SAR Evaluation Report

IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC OET BULLETIN 65 SUPPLEMENT C

FOR

VOIP DEVICE

MODEL: CA5090

FCC ID: H9PCA5090

REPORT NUMBER: 07U10908-7

ISSUE DATE: APRIL 30, 2007

Prepared for

SYMBOL TECHNOLOGIES INC
ONE SYMBOL PLAZA, HOLTSVILLE, NY 11742
UNITED STATES

Prepared by

COMPLIANCE CERTIFICATION SERVICES
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FREMONT, CA 94538 USA

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issued date	Revisions	Revised By
--	May 1, 2007	Initial issue	Sunny Shih

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: April 18, 19, 20, and 23, 2007

APPLICANT: ADDRESS:	SYMBOL TECHNOLOGIES INC ONE SYMBOL PLAZA, HOLTSVILLE, NY 11742 UNITED STATES
FCC ID: MODEL:	H9PCA5090 CA5090
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

VoIP Device Has a WLAN that Operates on 2.4 GHz, 5.2 GHz, 5.5 GHz, and 5.8 GHz Band		
Test Sample is a:	Production unit	
Modulation type:	Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11ag	
Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]
FCC 15.247	2412 - 2462	Head: 0.465 Body: 0.566
	5745 - 5825	Head: 0.539 Body: 0.621
FCC 15.401	5180 - 5320	Head: 0.895 Body: 0.971
	5500 - 5700	Head: 0.767 Body: 1.350

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in FCC OET 65 Supplement C (Edition 01-01).

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:	Tested By:
Hsin Fu Shih	Ninous Davoudi
Engineering Supervisor	EMC Engineer
Compliance Certification Services	Compliance Certification Services

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1 DEVICE UNDER TEST (DUT) DESCRIPTION

VoIP Device Has a WLAN that Operates on 2.4 GHz, 5.2 GHz, 5.5 GHz, and 5.8 GHz Band	
Normal operation:	Head & Body Positions
Body worn Accessories:	- Lanyard - Holster with belt-clip - Headset
Duty cycle:	100% for 802.11abg
Power supply:	Symbol Technologies Inc, Li-Ion Battery 3.7V, 920mAh

2 FACILITIES AND ACCREDITATION

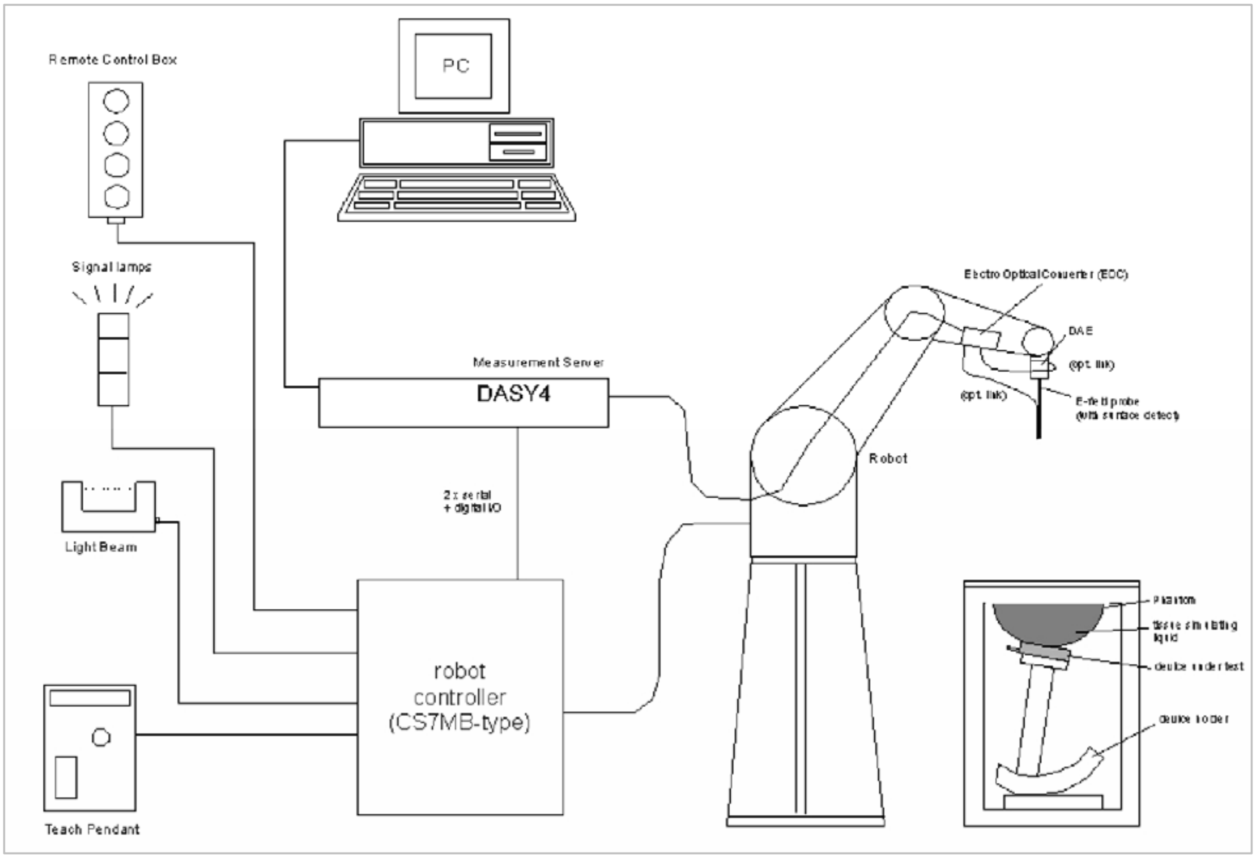
The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, CA 94538 USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

NVLAP LAB CODE 200065-0

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

3 SYSTEM DESCRIPTION



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

3.1 COMPOSITION OF INGREDIENTS FOR TISSUE SIMULATING LIQUIDS

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.

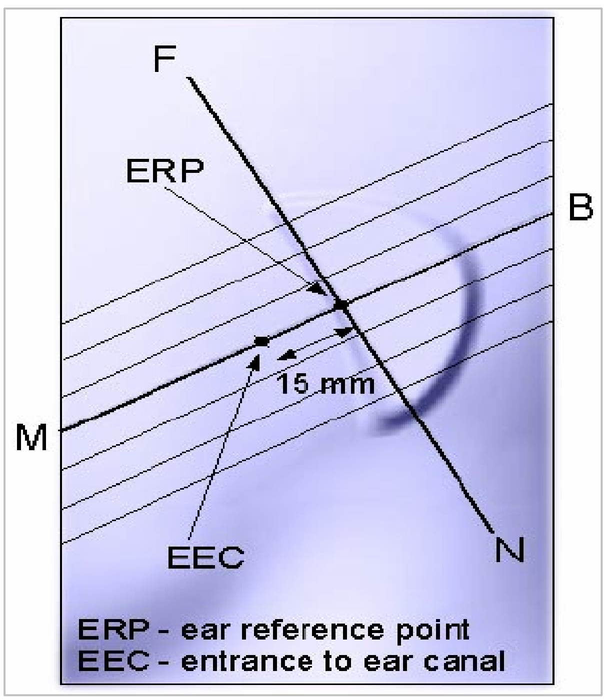
Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

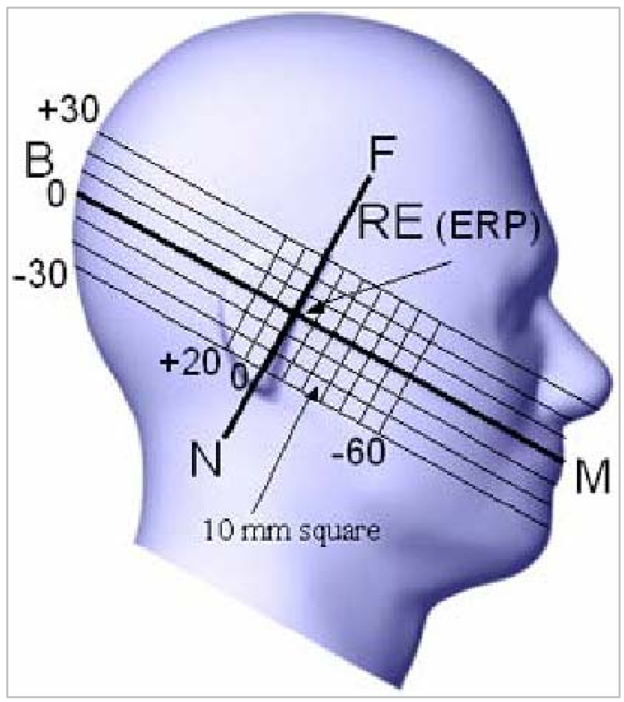
Salt: 99+% Pure Sodium Chloride
Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity
HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

4 TEST POSITIONS FOR DEVICES OPERATING NEXT TO A PERSON'S EAR

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point". The "test device reference point" should be located at the same level as the center of the earpiece region. The "vertical centerline" should bisect the front surface of the handset at its top and bottom edges. A "ear reference point" is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the "phantom reference plane" defined by the three lines joining the center of each "ear reference point" (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the "N-F" line defined along the base of the ear spacer that contains the "ear reference point". For interim head phantoms, the device should be positioned parallel to the cheek for maximum RF energy coupling. The "test device reference point" is aligned to the "ear reference point" on the head phantom and the "vertical centerline" is aligned to the "phantom reference plane". This is called the "initial ear position". While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:





4.1 CHEEK/TOUCH POSITION

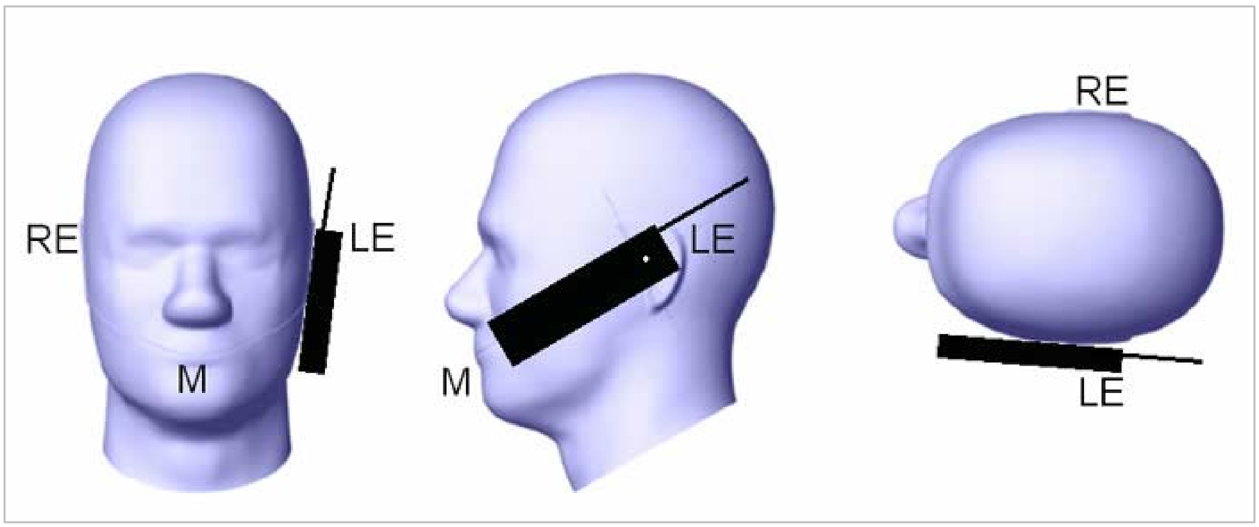
The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line for the SCC-34/SC-2 head phantom.

This test position is established:

i. When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
ii. (or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

Cheek / Touch Position



4.2 EAR/TILT POSITION

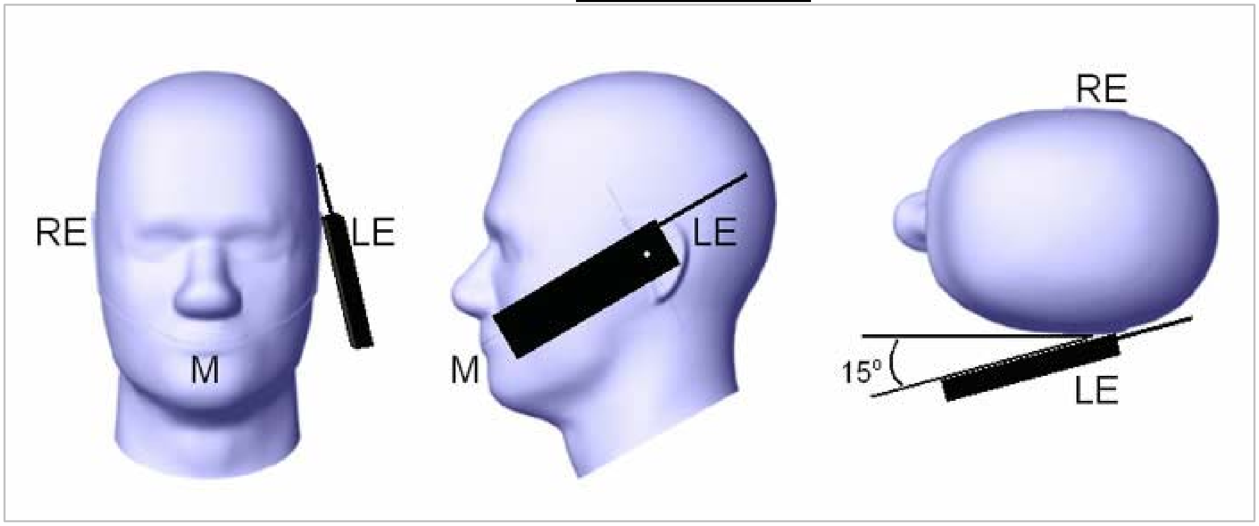
With the handset aligned in the "Cheek/Touch Position":

i. If the earpiece of the handset is not in full contact with the phantom's ear spacer (in the "Cheek/Touch position") and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.

ii. (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both "ear reference points" (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the "test device reference point" until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the "Cheek/Touch" and "Ear/Tilt" positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tilt/Ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

Ear/Tilt 15° Position



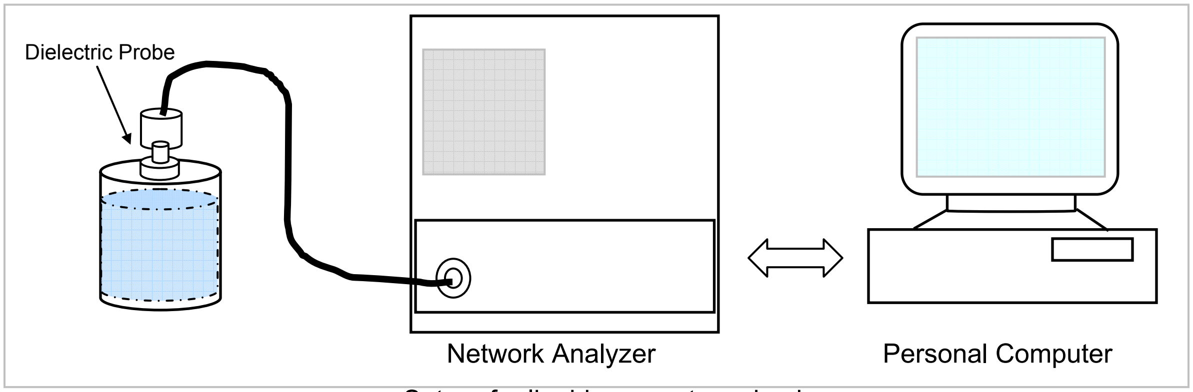
4.3 TEST POSITIONS FOR BODY-WORN AND OTHER SIMILAR CONFIGURATIONS

Without the belt-clips or holsters

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.

5 SIMULATING LIQUID PARAMETERS CHECK

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameters are within the tolerances of the specified target values. The relative permittivity and conductivity of the tissue material should be within ± 5% of the values given in the table below.



Set-up for liquid parameters check

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 150 – 3000 MHz and 5800 MHz)

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE Standard 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Standard 1528.

Target Frequency (MHz)	**Head**		**Body**	
	ε_r	σ (S/m)	ε_r	σ (S/m)
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

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 3000 MHz – 5800 MHz)

In the current guidelines and draft standards for compliance testing of mobile phones (i.e., IEEE P1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given only at 3.0 GHz and 5.8 GHz. As an intermediate solution, dielectric parameters for the frequencies between 5 to 5.8 GHz were obtained using linear interpolation (see table below).

SPEAG has developed suitable head and body tissue simulating liquids consisting of the following ingredients: de-ionized water, salt and a special composition including mineral oil and an emulgators. Dielectric parameters of these liquids were measured suing a HP 8570C Dielectric Probe Kit in conjunction with HP 8753ES Network Analyzer (30 kHz – 6G Hz). The differences with respect to the interpolated values were well within the desired ±5% for the whole 5 to 5.8 GHz range.

f (MHz)	Head Tissue		Body Tissue		Reference
	rel. permitivity	conductivity	rel. permitivity	conductivity	
3000	38.5	2.40	52.0	2.73	Standard
5800	**35.3**	**5.27**	**48.2**	**6.00**	Standard
5000	36.2	1.45	49.3	5.07	Interpolated
5100	36.1	4.55	49.1	5.18	Interpolated
5200	**36.0**	**4.66**	**49.0**	**5.30**	Interpolated
5300	35.9	4.76	48.9	5.42	Interpolated
5400	35.8	4.86	48.7	5.53	Interpolated
5500	**35.6**	**4.96**	**48.6**	**5.65**	Interpolated
5600	35.5	5.07	48.5	5.77	Interpolated
5700	35.4	5.17	48.3	5.88	Interpolated

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

5.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameter Check Result @ Head 2450 MHz

Room Ambient Temperature = 22°C; Relative humidity = 40% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
2450	21	15	e'	40.5803	Relative Permittivity (ε_r):	40.5803	39.2	3.52	± 5
			e"	13.4360	Conductivity (σ):	1.83128	1.80	1.74	± 5

Liquid Check Head
Ambient Temperature: 22°C; Liquid Temperature: 21 deg C
April 18, 2007 09:36 AM

Frequency	e'	e"
2400000000.	40.7950	13.2946
2405000000.	40.7665	13.3014
2410000000.	40.7576	13.3138
2415000000.	40.7414	13.3243
2420000000.	40.7254	13.3346
2425000000.	40.7063	13.3477
2430000000.	40.6940	13.3778
2435000000.	40.6717	13.3997
2440000000.	40.6608	13.4115
2445000000.	40.6211	13.4261
2450000000.	**40.5803**	**13.4360**
2455000000.	40.5736	13.4643
2460000000.	40.5774	13.4690
2465000000.	40.5736	13.4776
2470000000.	40.5484	13.4941
2475000000.	40.5256	13.5257
2480000000.	40.5150	13.5578
2485000000.	40.4938	13.5938
2490000000.	40.4649	13.6083
2495000000.	40.4336	13.6135
2500000000.	40.4019	13.6336

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature = 22°C; Relative humidity = 40% Measured by: Jonathan King

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
2450	21	15	e'	52.8516	Relative Permittivity (ϵ_r):	52.8516	52.7	0.29	± 5
			e"	14.7624	Conductivity (σ):	2.01207	1.95	3.18	± 5

Liquid Check
Ambient Temperature: 22 deg C; Liquid Temperature: 21 deg C
April 18, 2007 08:27 AM

Frequency	e'	e"
2400000000.	53.0639	14.5456
2405000000.	53.0342	14.5538
2410000000.	53.0288	14.5655
2415000000.	53.0023	14.5816
2420000000.	52.9826	14.5966
2425000000.	52.9725	14.6188
2430000000.	52.9620	14.6611
2435000000.	52.9412	14.6743
2440000000.	52.9185	14.7096
2445000000.	52.8784	14.7252
2450000000.	**52.8516**	**14.7624**
2455000000.	52.8425	14.7922
2460000000.	52.8568	14.8070
2465000000.	52.8488	14.8280
2470000000.	52.8409	14.8724
2475000000.	52.8154	14.9091
2480000000.	52.7902	14.9455
2485000000.	52.7639	14.9720
2490000000.	52.7286	14.9914
2495000000.	52.7075	15.0036
2500000000.	52.6858	14.9974

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^{6}$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Head 5200 & 5800 MHz

Room Ambient Temperature = 23°C; Relative humidity = 35% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5200	22	15	e'	37.2511	Relative Permittivity (ε_r):	37.2511	36.0	3.48	± 10
			e''	16.7764	Conductivity (σ):	4.85312	4.66	4.14	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
April 19, 2007 08:59 AM

Frequency	e'	e''
4600000000.	38.1867	16.0310
4650000000.	38.2258	16.2346
4700000000.	38.1165	16.1477
4750000000.	37.8535	16.2083
4800000000.	37.9838	16.3392
4850000000.	37.7025	16.2767
4900000000.	37.7584	16.5006
4950000000.	37.5920	16.3556
5000000000.	37.5816	16.6294
5050000000.	37.7031	16.5330
5100000000.	37.3951	16.6544
5150000000.	37.5866	16.9369
5200000000.	**37.2511**	**16.7764**
5250000000.	37.1775	16.9935
5300000000.	37.3432	16.8768
5350000000.	37.1146	16.8980
5400000000.	37.2606	16.9187
5450000000.	36.9497	16.8456
5500000000.	36.9769	16.9357
5550000000.	36.7015	16.7638
5600000000.	36.4872	16.8989
5650000000.	36.5290	16.9643
5700000000.	36.3823	16.9791
5750000000.	36.3076	17.0136
5800000000.	36.1246	17.0108
5850000000.	36.1931	17.1766
5900000000.	36.0285	16.9753
5950000000.	35.6675	17.2933
6000000000.	36.1408	17.5022

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5GHz

Room Ambient Temperature = 23°C; Relative humidity = 35% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5200	22	15	e'	48.0848	Relative Permittivity (ε_r):	48.0848	49.0	-1.87	± 10
			e"	18.5931	Conductivity (σ):	5.37866	5.30	1.48	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
April 19, 2007 08:19 AM

Frequency	e'	e"
4600000000.	49.1692	17.4104
4650000000.	49.2940	17.7397
4700000000.	49.0773	17.5711
4750000000.	48.8159	17.8072
4800000000.	48.9842	17.8615
4850000000.	48.6059	17.8645
4900000000.	48.7571	18.1176
4950000000.	48.4901	17.9716
5000000000.	48.5437	18.3387
5050000000.	48.6327	18.1708
5100000000.	48.2995	18.4524
5150000000.	48.5978	18.7054
5200000000.	**48.0848**	**18.5931**
5250000000.	48.1276	18.8246
5300000000.	48.2456	18.6906
5350000000.	48.0229	18.7247
5400000000.	48.1539	18.7287
5450000000.	47.7561	18.6998
5500000000.	47.8216	18.7832
5550000000.	47.4550	18.6637
5600000000.	47.2535	18.8367
5650000000.	47.3039	18.9462
5700000000.	47.1860	18.9288
5750000000.	47.0493	19.0211
5800000000.	46.9037	19.0673
5850000000.	46.9259	19.2494
5900000000.	46.7199	19.0440
5950000000.	46.3996	19.4595
6000000000.	47.0690	19.7243

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Head 5200 & 5800 MHz

Ambient Temperature = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5500	22	15	e'	36.0472	Relative Permittivity (ε_r):	36.0472	35.6	1.26	± 10
			e"	16.7105	Conductivity (σ):	5.11295	4.96	3.08	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
April 20, 2007 08:05 AM

Frequency	e'	e"
4600000000.	37.2927	15.8227
4650000000.	37.3606	16.1264
4700000000.	37.2274	15.9285
4750000000.	36.9339	16.1206
4800000000.	37.0950	16.1578
4850000000.	36.7551	16.1364
4900000000.	36.8616	16.3099
4950000000.	36.6607	16.1666
5000000000.	36.6462	16.4704
5050000000.	36.7642	16.3277
5100000000.	36.4430	16.5204
5150000000.	36.6687	16.7113
5200000000.	36.2687	16.6524
5250000000.	36.2349	16.7810
5300000000.	36.3513	16.7006
5350000000.	36.2058	16.7138
5400000000.	36.2907	16.6988
5450000000.	36.0257	16.6674
5500000000.	**36.0472**	**16.7105**
5550000000.	35.7917	16.6564
5600000000.	35.5708	16.7166
5650000000.	35.5567	16.8045
5700000000.	35.5157	16.7924
5750000000.	35.3648	16.8119
5800000000.	35.2238	16.8607
5850000000.	35.1891	16.9696
5900000000.	35.0897	16.8436
5950000000.	34.6997	17.0192
6000000000.	35.1599	17.3404

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5GHz

Room Ambient Temperature = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5500	22	15	e'	48.3037	Relative Permittivity (ε_r):	48.3037	48.6	-0.61	± 10
			e"	18.5698	Conductivity (σ):	5.68184	5.65	0.56	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
April 20, 2007 07:43 AM

Frequency	e'	e"
4600000000.	49.6304	17.2133
4650000000.	49.8702	17.6595
4700000000.	49.5419	17.3419
4750000000.	49.3066	17.7564
4800000000.	49.4938	17.6769
4850000000.	49.0358	17.7808
4900000000.	49.2656	17.9270
4950000000.	48.9461	17.8104
5000000000.	49.0363	18.2014
5050000000.	49.0981	17.9642
5100000000.	48.7577	18.3838
5150000000.	49.1277	18.4945
5200000000.	48.4757	18.5316
5250000000.	48.6232	18.6398
5300000000.	48.6422	18.5643
5350000000.	48.5429	18.5627
5400000000.	48.5639	18.5387
5450000000.	48.2358	18.5415
5500000000.	**48.3037**	**18.5698**
5550000000.	47.9261	18.5958
5600000000.	47.6988	18.6900
5650000000.	47.7167	18.8275
5700000000.	47.7140	18.7621
5750000000.	47.4642	18.8553
5800000000.	47.4140	18.9513
5850000000.	47.2968	19.0434
5900000000.	47.1647	18.9280
5950000000.	46.7870	19.2061
6000000000.	47.5301	19.5925

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Head 5200 & 5800 MHz

Ambient Temperature = 23°C; Relative humidity = 50% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5800	22	15	e'	36.5373	Relative Permittivity (ε_r):	36.5373	35.3	3.51	± 10
			e"	16.9842	Conductivity (σ):	5.48015	5.27	3.99	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
April 23, 2007 08:04 AM

Frequency	e'	e"
4600000000.	38.6669	15.9935
4650000000.	38.7007	16.1961
4700000000.	38.5632	16.0730
4750000000.	38.3822	16.2312
4800000000.	38.3837	16.2373
4850000000.	38.2155	16.2922
4900000000.	38.2019	16.3587
4950000000.	38.0328	16.3228
5000000000.	38.0748	16.5025
5050000000.	38.0497	16.4101
5100000000.	37.8874	16.6219
5150000000.	37.9792	16.7041
5200000000.	37.6519	16.7598
5250000000.	37.6443	16.7712
5300000000.	37.6513	16.7671
5350000000.	37.6958	16.7700
5400000000.	37.5752	16.7315
5450000000.	37.4476	16.7520
5500000000.	37.3852	16.6969
5550000000.	37.0877	16.7045
5600000000.	36.9532	16.7601
5650000000.	36.8161	16.8046
5700000000.	36.8940	16.9288
5750000000.	36.6853	16.8133
5800000000.	**36.5373**	**16.9842**
5850000000.	36.6277	17.0296
5900000000.	36.4192	16.9061
5950000000.	36.1481	17.1729
6000000000.	36.5285	17.3643

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5GHz

Room Ambient Temperature = 23°C; Relative humidity = 50% Measured by: Ninous Davoudi

Simulating Liquid			Parameters			Measured	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)							
5800	22	15	e'	46.2502	Relative Permittivity (ε_r):	46.2502	48.2	-4.05	± 10
			e"	18.8983	Conductivity (σ):	6.09775	6.00	1.63	± 5

Liquid Check
Ambient temperature: 23.0 deg. C; Liquid temperature: 22.0 deg C
April 23, 2007 07:53 AM

Frequency	e'	e"
4600000000.	48.5801	17.1736
4650000000.	48.6934	17.4951
4700000000.	48.4421	17.2940
4750000000.	48.2726	17.6214
4800000000.	48.2886	17.5636
4850000000.	48.0510	17.6981
4900000000.	48.0938	17.7439
4950000000.	47.8650	17.7581
5000000000.	47.9489	17.9858
5050000000.	47.8841	17.8589
5100000000.	47.7050	18.2108
5150000000.	47.8480	18.2505
5200000000.	47.4154	18.4047
5250000000.	47.4894	18.3746
5300000000.	47.4342	18.4174
5350000000.	47.5324	18.4005
5400000000.	47.3111	18.3661
5450000000.	47.2056	18.4203
5500000000.	47.0851	18.3458
5550000000.	46.7700	18.4586
5600000000.	46.5956	18.5069
5650000000.	46.4851	18.6291
5700000000.	46.6377	18.7234
5750000000.	46.2951	18.6420
5800000000.	**46.2502**	**18.8983**
5850000000.	46.2764	18.8983
5900000000.	46.0378	18.8373
5950000000.	45.8102	19.1249
6000000000.	46.3312	19.4272

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

6 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of ±10%.

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3-SN: 3531 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 5 x 5 x 7 fine cube was chosen for cube integration(dx=dy=7.5mm; dz=5mm).
  For 5 GHz band - Special 8x8x8 fine cube was chosen for cube integration(dx=dy=4.3mm; dz=3mm)
- Distance between probe sensors and phantom surface was set to 4 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.0mm
- The dipole input power (forward power) was 250 mW±3%.
- The results are normalized to 1 W input power.

Reference SAR Values for body-tissue

In the table below, the numerical reference SAR values of a SPEAG validation dipoles placed below the flat phantom filled with body-tissue simulating liquid are given. The reference SAR values were calculated using the finite-difference time-domain method and the geometry parameters.

Dipole Type	Distance (mm)	Frequency (MHz)	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D450V2	15	450	5.01	3.36	7.22
D835V2	15	835	9.71	6.38	14.1
D900V2	15	900	11.1	7.17	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1800V2	10	1800	38.5	20.3	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	40.9	21.2	71.5
D2450V2	10	2450	**51.2**	**23.7**	97.6

Note: All SAR values normalized to 1 W forward power.

Reference SAR Values for body-tissue

In the table below, the numerical reference SAR values of a SPEAG validation dipoles placed below the flat phantom filled with body-tissue simulating liquid are given. The reference SAR values were calculated using finite-difference time-domain FDTD method (feed point-impedance set to 50 ohms) and the mechanical dimensions of the D5GHzV2 dipole (manufactured by SPEAG).

f (MHz)	Head Tissue		Body Tissue		
	SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}	SAR_{Peak}
5000	72.9	20.7	68.1	19.2	260.3
5100	74.6	21.1	78.8	19.6	272.3
5200	76.5	21.6	**71.8**	**20.1**	284.7
5500	83.3	23.4	**79.1**	**22.0**	326.3
5800	78.0	21.9	**74.1**	**20.5**	324.7

Note: All SAR values normalized to 1 W forward power.

6.1 SYSTEM PERFORMANCE CHECK RESULTS

System Validation Dipole: D2450V2 SN: 706

Date: April 18 2007

Ambient Temperature = 22°C; Relative humidity = 40% Measured by: Jonathan King

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	21	15	1g	12.40	49.6	51.2	-3.13	± 10
			10g	5.66	22.64	23.7	-4.47	± 10

System Validation Dipole: D5GHzV2 SN 1003

Date: April 19, 2007

Room Ambient Temperature = 23°C; Relative humidity = 35% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5200	22	15	1g	19.10	76.4	71.8	6.41	± 10
			10g	5.39	21.56	20.1	7.26	± 10

System Validation Dipole: D5GHzV2 SN 1003

Date: April 20, 2007

Ambient Temperature = 23°C; Relative humidity = 45% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5500	22	15	1g	19.20	76.8	79.1	-2.91	± 10
			10g	5.39	21.56	22.0	-2.00	± 10

System Validation Dipole: D5GHzV2 SN 1003

Date: April 23, 2007

Room Ambient Temperature = 23°C; Relative humidity = 50% Measured by: Ninous Davoudi

Body Simulating Liquid			SAR (mW/g)		Normalized to 1 W	Target	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5800	22	15	1g	16.90	67.6	74.1	-8.77	± 10
			10g	4.71	18.84	20.5	-8.10	± 10

7 SAR MEASURMENT PROCEDURE

A summary of the procedure follows:

a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the DUT. The SAR at this point is measured at the start of the test, and then again at the end of the test.

b) The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 4 mm from the inner surface of the shell. The area covers the entire dimension of the DUT and the horizontal grid spacing is 15 mm x 15 mm. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the DUT to ensure that the hotspot was correctly identified.

For 5 GHz band - The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 2.0 mm from the inner surface of the shell. The area covers the entire dimension of the DUT and the horizontal grid spacing is 10 mm x 10 mm. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the DUT to ensure that the hotspot was correctly identified.

c) Around this point, a volume of X=Y= 30 and Z=21 mm is assessed by measuring 5 x 5 x 7 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

For 5 GHz band - Around this point, a volume of X=Y=24 and Z=20 mm is assessed by measuring 7 x 7 x 9 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

(i) The data at the surface are extrapolated, since the centre of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.

(ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot”- condition (in x, y and z-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.

(iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

(iv) The SAR value at the same location as in Step (a) is again measured to evaluate the actual power drift.

7.1 DASY4 SAR MEASURMENT PROCEDURE

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 1.2 mm for an EX3DV3 probe type).

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 DASY4 software can find the maximum locations even 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. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums 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 5 x 5 x 7 points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job’s label.

For 5 GHz band – Same as above except the Zoom Scan measures 7 x 7 x 9 points.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement 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. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: 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.

8 PROCEDURE USED TO ESTABLISH TEST SIGNAL

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

The client provided a special driver and program, Remote Terminal Regulatory Tool, which enables a user to control the frequency and output power of the module.

802.11b

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	11.9
Middle	2437	13.6
High	2462	12.2

802.11g

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	12.3
Middle	2437	16.7
High	2462	12.6

802.11a

Channel	Frequency (MHz)	Average Power (dBm)
Low	5180	15.1
Middle	5260	16.4
High	5320	16.8

Channel	Frequency (MHz)	Average Power (dBm)
Low	5500	15.9
Middle	5600	14.7
High	5700	13.7

Channel	Frequency (MHz)	Average Power (dBm)
Low	5745	14.0
Middle	5785	14.0
High	5825	14.1

9 2.4 GHZ BAND SAR MEASURMENT RESULTS

9.1 LEFT HAND SIDE

Touch Position

Tilt (15°) Position

802.11b

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	1 6 11	2412 2437 2462	0.329	0.000	0.329
Tilt (15°)	1 6 11	2412 2437 2462	0.241	-0.002	0.241

802.11g

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	1 6 11	2412 2437 2462	0.421	0.000	0.421
Tilt (15°)	1 6 11	2412 2437 2462	0.326	-0.024	0.328

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.

9.2 RIGHT HAND SIDE

Touch Position

Tilt (15°) Position

802.11b

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	1 6 11	2412 2437 2462	0.346	-0.028	0.348
Tilt (15°)	1 6 11	2412 2437 2462	0.230	-0.020	0.231

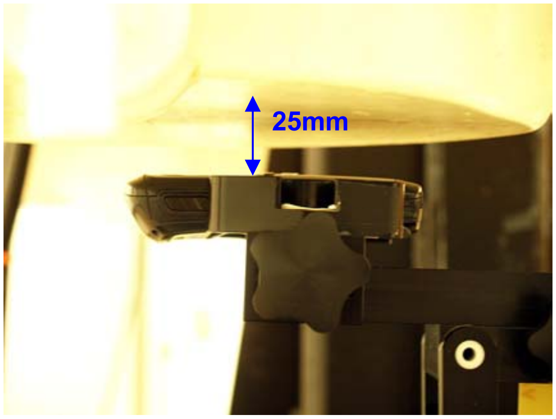
802.11g

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	1 **6** 11	2412 **2437** 2462	**0.457**	**-0.080**	**0.465**
Tilt (15°)	1 6 11	2412 2437 2462	0.333	-0.080	0.339

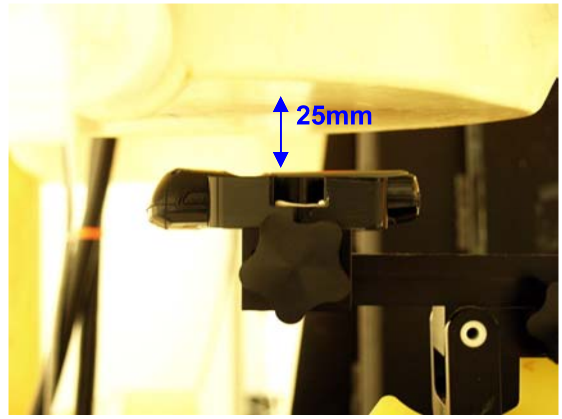
Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) The battery was fully charged in accordance with manufacture’s instructions prior to SAR measurements.

9.3 HELD TO FACE



LCD Up



LCD Down

802.11g

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
LCD Up	1 6 11	2412 2437 2462	0.064	-0.201	0.067

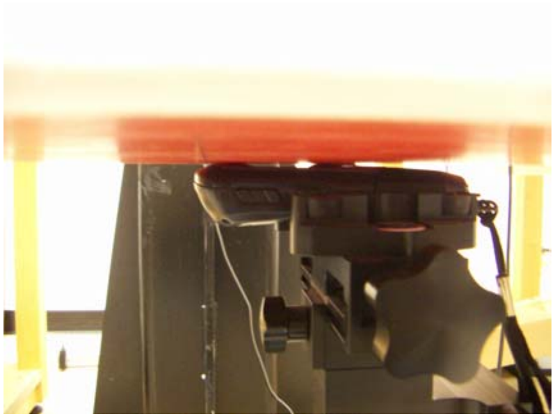
802.11g

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
LCD Down	1 6 11	2412 2437 2462	0.018	0.000	0.018

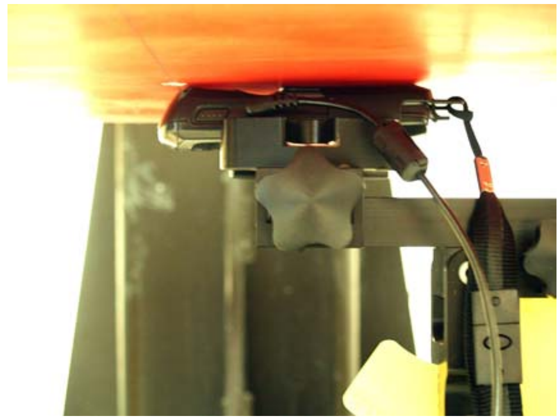
Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
5) 802.11b mode is skipped since power level is much lower than 802.11g.

9.4 BODY WORN – WITH LANYARD



LCD of EUT facing phantom



Back of EUT facing phantom

802.11b

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
LCD Up	1 6 11	2412 2437 2462	0.434	0.000	0.434

802.11g

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
LCD Up	1 **6** 11	2412 **2437** 2462	**0.556**	**0.000**	**0.556**

802.11b

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
LCD Down	1 6 11	2412 2437 2462	0.300	-0.083	0.306

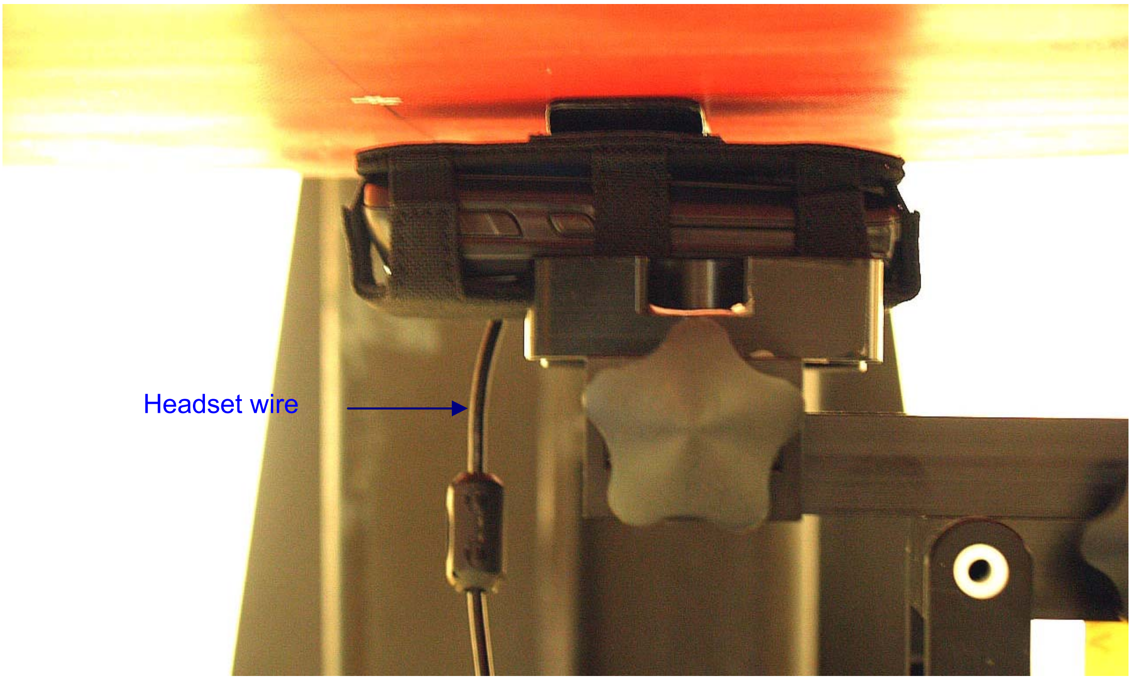
802.11g

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
LCD Down	1 6 11	2412 2437 2462	0.379	0.000	0.379

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.

9.5 BODY WORN – WITH HOLSTER



802.11b

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
LCD Face up	1 6 11	2412 2437 2462	0.094	-0.118	0.096

802.11g

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
LCD Face up	1 6 11	2412 2437 2462	0.118	0.000	0.118

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
5) Based on the measurements from Body Worn – with Lanyard, LCD Down position is skipped since SAR values are too low.

10 5 GHZ BAND SAR MEASURMENT RESULTS

10.1 LEFT HAND SIDE

Touch Position

Tilt (15°) Position

802.11a 5.2GHz					
Test Position	**Channel**	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
Touch	36 52 64	5180 5260 5320	0.700	0.000	0.700
Tilt (15°)	36 52 64	5180 5260 5320	0.685	-0.053	0.693
802.11a 5.5GHz					
Test Position	**Channel**	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
Touch	100 120 140	5500 5600 5700	0.743	-0.069	0.755
Tilt (15°)	100 120 140	5500 5600 5700	0.700	0.000	0.700
802.11a 5.8GHz					
Test Position	**Channel**	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1)] SAR 1g (mW/g)**
Touch	149 157 165	5745 5785 5825	0.496	-0.202	0.520
Tilt (15°)	149 157 165	5745 5785 5825	0.425	0.000	0.425

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.

10.2 RIGHT HAND SIDE

Touch Position

Tilt (15°) Position

802.11a 5.2GHz

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	36	5180	0.744	-0.050	0.753
	52	5260	0.767	-0.085	0.782
	64	**5320**	**0.895**	**0.000**	**0.895**
Tilt (15°)	36	5180	0.751	-0.035	0.757
	52	5260	0.779	-0.192	0.814
	64	5320	0.882	-0.014	0.885

802.11a 5.5GHz

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	100	5500			
	120	**5600**	**0.767**	**0.000**	**0.767**
	140	5700			
Tilt (15°)	100	5500			
	120	5600	0.740	0.000	0.740
	140	5700			

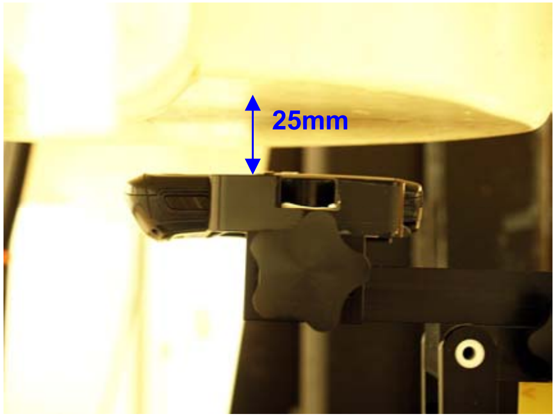
802.11a 5.8GHz

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
Touch	149	5745			
	157	**5785**	**0.525**	**-0.114**	**0.539**
	165	5825			
Tilt (15°)	149	5745			
	157	5785	0.476	-0.038	0.480
	165	5825			

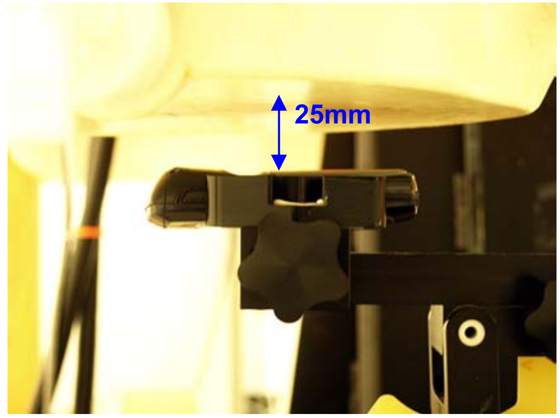
Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.

10.3 HELD TO FACE



LCD Up



LCD Down

802.11a 5.2GHz

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
LCD Up	36 52 64	5180 5260 5320	0.114	0.000	0.114
LCD Down	36 52 64	5180 5260 5320	0.047	-0.195	0.049

802.11a 5.5GHz

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
LCD Up	100 120 140	5500 5600 5700	0.102	-0.054	0.103
LCD Down	100 120 140	5500 5600 5700	0.016	0.000	0.016

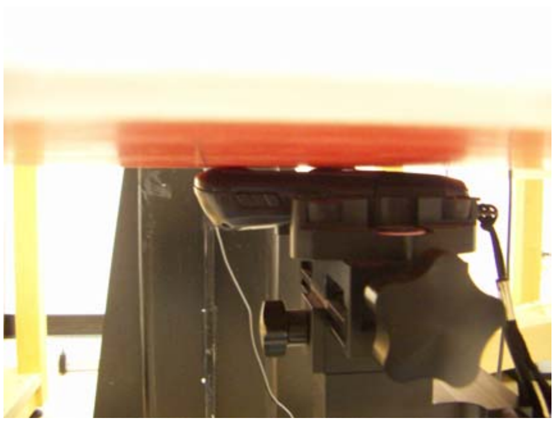
802.11a 5.8GHz

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1] SAR 1g (mW/g)
LCD Up	149 157 165	5745 5785 5825	0.059	0.000	0.059
LCD Down	149 157 165	5745 5785 5825	0.007	-0.029	0.007

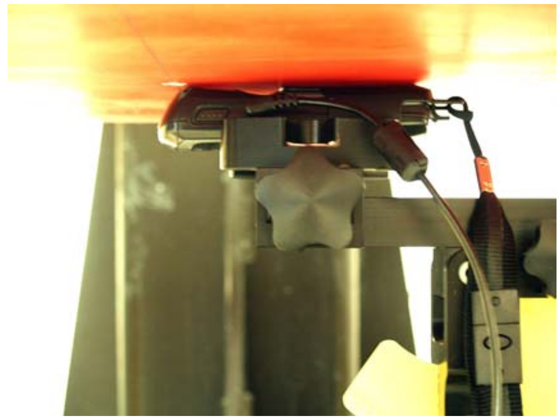
Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
5) 802.11b mode is skipped since power level is much lower than 802.11g.

10.4 BODY WORN – WITH LANYARD



LCD Up



LCD Down

802.11a 5.2GHz

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
LCD Up	36	5180	0.801	0.000	0.801
	52	5260	0.831	0.000	0.831
	64	**5320**	**0.971**	**0.000**	**0.971**
LCD Down	36 52 64	5180 5260 5320	0.195	0.000	0.195

802.11a 5.5GHz

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
LCD Up	**100**	**5500**	**1.350**	**0.000**	**1.350**
	120	5600	1.010	0.000	1.010
	140	5700	0.741	0.000	0.741
LCD Down	100 120 140	5500 5600 5700	0.098	-0.112	0.101

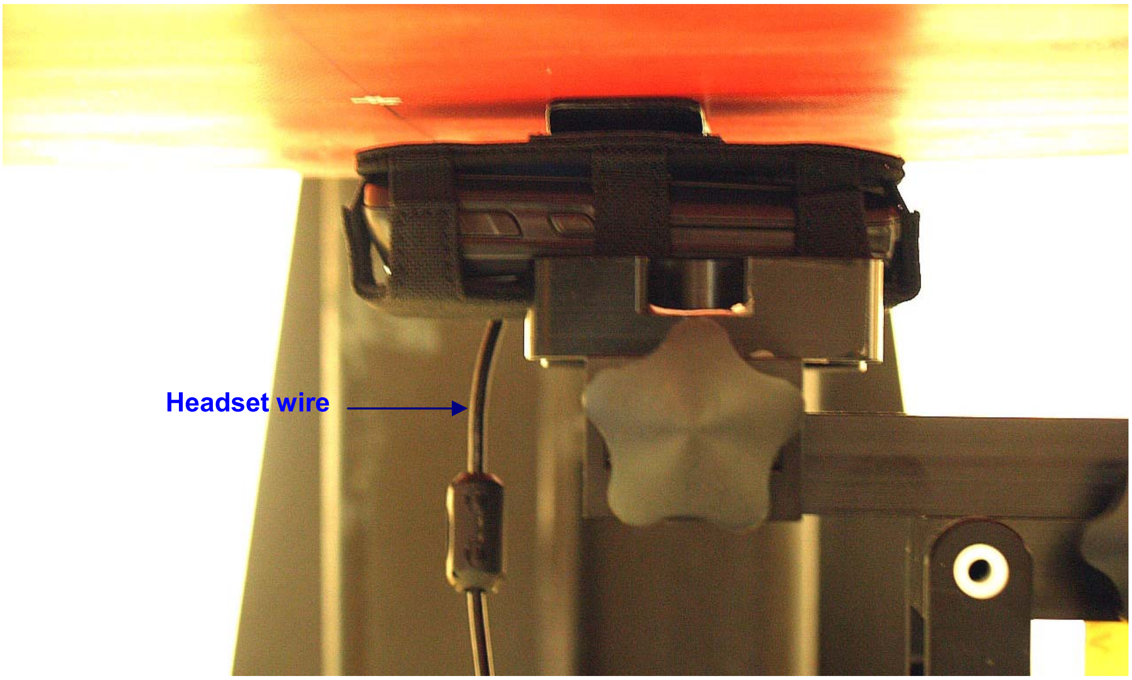
802.11a 5.8GHz

Test Position	Channel	f (MHz)	Measured SAR 1g (mW/g)	Power Drift (dB)	Extrapolated[1)] SAR 1g (mW/g)
LCD Up	149 **157** 165	5745 **5785** 5825	**0.621**	**0.000**	**0.621**
LCD Down	149 157 165	5745 5785 5825	0.037	0.000	0.037

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.

10.5 BODY WORN – WITH HOLSTER



802.11a 5.2GHz					
Test Position	**Channel**	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1] SAR 1g (mW/g)**
LCD Up	36 52 64	5180 5260 5320	0.182	0.000	0.182
802.11a 5.5GHz					
Test Position	**Channel**	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1] SAR 1g (mW/g)**
LCD Up	100 120 140	5500 5600 5700	0.256	0.000	0.256
802.11a 5.8GHz					
Test Position	**Channel**	**f (MHz)**	**Measured SAR 1g (mW/g)**	**Power Drift (dB)**	**Extrapolated[1] SAR 1g (mW/g)**
LCD Up	149 157 165	5745 5785 5825	0.143	-0.052	0.145

Notes:

1) The exact method of extrapolation is Measured SAR x 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY4 system can be scaled up by the Power drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the middle channel for this configuration is at least 3 dB lower (0.8 mW/g) than SAR limit (1.6 mW/g), thus testing at low & high channel is optional.
3) Please see attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
5) Based on the measurements from Body Worn – with Lanyard, LCD Down position is skipped since SAR values are too low.

11 MEASURMENT UNCERTAINTY

11.1 MEASURMENT UNCERTAINTY FOR 300 MHz – 3000 MHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	1.59	R	1.732	1	1	0.92	0.92
RF Ambient Conditions - Reflections	0.00	R	1.732	1	1	0.00	0.00
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.44	10.49
Expanded Uncertainty (95% Confidence Interval)	K=2					22.87	20.98

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

11.2 MEASURMENT UNCERTAINTY 3 GHz – 6 GHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	3.00	R	1.732	1	1	1.73	1.73
RF Ambient Conditions - Reflections	3.00	R	1.732	1	1	1.73	1.73
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.66	10.73
Expanded Uncertainty (95% Confidence Interval)	K=2					23.32	21.46

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

12 EQUIPMENT LIST AND CALIBRATION

Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date		
				MM	DD	Year
Robot - Six Axes	Stäubli	RX90BL	N/A	N/A		
Robot Remote Control	Stäubli	CS7MB	3403-91535	N/A		
DASY4 Measurement Server	SPEAG	SEUMS001BA	1041	N/A		
Probe Alignment Unit	SPEAG	LB (V2)	261	N/A		
SAM Phantom (SAM1)	SPEAG	TP-1185	QD000P40CA	N/A		
SAM Phantom (SAM2)	SPEAG	TP-1015	N/A	N/A		
Electronic Probe kit	HP	85070C	N/A	N/A		
S-Parameter Network Analyzer	Agilent	8753ES-6	US39173569	2	14	2008
E-Field Probe	SPEAG	EX3DV4	3552	5	30	2007
Thermometer	ERTCO	639-1S	1718	11	7	2007
Data Acquisition Electronics	SPEAG	DAE3 V1	427	11	16	2007
System Validation Dipole	SPEAG	D2450V2	706	4	27	2008
System Validation Dipole	SPEAG	D5GHzV2	1003	11	22	2007
Signal Generator	R&S	SMP 04	DE34210	10	9	2007
Power Meter	HP	438A	3513U04320	9	4	2007
Amplifier	Mini-Circuits	ZVE-8G	360	N/A		
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A		
Simulating Liquid	CCS	H2450	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	H5200-5800	N/A	Within 24 hrs of first test		
Simulating Liquid	CCS	M2450	N/A	Within 24 hrs of first test		
Simulating Liquid	SPEAG	M5200-5800	N/A	Within 24 hrs of first test		

13 PHOTOS


symbol
SYMBOL TECHNOLOGIES INC.,N.Y.
RF1
Engineering Samples - NOT FOR SALE
MADE IN:
MEXICO
MFD
March,2007

Headset

EUT with Holster/Belt-clip

EUT with Lanyard

14 ATTACHMENTS

No.	Contents	No. Of Pages
1	System Performance Check Plots	8
2-1	SAR Test Plots – 2.4 GHz Band	17
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2-3	SAR Test Plots – 5.5 GHz Band	12
2-4	SAR Test Plots – 5.8 GHz Band	10
3	Certificate of E-Field Probe - EXDV4SN3552	9
4	Certificate of System Validation Dipole - D2450 SN:706	9
5	Certificate of System Validation Dipole - D5GHzV2 SN:1003	10

END OF REPORT