JQA

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Issue Date : January 21, 2014

TEST REPORT (SAR EVALUATION)

Applicant	:	SEIKO EPSON Corporation
Address	:	6925 Tazawa, Toyoshina, Azumino-shi, Nagano, 399-8285 Japan
Products	:	See-Through Mobile Viewer
Model No.	:	H560A
Serial No.	:	TCW35600093
FCC ID	:	SKSH560A
Test Standard	:	CFR 47 FCC Rules and Regulations Part 2
Test Results	:	**Passed**
Date of Test	:	December 11, 2013

ilac-MRA VLAC Lab Accreditation VLAC-001-2

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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	:	SEIKO EPSON Corporation 6925 Tazawa, Toyoshina, Azumino-shi, Nagano, 399-8285 Japan
2.	Products	:	See-Through Mobile Viewer
3.	Model No.	:	H560A
4.	Serial No.	:	TCW35600093
5.	Product Type	:	Pre-production
6.	Date of Manufacture	:	September 27, 2013
7.	Transmitting Frequency	:	2412 MHz – 2462 MHz (WLAN 802.11b/g/n)
8.	Battery Option	:	Rechargeable Li-polymer Battery ES-7A (2720mAh)
9.	Power Rating	:	3.7VDC
10.	EUT Grounding	:	None
11.	Device Category	:	Portable Device (§2.1093)
12.	Exposure Category	:	General Population/Uncontrolled Exposure
13.	FCC Rule Part(s)	:	15.247
14.	EUT Authorization	:	Certification
15.	Received Date of DUT	:	December 10, 2013

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

Band	Test Configuration	**Reported 1 g SAR (W/kg)**	Limit (W/kg)
WLAN 2.4 GHz	Body	**0.51**	**1.6**

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.

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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.

248227 D01 SAR meas for 802 11 a b g v01r02
447498 D01 General RF Exposure Guidance v05r01
865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01
865664 D02 RF Exposure Reporting v01r01

4 Test Location

Japan Quality Assurance Organization (JQA)
KITA-KANSAI Testing Center
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SAITO EMC Branch
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5 Recognition of Test Laboratory

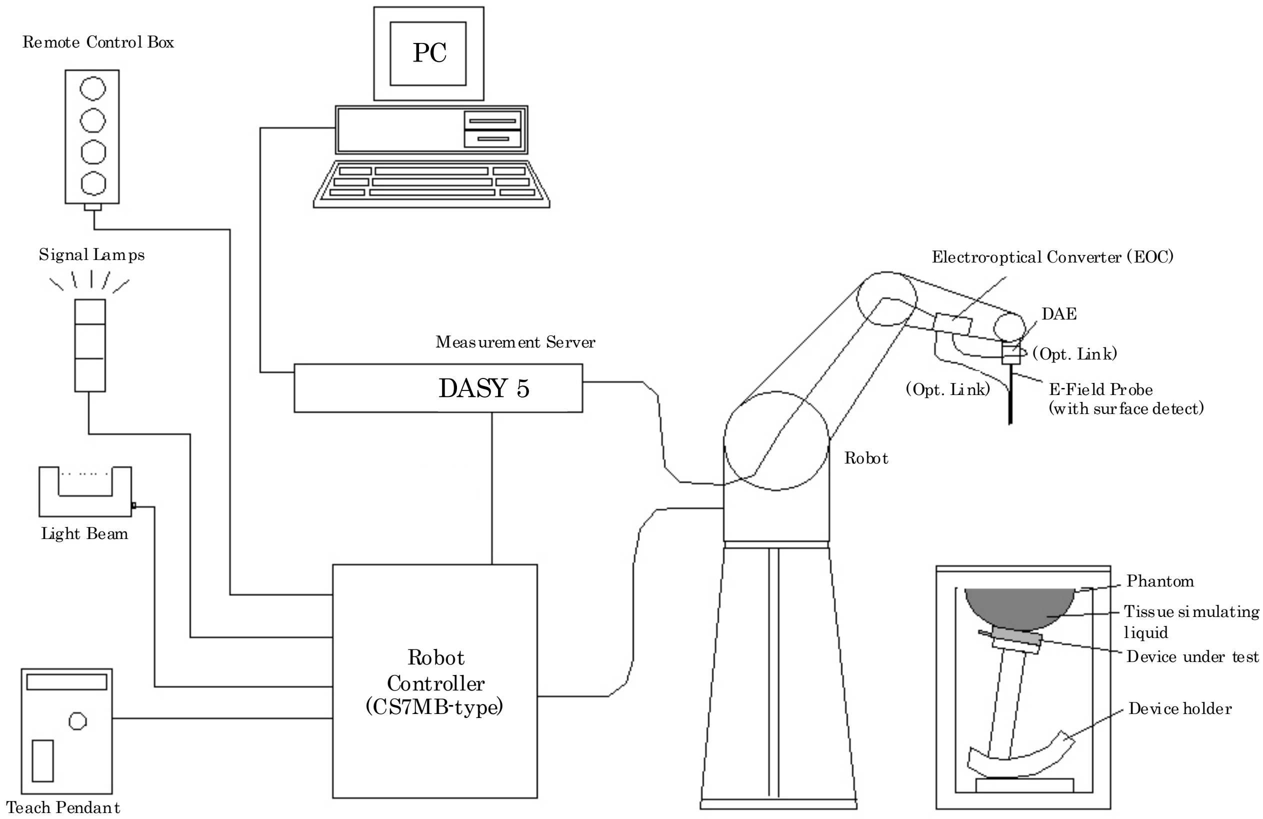
JQA KITA-KANSAI Testing Center SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility is registered by the following bodies.

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-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. (± %) 1g	Std. Unc. (± %) 10g	v_i
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

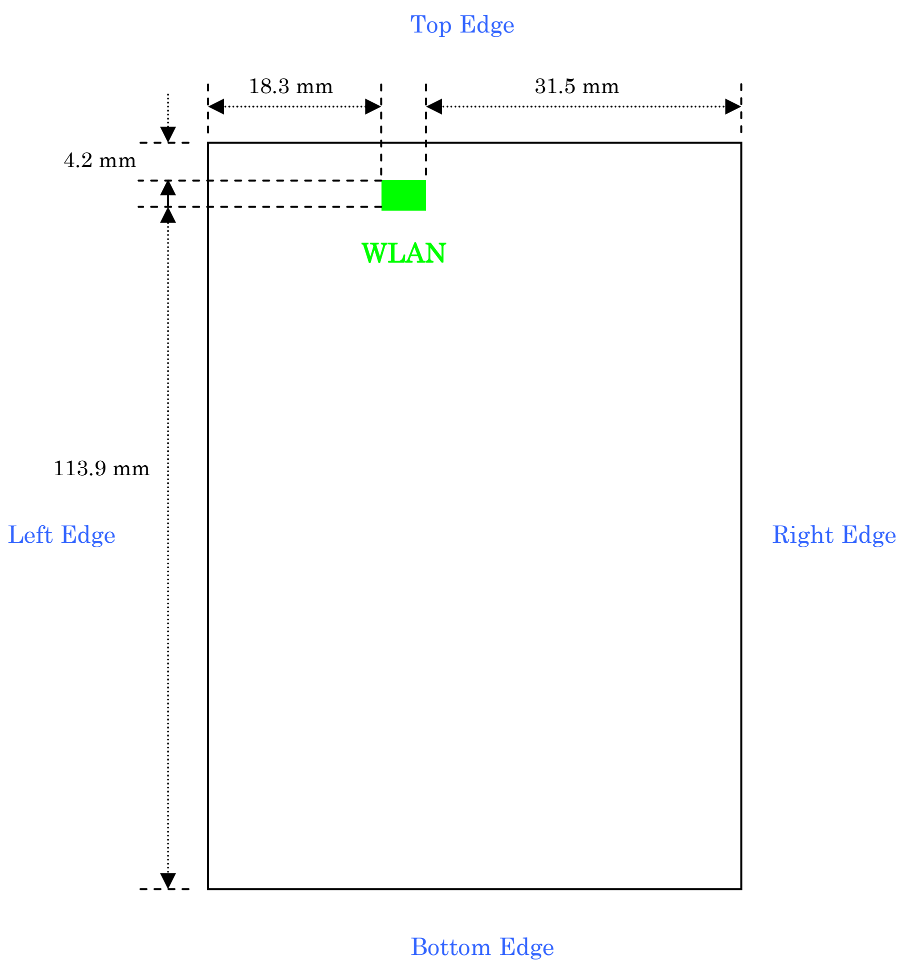
Uncertainty Component	Tol. (± %)	Prob. Dist.	Div.	c_i (1g)	c_i (10g)	Std. Unc. (± %) 1g	Std. Unc. (± %) 10g	v_i
Measurement System								
Probe calibration	6.6	N	1	1	1	6.6	6.6	∞
Axial isotropy	4.7	R	√3	0.7	0.7	1.9	1.9	∞
Hemispherical isotropy	9.6	R	√3	0.7	0.7	3.9	3.9	∞
Boundary effects	2.0	R	√3	1	1	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.

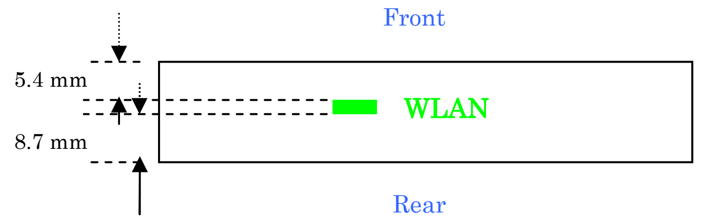
10 Test Arrangement

10.1 Antenna Location and Separation Distances

Front View



Top View



10.2 Exposure Conditions

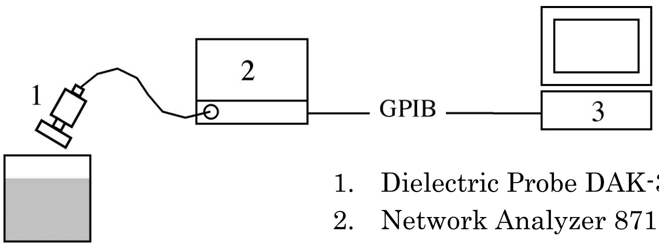
Refer to section 10.1 "Antenna Location and Separation Distances" for the specific details of the antenna-to-antenna and antenna-to-edge/surface(s) distances.

Test Position	Antenna-to-edge/surface	SAR Required	Note
Front	5.4 mm	YES	
Rear	8.7 mm	YES	
Top	4.2 mm	YES	
Bottom	113.9 mm	NO	Refer to section 13.2 for SAR exclusion justification
Left	18.3 mm	NO	Refer to section 13.2 for SAR exclusion justification
Right	31.5 mm	NO	Refer to section 13.2 for SAR exclusion justification

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 $M\Omega^{+}$ resistivity
HEC : Hydroxyethyl Cellulose
DGBE : 99^{+}% Di (ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure) : Polyethylene glycol mono [4-(1,1,3,3-tetramethylbuthyl)phenyl]ether

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.

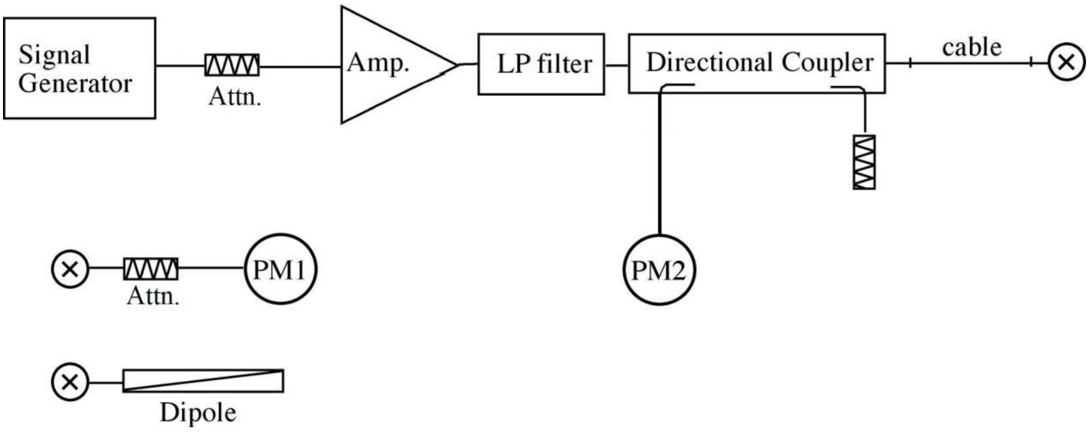
Date	Liquid	Frequency [MHz]	Parameters	Target	Measured	Deviation [%]	Limit [%]
12/11/2013	Body	2410	Permittivity (ε_r)	52.8	51.58	-2.31	± 5
			Conductivity (σ)	1.91	1.895	-0.79	± 5
		2450	Permittivity (ε_r)	52.7	51.43	-2.41	± 5
			Conductivity (σ)	1.95	1.948	-0.10	± 5
		2470	Permittivity (ε_r)	52.7	51.38	-2.50	± 5
			Conductivity (σ)	1.97	1.970	+0.00	± 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
D2450V2	714	11/14/2013	2450	1g	52.8	49.8
				10g	24.6	23.3

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						
12/11/2013	D2450V2	714	Body	1 g	48.40	49.8	-2.81	± 10
				10 g	22.64	23.3	-2.83	± 10

13 RF Output Power Measurements

13.1 WLAN 2.4 GHz

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

Output Power Tolerance

Band	Mode	Power (dBm)		
		Max	**Target**	Min
2.4 GHz	802.11b	15.0	**13.0**	11.0
	802.11g	13.5	**11.5**	9.5
	802.11n [HT20]	13.5	**11.5**	9.5

Conducted power measurement results

Band	Mode	Channel	Frequency (MHz)	Average Power (dBm)
2.4 GHz	802.11b	1	2412	13.83
		6	2437	13.85
		11	2462	13.67
	802.11g	1	2412	11.87
		6	2437	11.94
		11	2462	11.58
	802.11n [HT20]	1	2412	11.74
		6	2437	11.83
		11	2462	11.56

Note(s):
KDB 248227 D01 – 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.

13.2 Standalone SAR Test Exclusion Considerations (KDB 447498 D01)

The 1 g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by;
[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] · [√f (GHz)] ≤ 3.0, where

- f (GHz) is the RF channel transmit frequency in GHz.
- Power and distance are rounded to the nearest mW and mm before calculation.
- The result is rounded to one decimal place for comparison.
- When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied.

SAR exclusion calculations for antenna ≤ 50 mm from the user

Band	Frequency (MHz)	Max. Power		Test Position	Distance (mm)	Threshold	Test Exclusion
		(dBm)	(mW)				
WLAN 2.4 GHz	2462	15.0	32	Rear	5	10.0	NO
				Front	9	5.6	NO
				Top	< 5	10.0	NO
				Left	18	2.8	YES
				Right	32	1.6	YES

At 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following;
[(Power allowed at numeric threshold for 50 mm) + (*test separation distance* – 50 mm) · (f (MHz) /150)] mW, at 100 MHz to 1500 MHz
[(Power allowed at numeric threshold for 50 mm) + (*test separation distance* – 50 mm) · 10] mW, at > 1500 MHz and ≤ 6 GHz

SAR exclusion calculations for antenna > 50 mm from the user

Band	Frequency (MHz)	Max. Power		Test Position	Distance (mm)	Threshold (mW)	Test Exclusion
		(dBm)	(mW)				
WLAN 2.4 GHz	2462	15.0	32	Bottom	114	736	YES

Standalone SAR test exclusion was based upon the following criteria;

- The *test separation distance* used to determine SAR test exclusion for the surface and edges that contain an antenna is determined from the outer housing of the device.
- The *test separation distance* for SAR test exclusion of adjacent edges is determined by the closest distance between the antenna and outer housing on the adjacent edge of the device.

14 SAR Measurements

802.11b (1 Mbps) – Duty Cycle 100%								
Test Position	Ch#	Freq. [MHz]	Power [dBm]		**1 g SAR [W/kg]**		Plot No.	Note
			Tune-up Limit	Meas.	Meas.	Scaled		
Top Edge	1	2412						1
	6	2437	15.0	13.85	0.392	0.511	1	
	11	2462						1
Front Side	1	2412						1
	6	2437	15.0	13.85	0.372	**0.485**		
	11	2462						1
Rear Side	1	2412						1
	6	2437	15.0	13.85	0.231	**0.301**		
	11	2462						1

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

15 Test Setup Photographs

– Top Edge –

– Front Side –

– Rear Side –

16 Test Instruments

Type	Model	Manufacturer	ID No.	Last Cal.	Interval
E-Field Probe	EX3DV4	SPEAG	S-17	2013/9	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
2450MHz Dipole	D2450V2	SPEAG	S-6	2013/11	1 Year
Signal Generator	MG3681A	Anritsu	B-3	2013/9	1 Year
RF Power Amplifier	CGA020M602-2633R	R&K	A-51	------	N/A
Directional Coupler	4226-20	Narda	D-87	------	N/A
Power Meter	N1911A	Agilent	B-63	2013/7	1 Year
Power Sensor	N1921A	Agilent	B-64	2013/7	1 Year
Attenuator	2-10	Weinschel	D-40	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