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: ST22B

FCC ID: NM8TNDF

REPORT NUMBER: 05T3458-4

ISSUE DATE: July 14, 2005

Prepared for

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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 13 -14, 2005

APPLICANT:	High Tech Computer Corp.
ADDRESS:	23 Hsin Hua Road, Taoyuan 330, Taiwan, R. O. C
FCC ID:	NM8TNDF
MODEL:	ST22B
DEVICE CATEGORY:	Portable Device
EXPOSURE CATEGORY:	General Population/Uncontrolled Exposure

Smart Phone (GSM850/1900 with 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: 0.941 W/kg and Body-worn: 1.499 W/kg • The highest reported collocated SAR values are Head: 0.941 W/kg and body: 1.499 W/kg.
24E	1850.2 – 1909.8	• The highest reported SAR values are Head: 1.316 W/kg; Body-worn: 1.443 W/kg • The highest reported collocated SAR values are Head: 1.316 W/kg and body: 1.443 W/kg.
15C	2402 - 2480	• The highest reported SAR values are head: 0.00179 W/kg and body: 0.000 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 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 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: Eocepech , 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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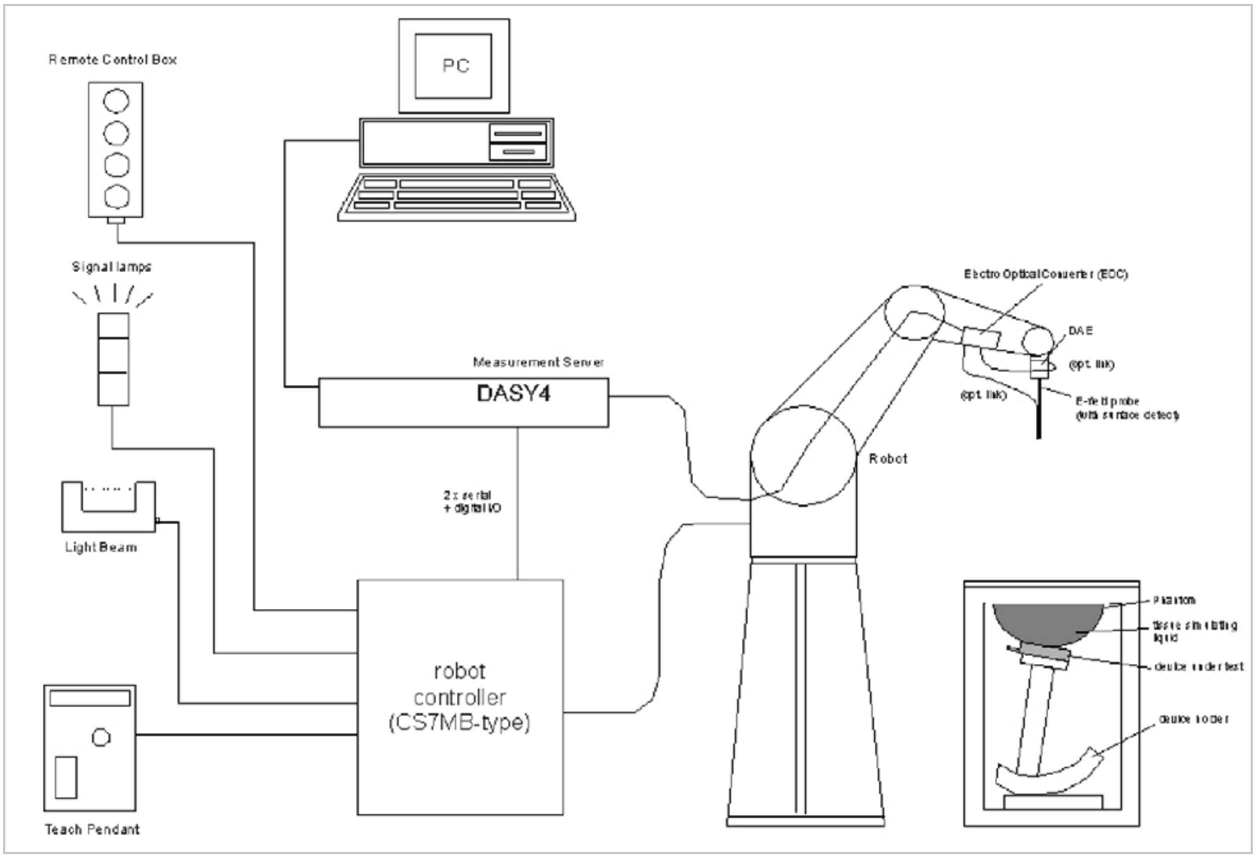
3 SYSTEM DESCRIPTION



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.

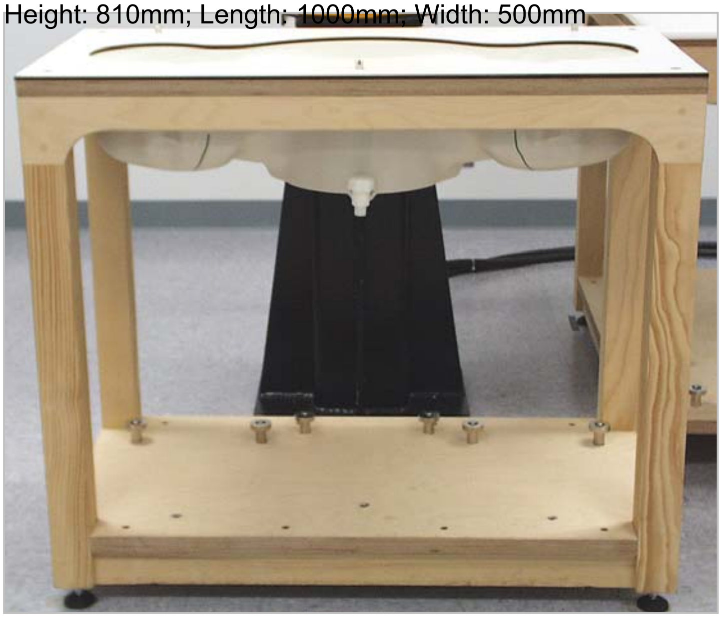
4.5 SAM PHANTOM (V4.0)

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.

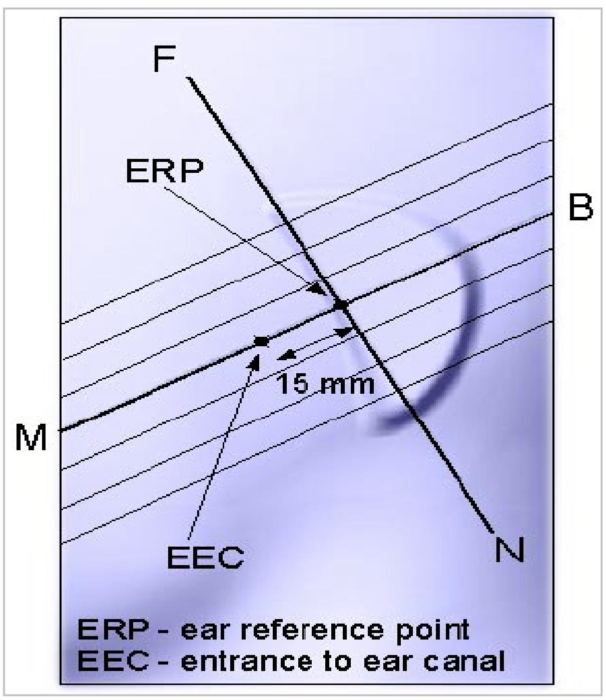
Ingredients (% by weight)	Frequency (MHz) 450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0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

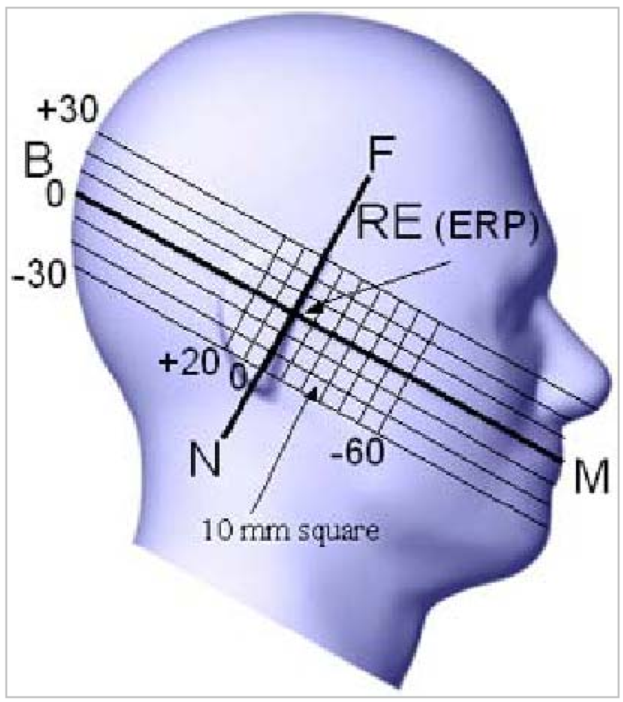
Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

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

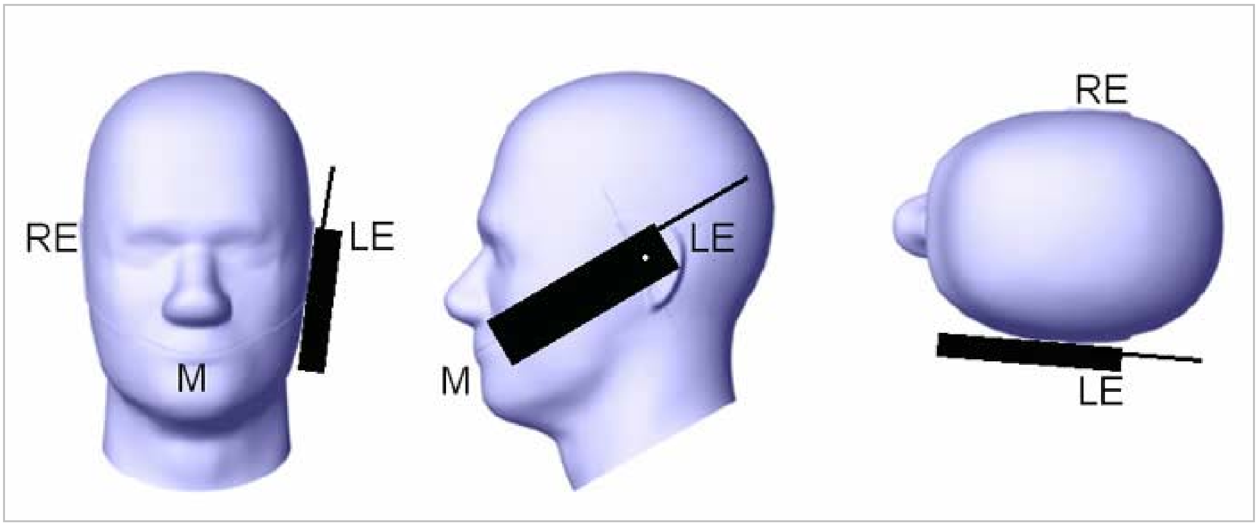
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

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

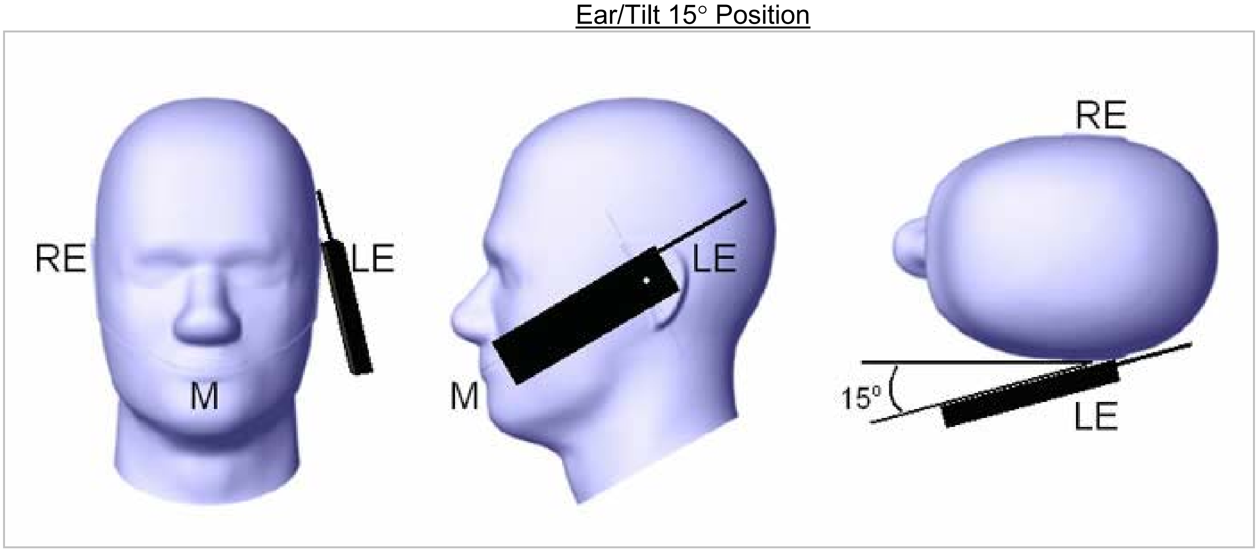
With the handset aligned in the "Cheek/Touch Position":

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

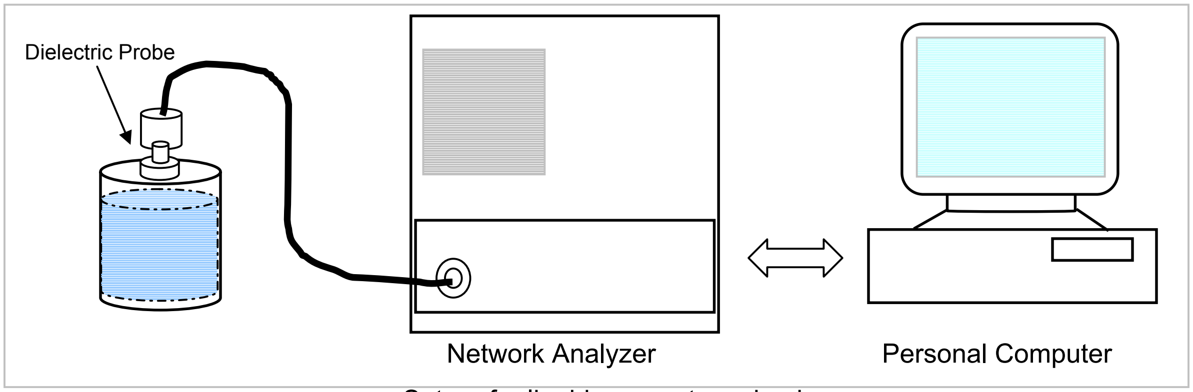
SAR data is requested for cell phones designed to be used with a headset while worn next to the body using a neck-strap or lanyard; device should be tested with front and back sides in contact with a flat phantom

☐ 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 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	41.1231	-0.91	± 5
			19.8636	Conductivity (σ):	0.90	0.9227	2.52	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 14, 2005 09:17 AM

Frequency	e'	e"
750000000.	42.1132	20.2295
755000000.	42.0148	20.2206
760000000.	41.9794	20.1846
765000000.	41.9314	20.1409
770000000.	41.8311	20.0662
775000000.	41.7700	20.0946
780000000.	41.6992	20.0807
785000000.	41.6476	20.0511
790000000.	41.5578	19.9989
795000000.	41.5321	20.0183
800000000.	41.4704	19.9816
805000000.	41.4024	19.9580
810000000.	41.3811	19.9438
815000000.	41.3367	19.9414
820000000.	41.3100	19.9022
825000000.	41.2316	19.8668
830000000.	41.1590	19.8675
835000000.	41.1231	19.8636
840000000.	41.0687	19.8282
845000000.	40.9932	19.7887
850000000.	40.9295	19.7881
855000000.	40.8902	19.7601
860000000.	40.8462	19.7132
865000000.	40.7366	19.6855
870000000.	40.6674	19.6877
875000000.	40.6126	19.6657
880000000.	40.5374	19.6398
885000000.	40.5083	19.6312
890000000.	40.4257	19.6083
895000000.	40.3836	19.5840
900000000.	40.3351	19.5866

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	56.2554	1.91	± 5
			21.5690	Conductivity (σ):	0.97	1.0019	3.29	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 14, 2005 01:01 PM

Frequency	e'	e"
750000000.	57.0386	22.0456
755000000.	56.9628	22.0095
760000000.	56.9454	21.9654
765000000.	56.8534	21.8765
770000000.	56.7741	21.8198
775000000.	56.7147	21.8156
780000000.	56.6803	21.7792
785000000.	56.6291	21.7258
790000000.	56.5584	21.6800
795000000.	56.5141	21.6714
800000000.	56.4799	21.6247
805000000.	56.4715	21.6145
810000000.	56.4557	21.6127
815000000.	56.4021	21.6134
820000000.	56.3924	21.5920
825000000.	56.3828	21.5987
830000000.	56.3151	21.5824
835000000.	56.2554	21.5690
840000000.	56.2295	21.5538
845000000.	56.1608	21.5111
850000000.	56.1426	21.4823
855000000.	56.0928	21.4550
860000000.	56.0518	21.3918
865000000.	55.9777	21.3531
870000000.	55.9085	21.3238
875000000.	55.8553	21.2779
880000000.	55.8160	21.2376
885000000.	55.7812	21.2066
890000000.	55.7271	21.2048
895000000.	55.7058	21.1633
900000000.	55.6927	21.1663

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 = 47 % 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	41.1344	2.84	± 5
			13.5077	Conductivity (σ):	1.40	1.42776	1.98	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 13, 2005 09:03 AM

Frequency	e'	e"
1710000000.	42.0347	13.0313
1720000000.	41.9677	13.0395
1730000000.	41.8692	13.0612
1740000000.	41.7904	13.0964
1750000000.	41.7164	13.1164
1760000000.	41.6617	13.1748
1770000000.	41.6172	13.2269
1780000000.	41.5844	13.2653
1790000000.	41.5833	13.3022
1800000000.	41.5739	13.3193
1810000000.	41.5691	13.3271
1820000000.	41.5211	13.3193
1830000000.	41.4789	13.3328
1840000000.	41.4062	13.3355
1850000000.	41.3330	13.3821
1860000000.	41.2548	13.3956
1870000000.	41.1947	13.4158
1880000000.	41.1407	13.4385
1890000000.	41.1284	13.4489
1900000000.	41.1344	13.5077
1910000000.	41.1444	13.5209

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 = 47 % 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	53.5035	0.38	± 5
			14.7144	Conductivity (σ):	1.52	1.55530	2.32	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 13, 2005 02:03 PM

Frequency	e'	e"
1710000000.	54.1966	14.2624
1720000000.	54.1152	14.2872
1730000000.	54.0515	14.3126
1740000000.	53.9831	14.3387
1750000000.	53.9265	14.3630
1760000000.	53.8823	14.3993
1770000000.	53.8774	14.4356
1780000000.	53.8615	14.4739
1790000000.	53.8547	14.5116
1800000000.	53.8512	14.5168
1810000000.	53.8198	14.5429
1820000000.	53.7759	14.5692
1830000000.	53.7089	14.5796
1840000000.	53.6382	14.5756
1850000000.	53.5949	14.5919
1860000000.	53.5548	14.6056
1870000000.	53.5328	14.6291
1880000000.	53.5155	14.6595
1890000000.	53.4920	14.6811
1900000000.	53.5035	14.7144
1910000000.	53.4994	14.7291

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	38.5858	-1.57	± 5
			13.3150	Conductivity (σ):	1.80	1.81479	0.82	± 5

Liquid Check
Ambient temperature: 24.0 deg. C; Liquid temperature: 23.0 deg C
July 14, 2005 05:59 PM

Frequency	e'	e"
2400000000.	38.7709	13.1710
2410000000.	38.7374	13.2003
2420000000.	38.6972	13.2436
2430000000.	38.6701	13.2652
2440000000.	38.6196	13.2873
2450000000.	38.5858	13.3150
2460000000.	38.5419	13.3460
2470000000.	38.4962	13.3705
2480000000.	38.4535	13.4039
2490000000.	38.4298	13.4296
2500000000.	38.3952	13.4704

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	52.4	24.0	54.8	25.4

8.1 SYSTEM PERFORMANCE CHECK RESULT FOR 835 MHZ

@ System Validation Dipole: D835V2 SN:4d002

Date: July 14, 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 13, 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			
1900	23	15	9.93	39.72	39.7	0.05	± 10

8.3 SYSTEM PERFORMANCE CHECK RESULT FOR 2450 MHZ

@ System Validation Dipole: D2450V2 SN: 748

Date: July 14, 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			
2450	23	15	13.1	52.4	52.4	0.00	± 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 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)
Bluetooth	0	2402	2.69
Bluetooth	39	2441	2.63
Bluetooth	78	2480	2.41

11 THE HIGHEST SAR VALUES FOR GSM850

The highest reported SAR values are: **Part 22H** - Head: 0.941 W/kg; Body-worn: 1.499 W/kg

The highest reported **collocated** SAR values are Head: 0.941 W/kg and body: 1.499 W/kg.

Test Position	Modulation	Test Mode	Ch. #	f (MHz)	SAR_1g (mW/g)	
					Measured	Summation[1)]
Righht Head - Touch	GSM850	GSM only	251	848.80	0.941	0.941
	Bluetooth		78	2480	0.000	
Body	GSM850	GPRS	128	824.20	1.499	1.499
	Bluetooth		78	2480	0.000	

Note:
1) Total SAR value is the sum of the SAR measurement of GSM/GPRS and Bluetooth.

12 THE HIGHEST SAR VALUES FOR GSM1900

The highest reported SAR values are: **Part 24E** - Head: 1.316 W/kg; Body-worn: 1.443 W/kg

The highest reported **collocated** SAR values are Head: 1.316 W/kg and body: 1.443 W/kg.

Test Position	Modulation	Test Mode	Ch. #	f (MHz)	SAR_1g (mW/g)	
					Measured	Summation[1)]
Right Head - Tilt	GSM1900	GSM only	512	1850.20	1.316	1.316
	Bluetooth		78	2480	0.00000	
Body	GSM1900	GPRS	661	1880.00	1.443	1.443
	Bluetooth		78	2480	0.000	

Note:
1) Total SAR value is the sum of the SAR measurement of GSM/GPRS and Bluetooth.

13 THE HIGHEST SAR VALUES FOR Bluetooth

The highest reported SAR values are: **Part 15** - Bluetooth head: 0.00179 W/kg and body: 0.000 W/kg.

Test Position	Mode	Channel	f (MHz)	SAR_1g (mW/g)
Left Head - Touch	Bluetooth	1	2412	0.00179
Body	Bluetooth	1	2412	0.000

14 SAR MEASUREMENT RESULT (GSM835)

14.1 Left Hand Side

Touch Position	Tilt (15°) Position

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	0.806	-0.023	0.810	1.6
Touch	190	836.6	0.893	-0.089	0.911	1.6
Touch	251	848.8	0.909	-0.032	0.916	1.6
Tilt	128	824.2				
Tilt	190	836.6	0.451	-0.015	0.453	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

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	0.857	-0.022	0.861	1.6
Touch	190	836.6	0.884	-0.137	0.912	1.6
Touch	251	848.8	0.933	-0.035	0.941	1.6
Tilt	128	824.2				
Tilt	190	836.6	0.488	-0.003	0.488	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.

14.3 Body Worn Front Side

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	0.458	-0.170	0.476	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	0.829	-0.187	0.865	1.6
18_w/Holster	190	836.6	0.833	-0.225	0.877	1.6
18_w/Holster	251	848.8	0.756	-0.087	0.771	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				
18_w/Holster	190	836.6	0.237	-0.033	0.239	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

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	0.672	-0.018	0.675	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	1.440	-0.175	1.499	1.6
18_w/Holster	190	836.6	1.430	-0.036	1.442	1.6
18_w/Holster	251	848.8	1.270	-0.018	1.275	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				
18_w/Holster	190	836.6	0.375	-0.020	0.377	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.

15 SAR MEASUREMENT RESULT (GSM1900)

15.1 Left Hand Side

Touch Position	Tilt (15°) Position

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	0.886	-0.175	0.922	1.6
Touch	661	1880.00	0.820	-0.142	0.847	1.6
Touch	810	1909.80	0.814	-0.036	0.821	1.6
Tilt	512	1850.20	1.220	-0.010	1.223	1.6
Tilt	661	1880.00	1.200	-0.013	1.204	1.6
Tilt	810	1909.80	1.090	-0.015	1.094	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.

15.2 Right Hand Side

Touch Position	Tilt (15°) Position

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	0.984	-0.107	1.009	1.6
Touch	661	1880.00	0.912	0.000	0.912	1.6
Touch	810	1909.80	0.933	-0.079	0.950	1.6
Tilt	512	1850.20	1.300	-0.054	1.316	1.6
Tilt	661	1880.00	1.190	-0.061	1.207	1.6
Tilt	810	1909.80	1.210	-0.032	1.219	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.

15.3 Body Worn Front Side

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	0.215	-0.117	0.221	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	0.389	-0.061	0.395	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	0.169	-0.052	0.171	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

Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
GSM1900 GSM only (duty cycle: 12.5%)						
18_w/Holster	512	1850.20				
18_w/Holster	661	1880.00	0.769	-0.156	0.797	1.6
18_w/Holster	810	1909.80				

Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
GSM1900 GSM+GPRS (duty cycle: 25%)						
18_w/Holster	512	1850.20	1.300	-0.189	1.358	1.6
18_w/Holster	661	1880.00	1.380	-0.194	1.443	1.6
18_w/Holster	810	1909.80	1.200	-0.027	1.207	1.6

Separation. distance (mm)	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
GSM1900 GSM+EGPRS (duty cycle: 25%)						
18_w/Holster	512	1850.20				
18_w/Holster	661	1880.00	0.613	-0.070	0.623	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.

16 SAR MEASUREMENT RESULT (BLUETOOTH)

16.1 Left Hand Side

Touch Position	Tilt (15°) Position

Bluetooth

Test Position	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
Touch	0	2402	0.00174	-0.120	0.00179	1.6
Tilt	0	2402	0.00114	-0.191	0.00119	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

Bluetooth

Test Position	Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	Limit (mW/g)
Touch	0	2402	0.000	0.000	0.000	1.6
Tilt	0	2402	0.000	0.000	0.000	1.6

Notes:

1) SAR measurement is out of Probe's sensitivity, and can't find any max. in AREA scan, The SAR value is 0
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.

16.3 Body Worn Front side

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	0.000	0.000	0.000	1.6
18_w/Holster	39	2441				
18_w/Holster	78	2480				

Notes:

1) SAR measurement is out of Probe's sensitivity, and can't find any max. in AREA scan, The SAR value is 0
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.

16.4 Body Worn Back side

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	0.000	0.000	0.000	1.6
18_w/Holster	39	2441				
18_w/Holster	78	2480				

Notes:

1) SAR measurement is out of Probe's sensitivity, and can't find any max. in AREA scan, The SAR value is 0
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.

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