SAR Evaluation Report

IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC REPORT AND ORDER:
ET DOCKET 93-62, AND OET BULLETIN 65 SUPPLEMENT C

FOR

Smart Phone

MODEL: ST22A

FCC ID: NM8TND

REPORT NUMBER: 05T3459-4

ISSUE DATE: July 15, 2005

Prepared for

High Tech Computer Corp.
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Prepared by

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LAB CODE:200065-0

Revision History

Rev.	Revisions	Revised By
A	Initial issue	HS

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: July 7, 8, 9 and 15 2005

APPLICANT:	High Tech Computer Corp.
ADDRESS:	23 Hsin Hua Road, Taoyuan 330, Taiwan, R. O. C
FCC ID:	NM8TND
MODEL:	ST22A
DEVICE CATEGORY:	Portable Device
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure

Smart Phone (GSM850/1900 with WiFi 802.11b and Bluetooth radio)

Test Sample is a:	Production unit	
FCC Rule Parts	Frequency Range [MHz]	The Highest SAR Values
22H	824.2 – 848.8	• The highest reported SAR values are: Head: 0.591W/kg and Body-worn: 0.955 W/kg • The highest reported collocated SAR values are Head: 0.651 W/kg and body: 1.009W/kg.
24E	1850.2 – 1909.8	• The highest reported SAR values are Head: 0.829W/kg; Body-worn: 0.978 W/kg • The highest reported collocated SAR values are Head: 0.886 W/kg and body: 1.032 W/kg.
15C	2412 - 2462	• The highest reported SAR values are head: 0.058 W/kg and body: 0.054 W/kg

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). And RSS-102 Issue 1 (Provisional) September 25, 1999.

The maximum 1g SAR level measured for all the tests performed did not exceed the limits for General Population/Uncontrolled Exposure (W/kg) Partial Body of 1.6 W/kg. Level defined in Supplement C (Edition 01-01) to OET Bulletin 65 (97-01).

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.

Released for CCS By:

Hsin Fu Shih (Sunny Shih)
COMPLIANCE CERTIFICATION SERVICES

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1 EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Smart Phone (GSM850/1900 with WiFi 802.11b and Bluetooth radio)	
Normal operation:	Held to ear, worn on body and hand-held
Duty cycle of Transmitter:	12.5% for GSM only 25% for GSM+(E)GPRS 100% for WiFi (802.11b) 100% for Bluetooth
Power supply:	**Rechargeable Li-ion Battery -** Manufactured by: Celxpert Energy Co., Ltd. model number: ST26B, rating: 3.7Vdc, 1150mA/h (Only one type of battery to be used in the EUT)
Body worn Accessory:	Holster with belt clip (Pouch) - Manufactured by: NewTech , model number: HTC-180-3. Headset - Manufactured by: Eacepech , model number: TS888-03206N.

2 FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, 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."

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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.

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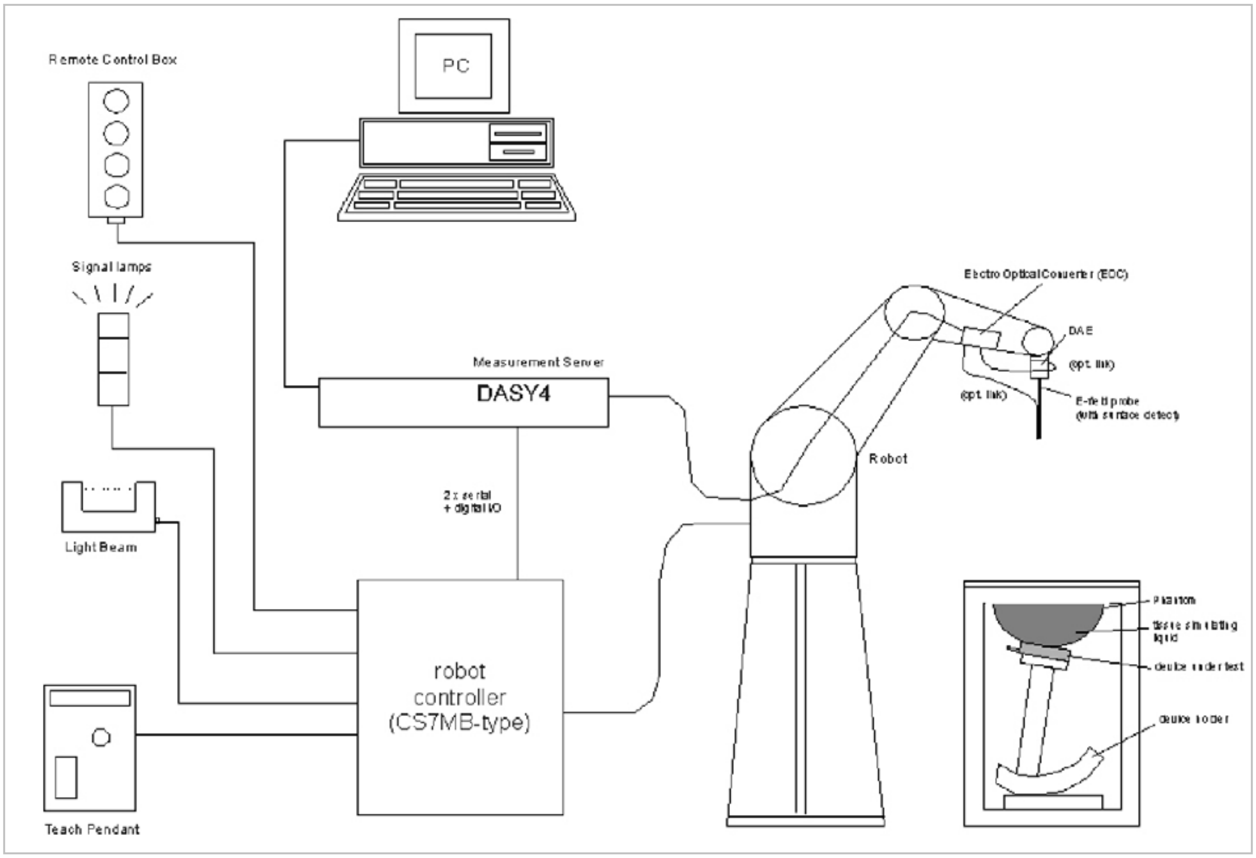
3 SYSTEM DESCRIPTION



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.

4 SYSTEM COMPONENT

4.1 DASY4 MEASUREMENT SERVER

The DASY4 measurement server is based on a PC/104 CPU board with a 166MHz low-power Pentium, 32MB chip disk and 64MB RAM. The necessary circuits for communication with either the DAE3 electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server. Calibration: No calibration required.

4.2 DATA ACQUISITION ELECTRONICS (DAE)

The data acquisition electronics (DAE3) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

4.3 EX3DV3 ISOTROPIC E-FIELD PROBE FOR DOSIMETRIC MEASUREMENTS

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency:	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 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: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application:	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

4.4 LIGHT BEAM UNIT

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, so that the robot coordinates are valid for the probe tip. The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

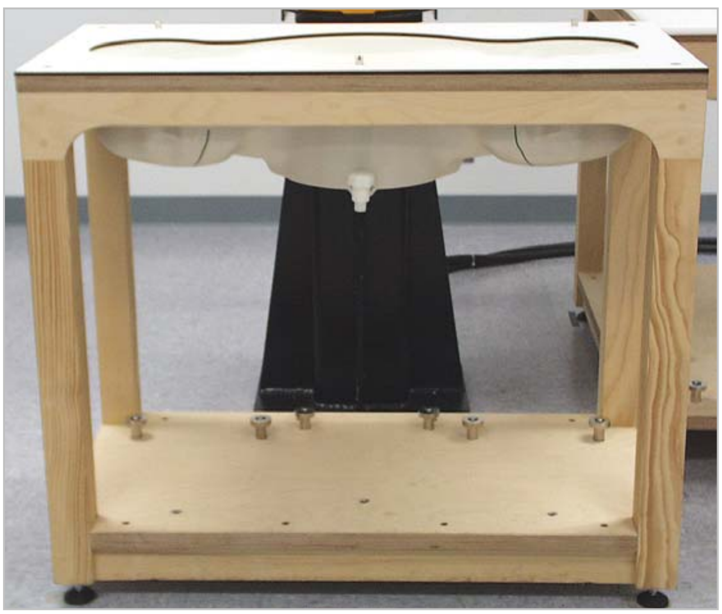
4.5 SAM PHANTOM (V4.0)

Construction: The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.

Shell Thickness: 2 ±0.2 mm

Filling Volume: Approx. 25 liters

Dimensions: Height: 810mm; Length: 1000mm; Width: 500mm



4.6 DEVICE HOLDER FOR SAM TWIN PHANTOM

Construction: In combination with the Twin SAM Phantom V4.0 or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

4.7 SYSTEM VALIDATION KITS

Construction: Symmetrical dipole with l/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

Frequency: 450, 900, 1800, 2450, 5800 MHz

Return loss: > 20 dB at specified validation position

Power capability: > 100 W (f < 1GHz); > 40 W (f > 1GHz)

Dimensions: 450V2: dipole length: 270 mm; overall height: 330 mm
D900V2: dipole length: 149 mm; overall height: 330 mm
D1800V2: dipole length: 72 mm; overall height: 300 mm
D835V2: dipole length: 161; overall height: 330
D1900V2: dipole length: 68; overall height: 300
D2450V2: dipole length: 51.5 mm; overall height: 300 mm D5GHzV2: dipole length: 25.5 mm; overall height: 290 mm

4.8 COMPOSITION OF INGREDIENTS FOR TISSUE SIMULATING LIQUID

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.

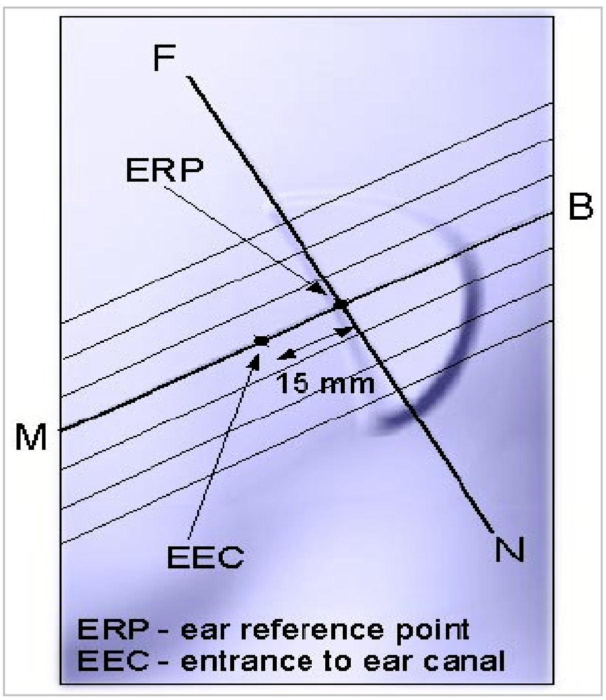
Ingredients (% by weight)	Frequency (MHz) 450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	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

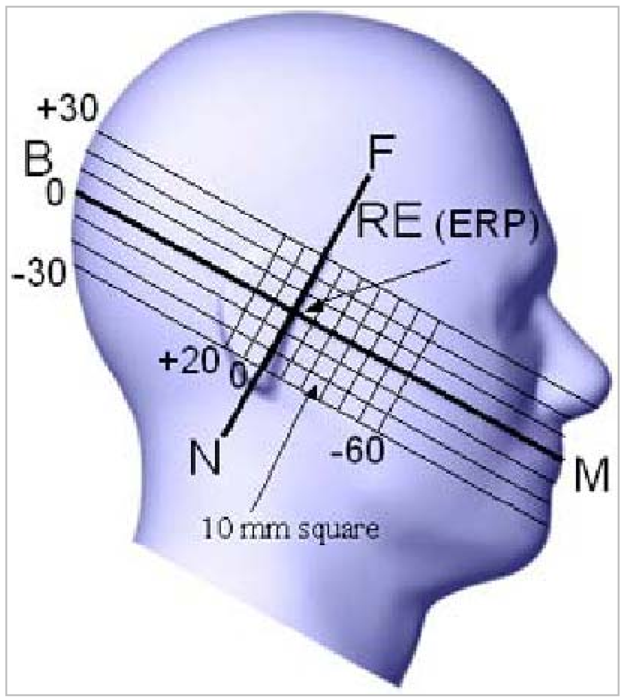
Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

5 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:





5.1 CHEEK/TOUCH POSITION

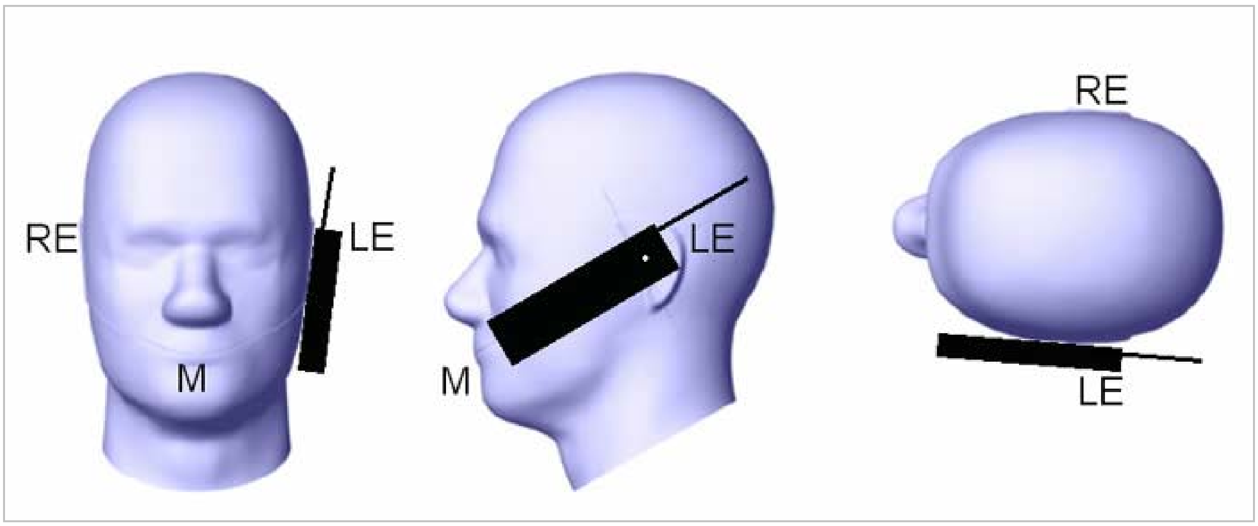
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

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



5.2 EAR/TILT POSITION

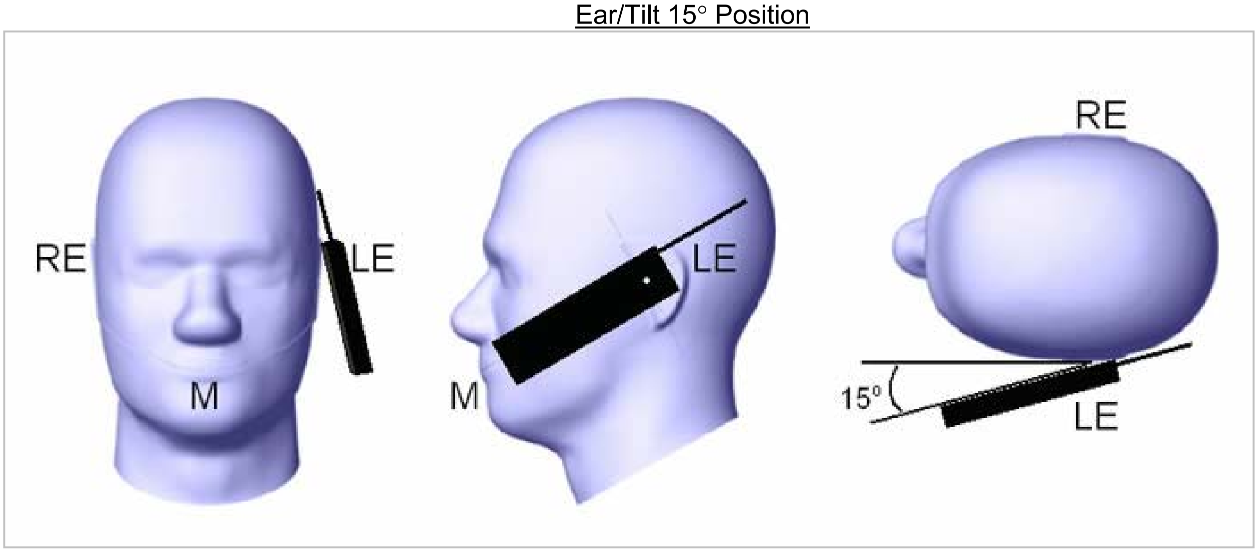
With the handset aligned in the “Cheek/Touch Position”:

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, Tile/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



6 TEST POSITIONS FOR BODY-WORN AND OTHER SIMILAR CONFIGURATIONS

☒ With the belt-clips or holsters

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. 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

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.

☐ 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.

☐ Transmitter that is designed to operate in front of a person's face (face-held)

Transmitters that are designed to operate in front of a person's face, in push-to-talk configurations, should be tested for SAR compliance with the front of the device positioned at 2.5 cm from a flat phantom. Frontal face-phantoms are typically not recommended because of the potential of higher E-field probe boundary-effects errors in the non-smooth regions of these face phantoms, such as the nose, lips and eyes etc. For devices that are carried next to the body, such as shoulder, waist or chest-worn transmitters, SAR compliance should be tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in normal use configurations.

☐ With neck-strap or lanyard

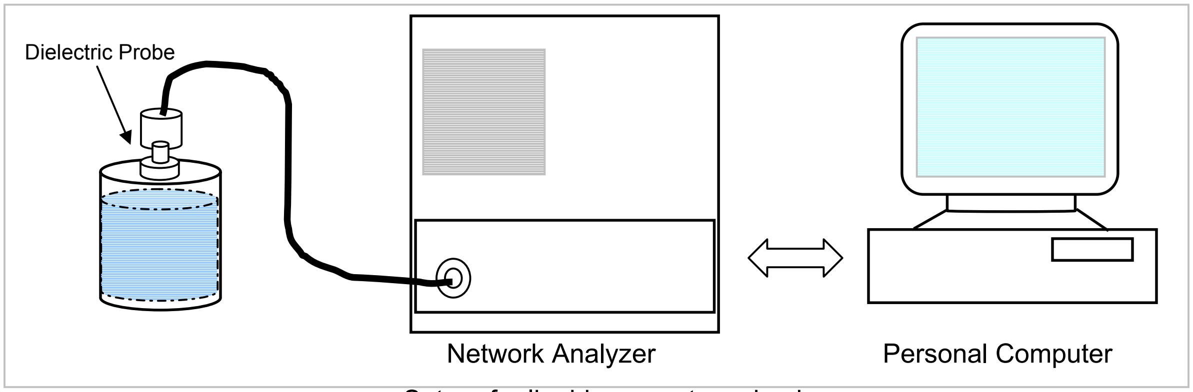
SAR data is requested for cell phones designed to be used with a headset while worn next to the body using a neck-strap or lanyard; device should be tested with front and back sides in contact with a flat phantom

☐ Lap-held

SAR is tested for a lap-held position with the bottom of the computer in direct contact against a flat phantom.

7 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

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)

7.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Parameter Check Result @ Head 835 MH

Room Ambient Temperature = 24.0 °C; Relative humidity = 47 % Measured by: Anson Lu

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	23	15	e'	Relative Permittivity (e"):	41.5	40.8378	-1.60	± 5
			19.7841	Conductivity (σ):	0.90	0.9190	2.11	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 07, 2005 09:12 AM

Frequency	e'	e''
750000000.	41.8069	20.1114
755000000.	41.7344	20.1088
760000000.	41.6925	20.0872
765000000.	41.6221	20.0393
770000000.	41.5317	19.9972
775000000.	41.4536	19.9975
780000000.	41.3767	19.9977
785000000.	41.3241	19.9586
790000000.	41.2496	19.9588
795000000.	41.1941	19.9432
800000000.	41.1499	19.9250
805000000.	41.1112	19.8838
810000000.	41.0859	19.8503
815000000.	41.0444	19.8538
820000000.	41.0028	19.8145
825000000.	40.9427	19.8020
830000000.	40.8553	19.8025
835000000.	40.8378	19.7841
840000000.	40.7751	19.7521
845000000.	40.6914	19.7160
850000000.	40.6345	19.7353
855000000.	40.5955	19.6670
860000000.	40.5243	19.6290
865000000.	40.4258	19.5993
870000000.	40.3701	19.6090
875000000.	40.3074	19.5904
880000000.	40.2455	19.5718
885000000.	40.1780	19.5653
890000000.	40.1155	19.5377
895000000.	40.0893	19.5298
900000000.	40.0317	19.5312

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 835 MHz

Room Ambient Temperature = 24.0 °C; Relative humidity = 47 % Measured by: Anson Lu

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	23	15	e'	Relative Permittivity (e"):	55.2	56.0155	1.48	± 5
			21.3485	Conductivity (σ):	0.97	0.9917	2.24	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 07, 2005 09:24 AM

Frequency	e'	e"
750000000.	56.6789	21.8080
755000000.	56.6155	21.7702
760000000.	56.5964	21.7531
765000000.	56.5421	21.7009
770000000.	56.4717	21.6667
775000000.	56.3958	21.6467
780000000.	56.3562	21.6259
785000000.	56.3066	21.5739
790000000.	56.2625	21.5668
795000000.	56.2463	21.5380
800000000.	56.2134	21.4925
805000000.	56.1923	21.4772
810000000.	56.1853	21.4511
815000000.	56.1508	21.4407
820000000.	56.1433	21.4090
825000000.	56.0872	21.3956
830000000.	56.0256	21.3789
835000000.	56.0155	21.3485
840000000.	55.9578	21.3364
845000000.	55.8901	21.2952
850000000.	55.8611	21.2945
855000000.	55.8182	21.2554
860000000.	55.7594	21.2011
865000000.	55.6807	21.1768
870000000.	55.6180	21.1899
875000000.	55.5475	21.1525
880000000.	55.5075	21.1355
885000000.	55.4648	21.1092
890000000.	55.4212	21.1047
895000000.	55.3939	21.0725
900000000.	55.3810	21.0611

The conductivity (σ) can be given as:

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

where f = target $f * 10^6$
$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Head 835 MHz

Room Ambient Temperature = 24.0 °C; Relative humidity = 48 % Measured by: Anson Lu

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	23	15	e'	Relative Permittivity (e"):	41.5	40.5093	-2.39	± 5
			19.6214	Conductivity (σ):	0.90	0.9115	1.27	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 15, 2005 04:28 PM

Frequency	e'	e"
750000000.	41.5767	20.0198
755000000.	41.4974	19.9857
760000000.	41.4326	19.9599
765000000.	41.3769	19.9209
770000000.	41.2906	19.8904
775000000.	41.1978	19.8733
780000000.	41.1195	19.8640
785000000.	41.0655	19.8156
790000000.	40.9636	19.7913
795000000.	40.9300	19.7716
800000000.	40.8537	19.7526
805000000.	40.8117	19.7357
810000000.	40.7792	19.7111
815000000.	40.7250	19.7033
820000000.	40.7126	19.6685
825000000.	40.6403	19.6660
830000000.	40.5588	19.6452
835000000.	40.5093	19.6214
840000000.	40.4880	19.6215
845000000.	40.4180	19.5934
850000000.	40.3377	19.5997
855000000.	40.3204	19.5682
860000000.	40.2384	19.5241
865000000.	40.1696	19.4872
870000000.	40.0856	19.4654
875000000.	40.0294	19.4665
880000000.	39.9636	19.4302
885000000.	39.9066	19.4220
890000000.	39.8241	19.3914
895000000.	39.7938	19.3663
900000000.	39.7420	19.3674

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 835 MHz

Room Ambient Temperature = 24.0 °C; Relative humidity = 48 % Measured by: Anson Lu

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
835	23	15	e'	Relative Permittivity (e"):	55.2	54.9036	-0.54	± 5
			20.9547	Conductivity (σ):	0.97	0.9734	0.35	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 15, 2005 06:50 PM

Frequency	e'	e"
750000000.	55.7116	21.4054
755000000.	55.6781	21.3749
760000000.	55.6243	21.3516
765000000.	55.5749	21.3034
770000000.	55.5307	21.3009
775000000.	55.4834	21.2527
780000000.	55.4305	21.2186
785000000.	55.3925	21.1911
790000000.	55.3146	21.1781
795000000.	55.2962	21.1670
800000000.	55.2584	21.1629
805000000.	55.2199	21.0908
810000000.	55.1808	21.0931
815000000.	55.1165	21.0539
820000000.	55.0754	21.0291
825000000.	55.0437	21.0122
830000000.	55.0136	20.9670
835000000.	54.9036	20.9574
840000000.	54.8954	20.9213
845000000.	54.8241	20.9200
850000000.	54.8173	20.8835
855000000.	54.7600	20.8555
860000000.	54.6907	20.8217
865000000.	54.6333	20.8161
870000000.	54.5956	20.8030
875000000.	54.5367	20.7876
880000000.	54.5045	20.7834
885000000.	54.4588	20.7420
890000000.	54.3881	20.7426
895000000.	54.3787	20.7086
900000000.	54.3517	20.6817

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 @ Head 1900 MHz

Room Ambient Temperature =24 °C; Relative humidity = 48 % Measured by: Anson Lu

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	23	15	e"	Relative Permittivity (e'):	40.0	40.9622	2.41	± 5
			13.5771	Conductivity (σ):	1.40	1.43509	2.51	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 09, 2005 08:54 AM

Frequency	e'	e"
1710000000.	41.8095	13.1147
1720000000.	41.7461	13.1531
1730000000.	41.6877	13.1917
1740000000.	41.6503	13.1955
1750000000.	41.6075	13.2342
1760000000.	41.5669	13.2840
1770000000.	41.4916	13.3306
1780000000.	41.4402	13.3530
1790000000.	41.3806	13.3652
1800000000.	41.3481	13.3886
1810000000.	41.3151	13.4091
1820000000.	41.2695	13.4225
1830000000.	41.2332	13.4484
1840000000.	41.2089	13.4575
1850000000.	41.1694	13.4888
1860000000.	41.1168	13.5072
1870000000.	41.0476	13.5217
1880000000.	41.0092	13.5345
1890000000.	40.9850	13.5350
1900000000.	40.9622	13.5771
1910000000.	40.9293	13.6472

The conductivity (σ) can be given as:

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

where $f = target\ f * 10^6$
$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Dielectric Parameter Check Result @ Muscle 1900 MHz

Room Ambient Temperature =24 °C; Relative humidity = 48 % Measured by: Anson Lu

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	23	15	e"	Relative Permittivity (e'):	53.3	53.0370	-0.49	± 5
			14.6615	Conductivity (σ):	1.52	1.54971	1.95	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 09, 2005 09:05 AM

Frequency	e'	e"
1710000000.	53.7370	14.1961
1720000000.	53.6805	14.2326
1730000000.	53.6288	14.2765
1740000000.	53.6179	14.2827
1750000000.	53.5648	14.3284
1760000000.	53.5253	14.3702
1770000000.	53.4657	14.4073
1780000000.	53.4040	14.4393
1790000000.	53.3698	14.4665
1800000000.	53.3435	14.4836
1810000000.	53.3160	14.5055
1820000000.	53.2817	14.5300
1830000000.	53.2485	14.5244
1840000000.	53.2243	14.5477
1850000000.	53.1940	14.5621
1860000000.	53.1354	14.5876
1870000000.	53.0817	14.6164
1880000000.	53.0638	14.6060
1890000000.	53.0136	14.6145
1900000000.	53.0370	14.6615
1910000000.	53.0130	14.7340

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 @ Head 1900 MHz

Room Ambient Temperature =24 °C; Relative humidity = 48 % Measured by: Anson Lu

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	23	15	e"	Relative Permittivity (e'):	40.0	40.6047	1.51	± 5
			13.5809	Conductivity (σ):	1.40	1.43549	2.54	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 15, 2005 10:38 AM

Frequency	e'	e"
1710000000.	41.5070	13.0857
1720000000.	41.4294	13.0994
1730000000.	41.3508	13.1142
1740000000.	41.2662	13.1424
1750000000.	41.2066	13.1932
1760000000.	41.1382	13.2371
1770000000.	41.0927	13.3105
1780000000.	41.0645	13.3638
1790000000.	41.0494	13.3809
1800000000.	41.0524	13.3957
1810000000.	41.0286	13.3811
1820000000.	40.9936	13.3860
1830000000.	40.9508	13.3530
1840000000.	40.8800	13.3752
1850000000.	40.8200	13.4213
1860000000.	40.7250	13.4629
1870000000.	40.6357	13.5012
1880000000.	40.5973	13.5128
1890000000.	40.5835	13.5418
1900000000.	40.6047	13.5809
1910000000.	40.6147	13.5877

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 1900 MHz

Room Ambient Temperature =24 °C; Relative humidity = 48 % Measured by: Anson Lu

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	23	15	e"	Relative Permittivity (e'):	53.3	52.8192	-0.90	± 5
			14.7660	Conductivity (σ):	1.52	1.56076	2.68	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 15, 2005 12:30 PM

Frequency	e'	e"
1710000000.	53.5819	14.2640
1720000000.	53.4948	14.2896
1730000000.	53.4359	14.3108
1740000000.	53.3723	14.3328
1750000000.	53.2955	14.3848
1760000000.	53.2514	14.4465
1770000000.	53.2164	14.5119
1780000000.	53.2067	14.5523
1790000000.	53.1856	14.5768
1800000000.	53.1960	14.5888
1810000000.	53.1741	14.5701
1820000000.	53.1385	14.5672
1830000000.	53.0909	14.5532
1840000000.	53.0292	14.5668
1850000000.	52.9552	14.6138
1860000000.	52.8816	14.6465
1870000000.	52.8125	14.6941
1880000000.	52.7945	14.7072
1890000000.	52.7737	14.7231
1900000000.	52.8192	14.7660
1910000000.	52.8364	14.7798

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 =24 °C; Relative humidity = 46 % Measured by: Anson Lu

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	23	15	e"	Relative Permittivity (e'):	52.7	51.8774	-1.56	± 5
			14.5777	Conductivity (σ):	1.95	1.98689	1.89	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 08, 2005 09:02 AM

Frequency	e'	e"
2400000000.	52.0082	14.3690
2410000000.	51.9800	14.4262
2420000000.	51.9590	14.4638
2430000000.	51.9380	14.5060
2440000000.	51.9003	14.5396
2450000000.	51.8774	14.5777
2460000000.	51.8088	14.5994
2470000000.	51.7770	14.6428
2480000000.	51.7211	14.6840
2490000000.	51.6811	14.7244
2500000000.	51.6441	14.7807

The conductivity (σ) can be given as:

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

where $f = target\ f * 10^6$

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

Simulating Liquid Dielectric Parameter Check Result @ Head 2450 MHz

Room Ambient Temperature =24 °C; Relative humidity = 48 % Measured by: Anson Lu

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	23	15	e"	Relative Permittivity (e'):	39.2	39.0051	-0.50	± 5
			13.6586	Conductivity (σ):	1.80	1.86162	3.42	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 09, 2005 04:26 PM

Frequency	e'	e"
2400000000.	39.1672	13.5059
2410000000.	39.1302	13.5366
2420000000.	39.1036	13.5753
2430000000.	39.0756	13.6044
2440000000.	39.0348	13.6304
2450000000.	39.0051	13.6586
2460000000.	38.9523	13.6815
2470000000.	38.9172	13.7175
2480000000.	38.8631	13.7367
2490000000.	38.8135	13.7664
2500000000.	38.7821	13.8002

The conductivity (σ) can be given as:

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

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

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

8 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 Head simulating liquid of the following parameters.
- For 2450 MHz, 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: 3552 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 f 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.
- Special 5 x 5 x 7 fine cube was chosen for cube integration(dx=dy=7.5mm; dz=5mm).
- Distance between probe sensors and phantom surface was set to 2.5 (below 3 G) mm.
- The dipole input power (forward power) was 250 mW±3%.
- The results are normalized to 1 W input power.

Reference SAR Values

IEEE Standard 1528 Recommended Reference Value

Frequency (MHz)	1 g SAR	10 g SAR	Local SAR at surface (Above feed point)	Local SAR at surface (y=2cm offset from feed point)
300	3.0	2.0	4.4	2.1
450	4.9	3.3	7.2	3.2
835	9.5	6.2	14.1	4.9
900	10.8	6.9	16.4	5.4
1450	29.0	16.0	50.2	6.5
1800	38.1	19.8	69.5	6.8
1900	39.7	20.5	72.1	6.6
2450	52.4	24.0	104.2	7.7
3000	63.8	25.7	140.2	9.5

Reference SAR Values

The reference SAR values were using measurement results indicated in the dipole calibration document (See attached dipole certificate).

f (MHz)	Head Tissue		Body Tissue	
	SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}
2450	52.0	23.8	54.8	25.4

8.1 SYSTEM PERFORMANCE CHECK RESULT FOR 835 MHZ

@ System Validation Dipole: D835V2 SN:4d002

Date: July 07, 2005

Ambient Temperature = 24 °C; Relative humidity = 47 % Measured by: Anson Lu

Head Simulating Liquid			Mrasured		$Target_{1g}$	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
835	23	15	2.43	9.72	9.5	2.32	± 10

Date: July 15, 2005

Ambient Temperature = 24 °C; Relative humidity = 48 % Measured by: Anson Lu

Head Simulating Liquid			Mrasured		$Target_{1g}$	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
835	23	15	2.44	9.76	9.5	2.74	± 10

8.2 SYSTEM PERFORMANCE CHECK RESULT FOR 1900 MHZ

@ System Validation Dipole: D1900V2 SN:5d043

Date: July 9, 2005

Ambient Temperature = 24°C; Relative humidity = 48 % Measured by: Anson Lu

Head Simulating Liquid			Mrasured		$Target_{1g}$	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
1900	23	15	9.68	38.72	39.7	-2.47	± 10

Date: July 15, 2005

Ambient Temperature = 24°C; Relative humidity = 48% Measured by: Anson Lu

Head Simulating Liquid			Mrasured		$Target_{1g}$	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
1900	23	15	9.78	39.12	39.7	-1.46	± 10

8.3 SYSTEM PERFORMANCE CHECK RESULT FOR 2450 MHZ

@ System Validation Dipole: D2450V2 SN: 748

Date: July 8, 2005

Ambient Temperature = 24°C, Relative humidity = 46 % Measured by: Anson Lu

Body Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
2450	23	15	13	52	54.8	-5.11	± 10

Date: July 9, 2005

Ambient Temperature = 24°C, Relative humidity = 48 % Measured by: Anson Lu

Body Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
2450	23	15	13.2	5	54.8	-90.88	± 10

9 SAR MEASUREMENT 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 EUT. 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 2.5 mm from the inner surface of the shell. The area covers the entire dimension of the EUT 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 EUT to ensure that the hotspot was correctly identified.

c) Around this point, a volume of X=Y=Z=30 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:

(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.

DASY4 SAR MEASUREMENT 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.

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.

10 PROCEDURES USED TO ESTABLISH TEST SIGNAL

The following settings were used to configure the Radio Communication Tester, R&S model CMU 200.

GSM850

Network Support: GSM only
Main Service: Circuit Switched
Power Setting: PCL: 5 (33 dBm) - for GSM850
GSM Class: Class B

GPRS/EGPRS mode

Service Selection: Test Mode A
Main Service: Packet Data
Network Support: GSM+GPRS (Power setting: 33 dBm)
Network Support: GSM+EGPRS (Power setting: 27 dBm)
GPRS Class: Class 10 (3 Down/2 up/ 5 Sum)
Conducted power measured result

Ch. #	f (MHz)	Peak Conducted Power (dBm)		
		GSM	GPRS	EGPRS
128	824.2	32.30	32.20	26.80
190	836.6	32.20	32.10	26.70
251	848.8	32.00	31.90	26.50

GSM1900

Network Support: GSM only
Main Service: Circuit Switched
Power Setting: PCL: 0 (30 dBm)
GSM Class: Class B

GPRS/EGPRS mode

Service Selection: Test Mode A
Main Service: Packet Data
Network Support: GSM+GPRS (Power setting: 30 dBm)
Network Support: GSM+EGPRS (Power setting: 26 dBm)
GPRS Class: Class 10 (3 Down/2 up/ 5 Sum)
Conducted power measured result

Ch. #	f (MHz)	Peak Conducted Power (dBm)		
		GSM	GPRS	EGPRS
512	1850.2	29.80	29.60	26.10
661	1880.0	29.40	29.40	25.90
810	1909.8	29.20	29.20	25.70

The following procedures had been used to prepare the WiFi (802.11b) and Bluetooth for the SAR test.

- The client supplied a special driving program to program the EUT to continually transmit the specified maximum power.

Mode	Channel	f (MHz)	Conducted Power Average (dBm)
802.11b	1	2412	13.29
	6	2437	12.75
	11	2462	11.65
Bluetooth	0	2402	2.69
	39	2441	2.63
	78	2480	2.41

11 THE HIGHEST SAR VALUES FOR GSM850

The highest reported SAR values are: **Part 22H** - Head: 0.591 W/kg; Body-worn: 0.955 W/kg

The highest reported **collocated** SAR values are Head: 0.651 W/kg and body: 1.009 W/kg.

Test Position	Modulation	Test Mode	Ch. #	f (MHz)	SAR_1g (mW/g)	
					Measured	Summation
Righht Head - Touch	GSM850	GSM only	128	824.20	0.591	
	WiFi	802.11b	1	2412	0.058	0.651
	Bluetooth		78	2480	0.00201	
Body	GSM850	GPRS	251	848.80	0.955	
	WiFi	802.11b	1	2412	0.054	1.009
	Bluetooth		78	2480	0.000	

12 THE HIGHEST SAR VALUES FOR GSM1900

The highest reported SAR values are: **Part 24E** - Head: 0.829 W/kg; Body-worn: 0.978 W/kg

The highest reported **collocated** SAR values are Head: 0.886 W/kg and body: 1.032 W/kg.

Test Position	Modulation	Test Mode	Ch. #	f (MHz)	SAR_1g (mW/g)	
					Measured	Summation
Right Head - Tilt	GSM1900	GSM only	810	1909.80	0.829	
	WiFi	802.11b	1	2412	0.0551	0.886
	Bluetooth		78	2480	0.00186	
Body	GSM1900	GPRS	512	1850.20	0.978	
	WiFi	802.11b	1	2412	0.054	1.032
	Bluetooth		78	2480	0.000	

13 THE HIGHEST SAR VALUES FOR WLAN (WIFI)

The highest reported SAR values are: **Part 15** - WLAN head: 0.058 W/kg and body: 0.054 W/kg.

Test Position	Mode	Channel	f (MHz)	SAR_1g (mW/g)
Right Head - Touch	802.11b	1	2412	0.058
Body	802.11b	1	2412	0.054

14 SAR MEASUREMENT RESULT (GSM835)

14.1 Left Hand Side

Touch Position	Tilt (15°) Position

Note: The setup photos on this page have been extracted under a separate file.

GSM850 (duty cycle:12.5%)

Test Position	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
Touch	128	824.2				
Touch	190	836.6	0.483	-0.052	0.489	1.6
Touch	251	848.8				
Tilt	128	824.2				
Tilt	190	836.6	0.233	-0.036	0.235	1.6
Tilt	251	848.8				

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 measurement system can be scaled up by the measured 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 than SAR limit, testing at low & high channel is optional.
3) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachment for the detailed measurement data and plots.

14.2 Right Hand Side

Touch Position	Tilt (15°) Position

Note: The setup photos on this page have been extracted under a separate file.

GSM850 (duty cycle: 12.5%)						
Test Position	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
Touch	128	824.2	0.590	-0.010	0.591	1.6
Touch	128 [1)]	824.2	0.520	-0.026	0.523	1.6
Touch	190	836.6	0.500	-0.062	0.507	1.6
Touch	251	848.8	0.457	-0.017	0.459	1.6
Tilt	128	824.2				
Tilt	190	836.6	0.251	-0.113	0.258	1.6
Tilt	251	848.8				

Notes:

1) Co-located SAR measurement result with the GSM and WiFi 802.11b radio. (Transmitting simultaneously)
2) 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 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process.
3) The SAR measured at the middle channel for this configuration is at least 3 dB lower than SAR limit, testing at low & high channel is optional.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
5) Please see attachment for the detailed measurement data and plots.

14.3 Body Worn Front Side

Note: The setup photos on this page have been extracted under a separate file.

GSM850 GSM only (duty cycle: 12.5%)

Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	128	824.2				
18_w/Holster	190	836.6	0.137	-0.029	0.138	1.6
18_w/Holster	251	848.8				

GSM850 GSM+GPRS (duty cycle: 25%)

Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	128	824.2				
18_w/Holster	190	836.6	0.499	-0.135	0.515	1.6
18_w/Holster	251	848.8				

GSM850 GSM+EGPRS (duty cycle: 25%)

Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	128	824.2				
18_w/Holster	190	836.6	0.150	-0.046	0.152	1.6
18_w/Holster	251	848.8				

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 measurement system can be scaled up by the measured 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 than SAR limit, testing at low & high channel is optional.
3) The earphone wire connected to the EUT to simulate hand-free operation in a body worn configuration.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
5) Please see attachment for the detailed measurement data and plots.

14.4 Body Worn Back Side

Note: The setup photos on this page have been extracted under a separate file.

GSM850 GSM only (duty cycle: 12.5%)						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	128	824.2	0.508	-0.070	0.516	1.6
18_w/Holster	190	836.6	0.496	-0.040	0.501	1.6
18_w/Holster	251	848.8	0.514	-0.043	0.519	1.6
GSM850 GSM+GPRS (duty cycle: 25%)						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	128	824.2	0.938	-0.042	0.947	1.6
18_w/Holster	190	836.6	0.915	-0.108	0.938	1.6
18_w/Holster	251	848.8	0.941	-0.062	0.955	1.6
18_w/Holster	251 [1)]	848.8	0.930	-0.105	0.953	1.6
GSM850 GSM+EGPRS (duty cycle: 25%)						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	128	824.2	0.272	-0.019	0.273	1.6
18_w/Holster	190	836.6	0.269	-0.001	0.269	1.6

Notes:
1) Co-located SAR measurement result with the GPRS and WiFi 802.11b radio. (Transmitting simultaneously)
2) 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 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process.
3) The SAR measured at the middle channel for this configuration is at least 3 dB lower than SAR limit, testing at low & high channel is optional.
4) The earphone wire connected to the EUT to simulate hand-free operation in a body worn configuration.
5) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
6) Please see attachment for the detailed measurement data and plots.

15 SAR MEASUREMENT RESULT (GSM1900)

15.1 Left Hand Side

Touch Position	Tilt (15°) Position

Note: The setup photos on this page have been extracted under a separate file.

GSM1900 (duty cycle:12.5%)						
Test Position	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
Touch	512	1850.20				
Touch	661	1880.00	0.491	-0.076	0.500	1.6
Touch	810	1909.80				
Tilt	512	1850.20				
Tilt	661	1880.00	0.637	-0.079	0.649	1.6
Tilt	810	1909.80				

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 measurement system can be scaled up by the measured 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 than SAR limit, testing at low & high channel is optional.
3) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachment for the detailed measurement data and plots.

15.2 Right Hand Side

Touch Position	Tilt (15°) Position

Note: The setup photos on this page have been extracted under a separate file.

GSM1900 (duty cycle:12.5%)

Test Position	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
Touch	512	1850.20				
Touch	661	1880.00	0.619	-0.024	0.622	1.6
Touch	810	1909.80				
Tilt	512	1850.20	0.798	-0.020	0.802	1.6
Tilt	661	1880.00	0.786	-0.030	0.791	1.6
Tilt	810	1909.80	0.826	-0.016	0.829	1.6
Tilt	810 1)	1909.80	0.791	-0.020	0.795	1.6

Notes:
1) Co-located SAR measurement result with the GSM and WiFi 802.11b radio. (Transmitting simultaneously)
2) 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 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process.
3) The SAR measured at the middle channel for this configuration is at least 3 dB lower than SAR limit, testing at low & high channel is optional.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
5) Please see attachment for the detailed measurement data and plots.

15.3 Body Worn Front Side

Note: The setup photos on this page have been extracted under a separate file.

GSM1900 GSM only (duty cycle: 12.5%)						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	512	1850.20				
18_w/Holster	661	1880.00	0.170	-0.180	0.177	1.6
18_w/Holster	810	1909.80				
GSM1900 GSM+GPRS (duty cycle: 25%)						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	512	1850.20				
18_w/Holster	661	1880.00	0.292	-0.071	0.297	1.6
18_w/Holster	810	1909.80				
GSM1900 GSM+EGPRS (duty cycle: 25%)						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	512	1850.20				
18_w/Holster	661	1880.00	0.127	-0.123	0.131	1.6
18_w/Holster	810	1909.80				

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 measurement system can be scaled up by the measured 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 than SAR limit, testing at low & high channel is optional.
3) The earphone wire connected to the EUT to simulate hand-free operation in a body worn configuration.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
5) Please see attachment for the detailed measurement data and plots.

15.4 Body Worn Back Side

Note: The setup photos on this page have been extracted under a separate file.

GSM1900 GSM only (duty cycle: 12.5%)						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	512	1850.20	0.497	-0.003	0.497	1.6
18_w/Holster	661	1880.00	0.479	-0.078	0.488	1.6
18_w/Holster	810	1909.80	0.468	-0.110	0.480	1.6
GSM1900 GSM+GPRS (duty cycle: 25%)						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	512	1850.20	0.968	-0.044	0.978	1.6
18_w/Holster	661	1880.00	0.922	-0.067	0.936	1.6
18_w/Holster	810	1909.80	0.871	-0.083	0.888	1.6
18_w/Holster	810 [1)]	1909.80	0.775	-0.188	0.809	1.6
GSM1900 GSM+EGPRS (duty cycle: 25%)						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	512	1850.20	0.438	-0.056	0.444	1.6
18_w/Holster	661	1880.00	0.413	-0.071	0.420	1.6

Notes:

1) Co-located SAR measurement result with the GPRS and WiFi 802.11b radio. (Transmitting simultaneously)
2) 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 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process.
3) The SAR measured at the middle channel for this configuration is at least 3 dB lower than SAR limit, testing at low & high channel is optional.
4) The earphone wire connected to the EUT to simulate hand-free operation in a body worn configuration.
5) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
6) Please see attachment for the detailed measurement data and plots.

16 SAR MEASUREMENT RESULT (WIFI AND BLUETOOTH)

16.1 Left Hand Side

Touch Position	Tilt (15°) Position

Note: The setup photos on this page have been extracted under a separate file.

802.11b (duty cycle: 100%)

Test Position	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
Touch	1	2412	0.039	-0.054	0.039	1.6
Touch	6	2437				
Touch	11	2462				
Tilt	1	2412	0.037	-0.012	0.037	1.6
Tilt	6	2437				
Tilt	11	2462				

Bluetooth

Test Position	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
Touch	0	2402	0.00358	-0.142	0.00370	1.6
Tilt	0	2402	0.00338	-0.141	0.00349	1.6

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 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process.
2) The SAR measured at the low channel (highest conducted power) for this configuration is at least 3 dB lower than SAR limit, testing at middle & high channel is optional.
3) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachment for the detailed measurement data and plots.

16.2 Right Hand Side

Touch Position	Tilt (15°) Position

Note: The setup photos on this page have been extracted under a separate file.

802.11b (duty cycle: 100%)

Test Position	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
Touch	1	2412	0.055	-0.195	0.058	1.6
Touch	6	2437				
Touch	11	2462				
Tilt	1	2412	0.054	-0.085	0.0551	1.6
Tilt	6	2437				
Tilt	11	2462				

Bluetooth

Test Position	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
Touch	0	2402	0.00197	-0.078	0.00201	1.6
Tilt	0	2402	0.00178	-0.190	0.00186	1.6

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 measurement system can be scaled up by the measured 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 than SAR limit, testing at low & high channel is optional.
3) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
4) Please see attachment for the detailed measurement data and plots.

16.3 Body Worn Front side

Note: The setup photos on this page have been extracted under a separate file.

802.11b (duty cycle: 100%)

Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	1	2412				
18_w/Holster	6	2437	0.00372	-0.189	0.00389	1.6
18_w/Holster	11	2462				

Bluetooth

Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	0	2402				
18_w/Holster	39	2441	0.000	0.000	0.000	1.6
18_w/Holster	78	2480				

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 measurement system can be scaled up by the measured 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 than SAR limit, testing at low & high channel is optional.
3) The earphone wire connected to the EUT to simulate hand-free operation in a body worn configuration.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
5) Please see attachment for the detailed measurement data and plots.

16.4 Body Worn Back side

Note: The setup photos on this page have been extracted under a separate file.

802.11b (duty cycle: 100%)						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	1	2412	0.052	-0.164	0.054	
18_w/Holster	6	2437	0.028	-0.102	0.029	1.6
18_w/Holster	11	2462	0.026	-0.128	0.027	
Bluetooth						
Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
18_w/Holster	0	2402				
18_w/Holster	39	2441	0.000	0.000	0.000	1.6
18_w/Holster	78	2480				

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 measurement system can be scaled up by the measured 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 than SAR limit, testing at low & high channel is optional.
3) The earphone wire connected to the EUT to simulate hand-free operation in a body worn configuration.
4) The battery was fully charged in accordance with manufacture's instructions prior to SAR measurements.
5) Please see attachment for the detailed measurement data and plots.

17 MEASUREMENT UNCERTAINTY

17.1 MEASUREMENT UNCERTAINTY FOR 300 MHZ – 3GHZ

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

17.2 MEASUREMENT 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

18 EQUIPMENT LIST

Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date
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
S-Parameter Network Analyzer	Agilent	8753ES-6	US39173569	8/19/05
Electronic Probe kit	Hewlett Packard	85070C	N/A	N/A
E-Field Probe	SPEAG	EX3DV3	3531	7/18/05
E-Field Probe	SPEAG	EX3DV4	3552	3/19/06
Thermometer	ERTCO	639-1	8402	10/13/2005
Thermometer	ERTCO	639-1	8404	10/21/2005
Thermometer	ERTCO	637-1	8661	10/21/2005
SAM Phantom (SAM1)	SPEAG	TP-1185	QD000P40CA	N/A
SAM Phantom (SAM2)	SPEAG	TP-1015	N/A	N/A
Data Acquisition Electronics	SPEAG	DAE3 V1	500	2/7/06
System Validation Dipole	SPEAG	D835V2	4d002	2/11/06
System Validation Dipole	SPEAG	D1900V2	5d043	2/16/06
System Validation Dipole	SPEAG	D2450V2	748	5/14/06
Signal General	R&H	SMP 04	DE34210	6/2/06
Power Meter	Giga-tronics	8651A	8651404	9/16/05
Power Sensor	Giga-tronics	80701A	1834588	9/16/05
Amplifier	Mini-Circuits	ZVE-8G	0360	N/A
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A
Radio Communication Tester	Rohde & Schwarz	CMU 200	838114/032	12/17/06
Simulating Liquid	CCS	H835	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	H1900	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	M835	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	M1900	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	M2450	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	H2450	N/A	Within 24 hrs of first test

19 ATTACHMENT

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END OF REPORT