz]	Power [dBm]		1 g SAR [W/kg]		Plot No.
			Tune-up Limit	Meas.	Meas.	Scaled	
Left Touch	4182	836.4	23.6	23.00	0.520	**0.597**	
Left Tilt	4182	836.4	23.6	23.00	0.217	**0.249**	
Right Touch	4182	836.4	23.6	23.00	0.676	0.776	5
Right Tilt	4182	836.4	23.6	23.00	0.252	**0.289**	

Body-worn Accessory

R99 12.2kbps RMC – Duty Cycle 100%								
Test Position	Dist. [mm]	Ch#	Freq. [MHz]	Power [dBm]		1 g SAR [W/kg]		Plot No.
				Tune-up Limit	Meas.	Meas.	Scaled	
Rear	15	4182	836.4	23.6	23.00	0.588	0.675	6
Front	15	4182	836.4	23.6	23.00	0.335	**0.385**	

Note(s):

1. KDB 447498 D01 – Testing of other required channels within the operating mode of a frequency band is not required when the reported 1 g SAR for the mid-band or highest output power channel is:
    - ≤ 0.8 W/kg when the transmission band is ≤ 100 MHz
    - ≤ 0.6 W/kg when the transmission band is between 100 MHz and 200 MHz
    - ≤ 0.4 W/kg when the transmission band is ≥ 200 MHz

16 Test Instruments

Shielded Room S3					
Type	**Model**	**Manufacturer**	**ID No.**	**Last Cal.**	**Interval**
E-Field Probe	ET3DV6	SPEAG	S-2	2013/8	1 Year
DAE	DAE4	SPEAG	S-3	2013/11	1 Year
Robot	RX60L	Stäubli	S-7	------	N/A
Probe Alignment Unit	LB5/80	SPEAG	S-13	------	N/A
Network Analyzer	8719ET	Agilent	B-53	2013/9	1 Year
Dielectric Probe	DAK-3.5	SPEAG	S-32	2013/7	1 Year
835MHz Dipole	D835V2	SPEAG	S-23	2013/8	1 Year
1900MHz Dipole	D1900V2	SPEAG	S-25	2013/8	1 Year
Signal Generator	E8257D	Agilent	B-39	2013/8	1 Year
RF Power Amplifier	CGA020M602-2633R	R&K	A-51	------	N/A
Directional Coupler	4226-20	Narda	D-87	------	N/A
Radio Communication Analyzer	MT8820C	Anritsu	B-5	2014/2	1 Year
Power Meter	E4417A	Agilent	B-51	2013/11	1 Year
Power Sensor	E9323A	Agilent	B-59	2013/6	1 Year
Attenuator	2-20	Weinschel	D-36	2013/10	1 Year

17 Appendix

Refer to separated files for the following appendixes.

Appendix 1 – System Performance Check Plots

Appendix 2 – Highest SAR Test Plots

Appendix 3 – Dosimetric E-Field Probe Calibration Data

Appendix 4 – System Validation Dipole Calibration Data