SAR Evaluation Report

in accordance with the requirements of
FCC Report and Order: ET Docket 93-62, and OET Bulletin 65 Supplement C

for

GSM Tri-band 900/1800/1900MHz Cellular Phone

MODEL: MCX-608

FCC ID: R8QMCX-608

October 31, 2004

REPORT NO: 04U3001-2

Prepared for

Macronix America Inc.
491 Fairview Way
Milpitas, CA 95035
USA

Prepared by

COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD,
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885

Revision History

Rev.	Revisions	Revised By
B	Additional test of secondary hot spot	Sunny Shih

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: September 28-29 & October 31, 2004

APPLICANT:	Macronix America Inc. 491 Fairview Way Milpitas, CA 95035 USA
MODEL:	MCX-608
FCC ID:	R8QMCX-608
DEVICE CATEGORY:	PORTABLE DEVICES
EXPOSURE CATEGORY:	GENERAL POPULATION/UNCONTROLLED EXPOSURE

Test Sample is a:	Production unit
Modulation type:	GSM
Tx Frequency:	1850.2 to 1909.8 MHz
Max. O/P Power: (Conducted/peak)	29.40 dBm
Max. SAR (1g):	0.704 mW/g at Left head tilt position 0.167 mW/g at Body worn
Application Type:	Certification
FCC Rule Part(s):	24E

Note: This device contains GSM900 and GSM1800 functions not operational in US territories. This report is only applicable for GSM1900 PCS band.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population 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 (released on 6/29/2001 see Test Report).

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Hsin-Fu Shih

Hsin-Fu Shih (Sunny Shih)
Senior Engineer

TABLE OF CONTENTS

1. EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The following is the information provided by the applicant.

Type of EUT:	GSM Tri-band 900/1800/1900MHz Cellular Phone
Type/Model No.:	MCX-608
Modulation Type:	GSM
TX Frequency:	1850.2 to 1909.8 MHz
Duty Cycle:	12.5%
Battery:	Only one model with EUT (Macronix CN208, Li-Ion Battery, 4.0Vdc, 700mAh)

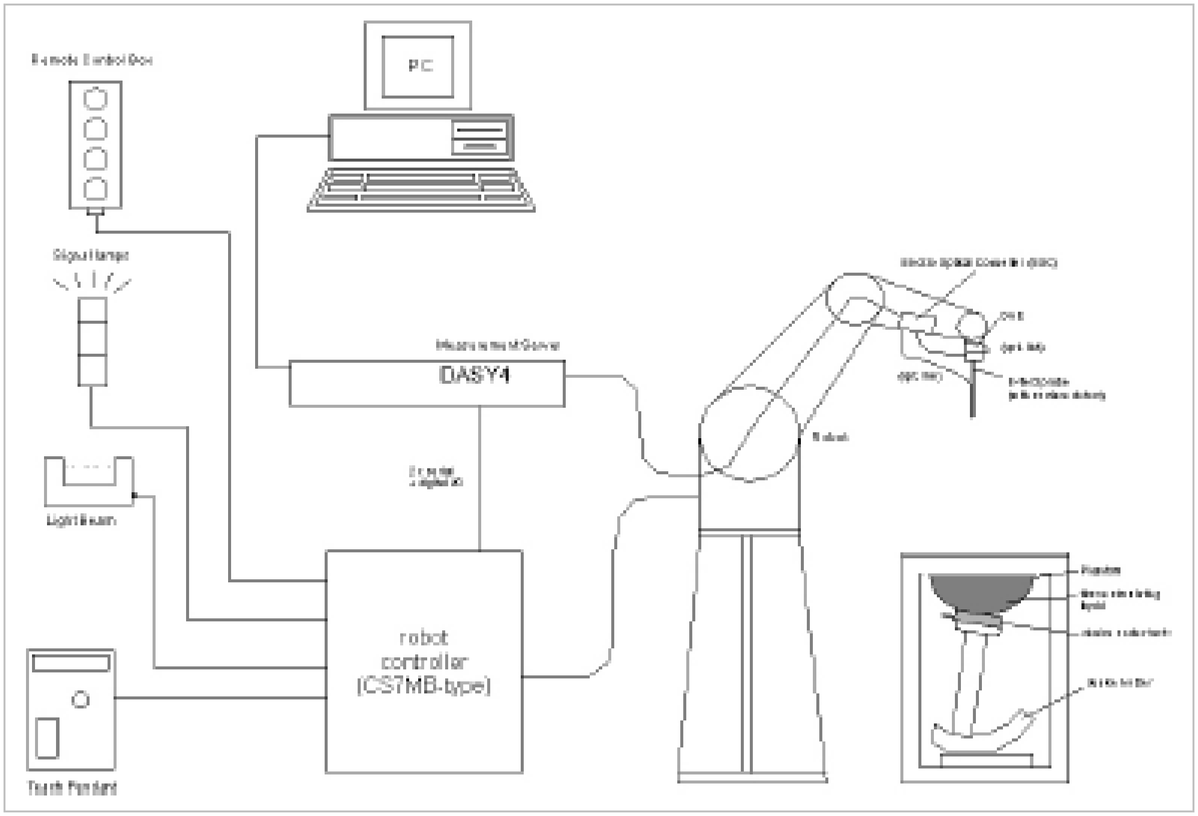
2. REQUIREMENTS FOR COMPLIANCE TESTING DEFINED BY THE FCC

The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

3. DOSIMETRIC ASSESSMENT SETUP

These measurements were performed with the automated near-field scanning system DASY3 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than ± 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetric probe **EX3DV3-SN: 3531** (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [7] with accuracy of better than ±10%. The spherical isotropy was evaluated with the procedure described in [8] and found to be better than ±0.25 dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEE P1528 and CENELEC EN50361.

3.1. MEASUREMENT SYSTEM DIAGRAM



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

- A standard high precision 6-axis robot (St¨aubli 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 Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- 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 control 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 validating the proper functioning of the system.

3.2. SYSTEM COMPONENTS

3.2.1. 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.

3.2.2. 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.

3.2.3. 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)

Calibration: Basic Broad Band Calibration in air: 10-2500 MHz.
Conversion Factors (CF) for HSL 900 and HSL 1800 CF-Calibration for other liquids and frequencies upon request.

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%.

3.2.4. 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

3.2.5. 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).

3.2.6. 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. EVALUATION PROCEDURES

4.1. SAR SYSTEM MEASUREMENT PROCEDURES

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 default Zoom Scan measures 7x7 x7 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.

4.2. DATA EVALUATION

The DASY4 post processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcp_i
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with
V_i = Compensated signal of channel i (i = x, y, z)
U_i = Input signal of channel i (i = x, y, z)
cf = Crest factor of exciting field (DASY parameter)
dcp_i = Diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \bullet ConvF}}$$

H-field probes:

$$H_i = \sqrt{Vi} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

with
V_i = Compensated signal of channel i (i = x, y, z)
$Norm_i$ = Sensor sensitivity of channel i (i = x, y, z)
$\mu V/(V/m)^2$ for E0field Probes
$ConvF$ = Sensitivity enhancement in solution
aij = Sensor sensitivity factors for H-field probes
f = Carrier frequency (GHz)
Ei = Electric field strength of channel i in V/m
Hi = Magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

The power flow density is calculated assuming the excitation field as a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770} \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with P_{pwe} = Equivalent power density of a plane wave in mW/cm^2
E_{tot} = total electric field strength in V/m
H_{tot} = total magnetic field strength in A/m

SPATIAL PEAK SAR EVALUATION

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard. It can be conducted for 1 g and 10 g.

The DASY4 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maximum searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.

Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 5x5x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1 g and 10 g cubes.

Boundary effect

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosimetric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary.

The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$S \approx S_o + S_b exp(-\frac{z}{a}) cos(\pi \frac{z}{\lambda})$$

Since the decay of the boundary effect dominates for small probes (a<<λ), the cos-term can be omitted. Factors *Sb* (parameter Alpha in the DASY4 software) and *a* (parameter Delta in the DASY4 software) are assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- the boundary curvature is small
- the probe axis is angled less than 30_ to the boundary normal
- the distance between probe and boundary is larger than 25% of the probe diameter
- the probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY4 system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during postprocessing.

5. MEASUREMENT UNCERTAINTY

UNCERTAINTY BUDGE ACCORDING TO IEEE P1528								
Error Description	Uncertainty Value [%]	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc.(1g)	Std. Unc. (10g)	(vi) v_{eff}
Measurement System								
Probe Calibration	±4.8	N	1	1	1	±4.8%	±4.8%	∞
Axial Isotropy	±4.7	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±1.0	N	$\sqrt{3}$	1	1	±1.0%	±1.0%	∞
Response Time	±0.8	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Condition	±1.59	R	$\sqrt{3}$	1	1	±0.9%	±0.9%	∞
Probe Positioner	±1.6	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Test sample Related								
Device Positioning	±1.1	N	1	1	1	±1.1%	±1.1%	145
Device Holder	±3.6	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0	R	$\sqrt{3}$	0.64	0.43	±1.8%	±1.2%	∞
Liquid Conductivity (meas.)	±2.5	N	1	0.64	0.43	±1.6%	±1.1%	∞
Liquid Peermittivity (target)	±5.0	R	$\sqrt{3}$	0.6	0.49	±1.7%	±1.4%	∞
Liquid Permittivity (meas.)	±2.5	N	1	0.6	0.49	±1.5%	±1.2%	∞
Combined Std. Uncertainty						±9.8%	±9.6%	330
Expanded STD Uncertainty						**±19.6%**	***±19.2%***	

Table: Worst-case uncertainty for DASY4 assessed according to IEEE P1528.
The budge is valid for the frequency range 300MHz – 3GHz and represents a worst-case analysis.

6. EXPOSURE LIMIT

(A) Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

(B) Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

NOTE 1: See Section 1 for discussion of exposure categories.

NOTE 2: Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

NOTE 3: At frequencies above 6.0 GHz, SAR limits are not applicable and MPE limits for power density should be applied at 5 cm or more from the transmitting device.

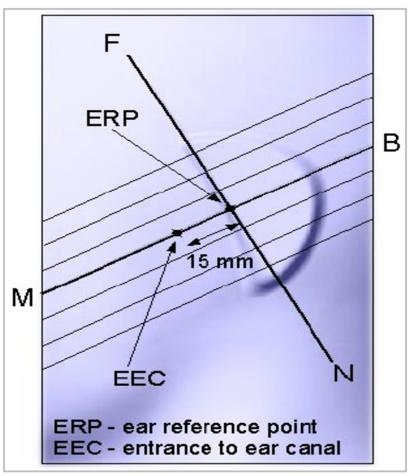
NOTE 4: The time averaging criteria for field strength and power density do not apply to general population SAR limit of 47 CFR §2.1093

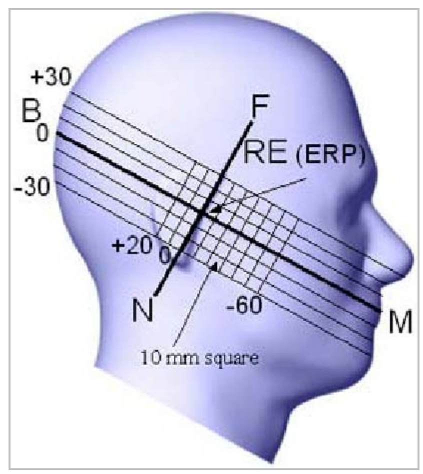
NOTE
GENERAL POPULATION/UNCONTROLLED EXPOSURE
PARTIAL BODY LIMIT
1.6 mW/g

7. 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:





7.1. CHEEK/TOUCH POSITION

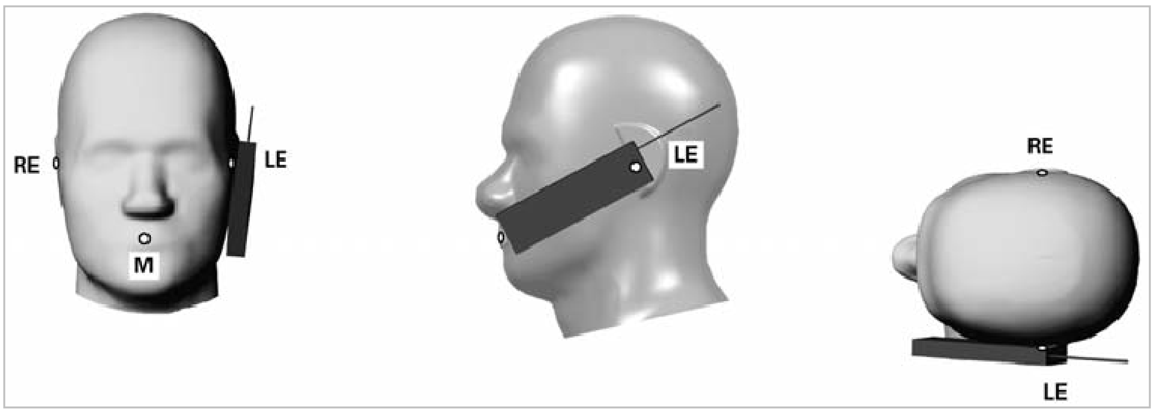
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

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



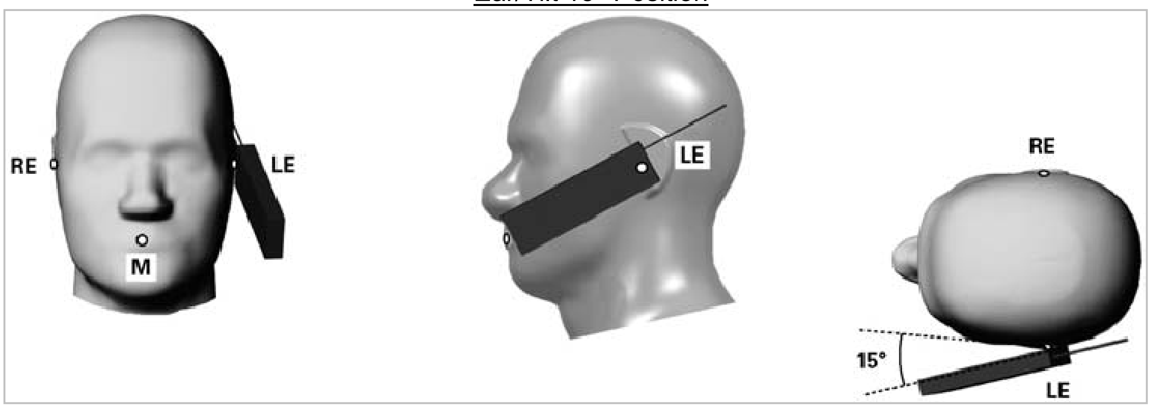
7.2. EAR/TILT POSITION

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 isby 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 2.0 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



8. TEST POSITIONS FOR BODY-WORN AND OTHER SIMILAR CONFIGURATIONS

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 that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the 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.

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.

9. PROCEDURES USED TO ESTABLISH TEST SIGNAL

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

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

Maximum conducted power was measured by replacing the antenna with an adapter for conductive measurements, before and after the SAR measurements were done.

10. MEASUREMENT RESULTS

10.1. SIMULATING LIQUIDS PARAMETER 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.

TISSUE DIELECTRIC PARAMETERS FOR HEAD AND BODY PHANTOMS

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 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 P1528.

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)

TYPICAL COMPOSITION OF INGREDIENTS FOR LIQUID TISSUE PHANTOMS

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

Simulating Liquid Dielectric Parameters Check Result @ Head 1900 MHz

Room Ambient Temperature = 24.0°C; Relative humidity = 38% Measured by: Sunny Shih

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	23.5	15	ε''	Relative Permittivity (ϵ_r):	40.0	39.3105	-1.72	± 5
			13.2672	Conductivity (σ):	1.40	1.4023	0.17	± 5

Simulating Liquid Dielectric Parameters Check @ 1900 MHz
Room ambient temperature: 24.0 deg. C; Liquid temperature: 23.5 deg. C
September 28, 2004 09:45 AM

Frequency	e'	e''
1710000000.	40.0388	12.7947
1720000000.	40.0279	12.8109
1730000000.	40.0112	12.8364
1740000000.	39.9657	12.8787
1750000000.	39.9330	12.9196
1760000000.	39.8789	12.9425
1770000000.	39.8236	12.9662
1780000000.	39.7872	12.9788
1790000000.	39.7582	13.0114
1800000000.	39.7108	13.0368
1810000000.	39.6454	13.0552
1820000000.	39.5814	13.0490
1830000000.	39.5388	13.0661
1840000000.	39.4955	13.0898
1850000000.	39.4606	13.1443
1860000000.	39.4130	13.1858
1870000000.	39.3812	13.2025
1880000000.	39.3502	13.2189
1890000000.	39.3339	13.2379
1900000000.	39.3105	13.2672
1910000000.	39.2705	13.2274

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 Parameters Check Result @ Muscle 1900 MHz

Room Ambient Temperature = 24.0°C; Relative humidity = 38% Measured by: Sunny Shih

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	23.5	15	є"	Relative Permittivity (ϵ_r):	53.3	53.3457	0.09	± 5
			14.4061	Conductivity (σ):	1.52	1.5227	0.18	± 5

Simulating Liquid Dielectric Parameters Check @ 1900 MHz
Room ambient temperature: 24.0 deg. C; Liquid temperature: 23.5 deg. C
September 28, 2004 03:31 PM

Frequency	e'	e''
1710000000.	53.9148	13.9312
1720000000.	53.9053	13.9463
1730000000.	53.8865	13.9875
1740000000.	53.8690	14.0277
1750000000.	53.8381	14.0755
1760000000.	53.7922	14.0771
1770000000.	53.7583	14.0948
1780000000.	53.7282	14.1019
1790000000.	53.7215	14.1294
1800000000.	53.6545	14.1655
1810000000.	53.5835	14.1947
1820000000.	53.5264	14.2122
1830000000.	53.4889	14.2165
1840000000.	53.4512	14.2433
1850000000.	53.4205	14.3082
1860000000.	53.3974	14.3261
1870000000.	53.3946	14.3403
1880000000.	53.3810	14.3645
1890000000.	53.3784	14.3749
1900000000.	53.3457	14.4061
1910000000.	53.2916	14.3732

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 Parameters Check Result @ Head 1900 MHz

Room Ambient Temperature = 24.0 °C; Relative humidity = 40% Measured by: Sunny Shih

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	23.5	15	є"	Relative Permittivity (ϵ_r):	40.0	39.8772	-0.31	± 5
			13.5204	Conductivity (σ):	1.40	1.4291	2.08	± 5

Simulating Liquid Dielectric Parameters Check @ 1900 MHz
Room ambient temperature: 24.0 deg. C; Liquid temperature: 23.5 deg. C
September 29, 2004 10:10 AM

Frequency	e'	e''
1710000000.	40.6657	13.0145
1720000000.	40.6368	13.0220
1730000000.	40.6168	13.0429
1740000000.	40.5594	13.0768
1750000000.	40.5095	13.1310
1760000000.	40.4499	13.1664
1770000000.	40.4050	13.2084
1780000000.	40.3750	13.2169
1790000000.	40.3564	13.2520
1800000000.	40.3061	13.2883
1810000000.	40.2565	13.2937
1820000000.	40.1851	13.2916
1830000000.	40.1432	13.2716
1840000000.	40.0965	13.3003
1850000000.	40.0553	13.3741
1860000000.	39.9748	13.4214
1870000000.	39.9288	13.4350
1880000000.	39.8935	13.4541
1890000000.	39.8876	13.4754
1900000000.	39.8772	13.5204
1910000000.	39.8402	13.4720

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 Parameters Check Result @ Head 1900 MHz

Room Ambient Temperature = 23.0°C; Relative humidity = 38% Measured by: Sunny Shih

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	22.5	15	ε''	Relative Permittivity (ϵ_r):	40.0	40.7319	1.83	± 5
			13.7601	Conductivity (σ):	1.40	1.4544	3.89	± 5

Simulating Liquid Dielectric Parameters Check @ 2450 MHz
Room Ambient Temperature: 23 deg. C, Liquid temperature: 22.5 deg. C
October 31, 2004 04:07 PM

Frequency	e'	e''
1710000000.	41.5022	13.2721
1720000000.	41.4556	13.3043
1730000000.	41.4123	13.3189
1740000000.	41.3633	13.3528
1750000000.	41.3146	13.3897
1760000000.	41.2597	13.4243
1770000000.	41.2082	13.4569
1780000000.	41.1515	13.4837
1790000000.	41.1232	13.4990
1800000000.	41.0772	13.5286
1810000000.	41.0502	13.5371
1820000000.	41.0234	13.5393
1830000000.	40.9667	13.5700
1840000000.	40.9476	13.5951
1850000000.	40.8924	13.6191
1860000000.	40.8679	13.6508
1870000000.	40.8196	13.6767
1880000000.	40.7837	13.7008
1890000000.	40.7591	13.7357
1900000000.	40.7319	13.7601
1910000000.	40.6973	13.7897

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 Parameters Check Result @ Muscle 1900 MHz

Room Ambient Temperature = 23.0°C; Relative humidity = 38% Measured by: Sunny Shih

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
1900	22.5	15	ε"	Relative Permittivity (ϵ_r):	53.3	54.3794	2.03	± 5
			14.8302	Conductivity (σ):	1.52	1.56754	3.13	± 5

Simulating Liquid Dielectric Parameters Check @ 2450 MHz
Room Ambient Temperature: 23 deg. C, Liquid temperature: 22.5 deg. C
October 31, 2004 04:31 PM

Frequency	e'	e"
1710000000.	54.9383	14.3383
1720000000.	54.9122	14.3493
1730000000.	54.8753	14.3848
1740000000.	54.8314	14.4228
1750000000.	54.7880	14.4456
1760000000.	54.7375	14.4749
1770000000.	54.7104	14.5029
1780000000.	54.6723	14.5371
1790000000.	54.6526	14.5515
1800000000.	54.6033	14.5850
1810000000.	54.5881	14.5958
1820000000.	54.5639	14.6110
1830000000.	54.5274	14.6228
1840000000.	54.4914	14.6495
1850000000.	54.4684	14.6718
1860000000.	54.4616	14.7094
1870000000.	54.4193	14.7427
1880000000.	54.4078	14.7588
1890000000.	54.3870	14.8025
1900000000.	54.3794	14.8302
1910000000.	54.3344	14.8676

The conductivity (σ) can be given as:

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

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

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

10.2. 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. The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

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.
- The DASY4 system with an Isotropic E-Field Probe ES3DV2-SN: 3023 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 f15 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 mm.
- The dipole input power (forward power) was 250 mW±3%.
- The results are normalized to 1 W input power.

REFERENCE SAR VALUES

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%. The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.
IEEE P1528 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

SYSTEM PERFORMANCE CHECK RESULTS

@ SYSTEM VALIDATION DIPOLE: D1900V2 SN:5d043 Date: September 28, 2004

Ambient Temperature = 24°C; Relative humidity = 38% Measured by: Sunny Shih

Head Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
1900	23.5	15	9.77	39.08	39.7	-1.56	± 10

SYSTEM PERFORMANCE CHECK RESULTS

@ SYSTEM VALIDATION DIPOLE: D1900V2 SN:5d043 Date: September, 29, 2004

Ambient Temperature = 24°C; Relative humidity = 40% Measured by: Sunny Shih

Head Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
1900	23.5	15	9.9	39.6	39.7	-0.25	± 10

@ System Validation Dipole: D1900V2 SN:5d043 Date: October 31, 2004

Ambient Temperature = 23°C; Relative humidity = 38% Measured by: Sunny Shih

Head Simulating Liquid			Mrasured		Target_1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
1900	22.5	15	9.89	39.56	39.7	-0.35	± 10

10.3. SAR MEASUREMENT RESULTS

10.3.1. Left Head Touch Position

GSM - Duty cycle: 12.5%; Crest factor: 8 Depth of liquid: 15 cm

EUT Position	Antenna	Ch. #	f [MHz]	*Conducted Power [dBm]		SAR_1g [mW/g]	
				Before	After	Measured	Limit
Left Touch	Fixed	512	1850.20	29.35	29.30	**	1.6
Left Touch	Fixed	661	1880.00	29.20	29.20	0.536	1.6
Left Touch	Fixed	812	1909.80	29.40	29.35	0.646	1.6

Notes:

1. *: Peak power.
2. **: The SAR measured at the middle channel for this configuration is at least 3 dB lower than SAR limit, testing at low channel is optional.
3. Please see attachment for the detailed measurement data and plots showing the maximum SAR location of the EUT.

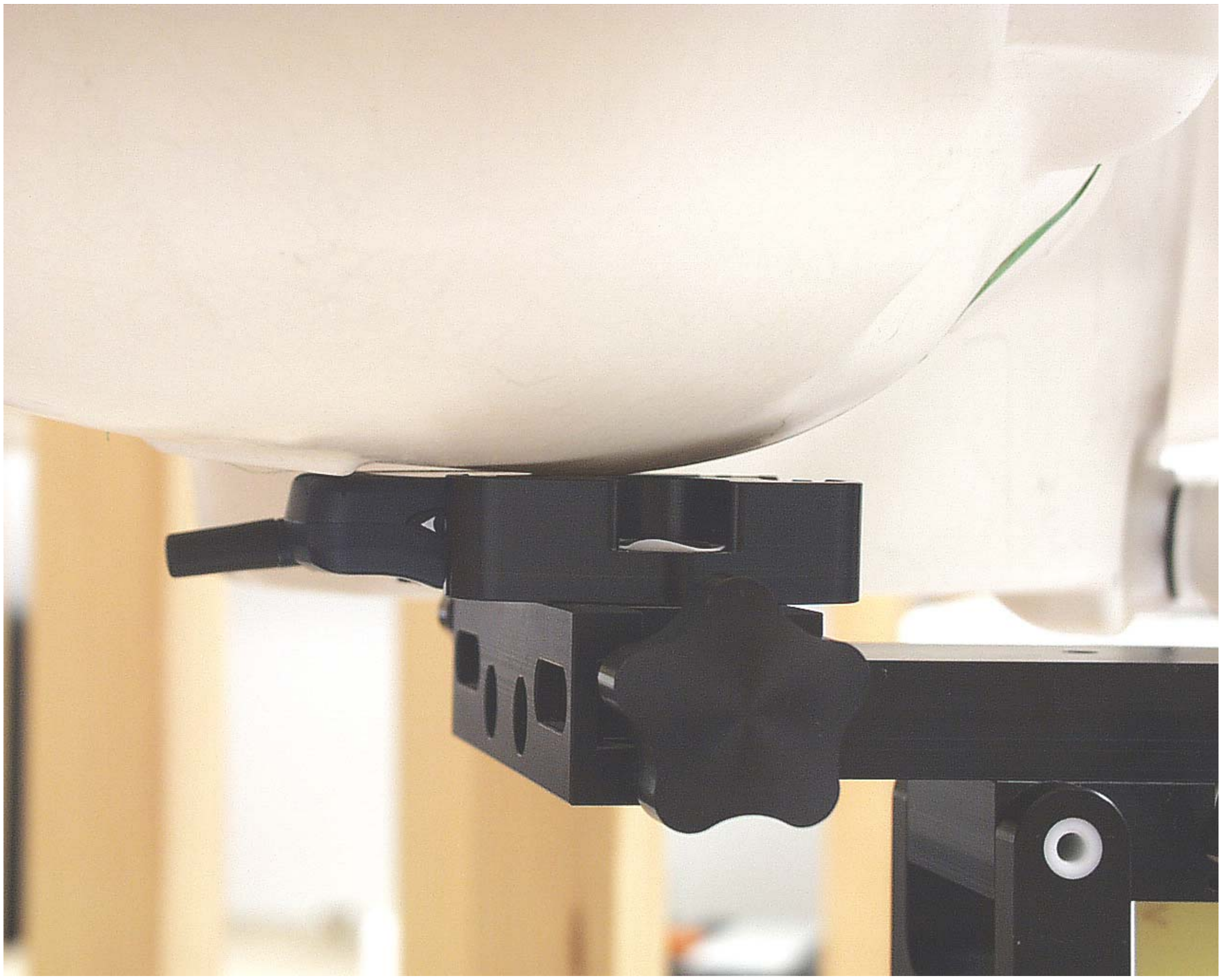
10.3.2. Left Head Tilt Position

GSM - Duty cycle: 12.5%; Crest factor: 8 Depth of liquid: 15 cm

EUT Position	Antenna	Ch. #	f [MHz]	*Conducted Power [dBm]		SAR_1g [mW/g]	
				Before	After	Measured	Limit
Left Tilt	Fixed	512	1850.20	29.35	29.30	0.639	1.6
Left Tilt	Fixed	661	1880.00	29.20	39.20	0.566	1.6
Left Tilt	Fixed	812	1909.80	29.40	29.35	0.704	1.6

Notes:
1. *: Peak power.
2. Please see attachment for the detailed measurement data and plots showing the maximum SAR location of the EUT.

10.3.3. Right Head Touch Position

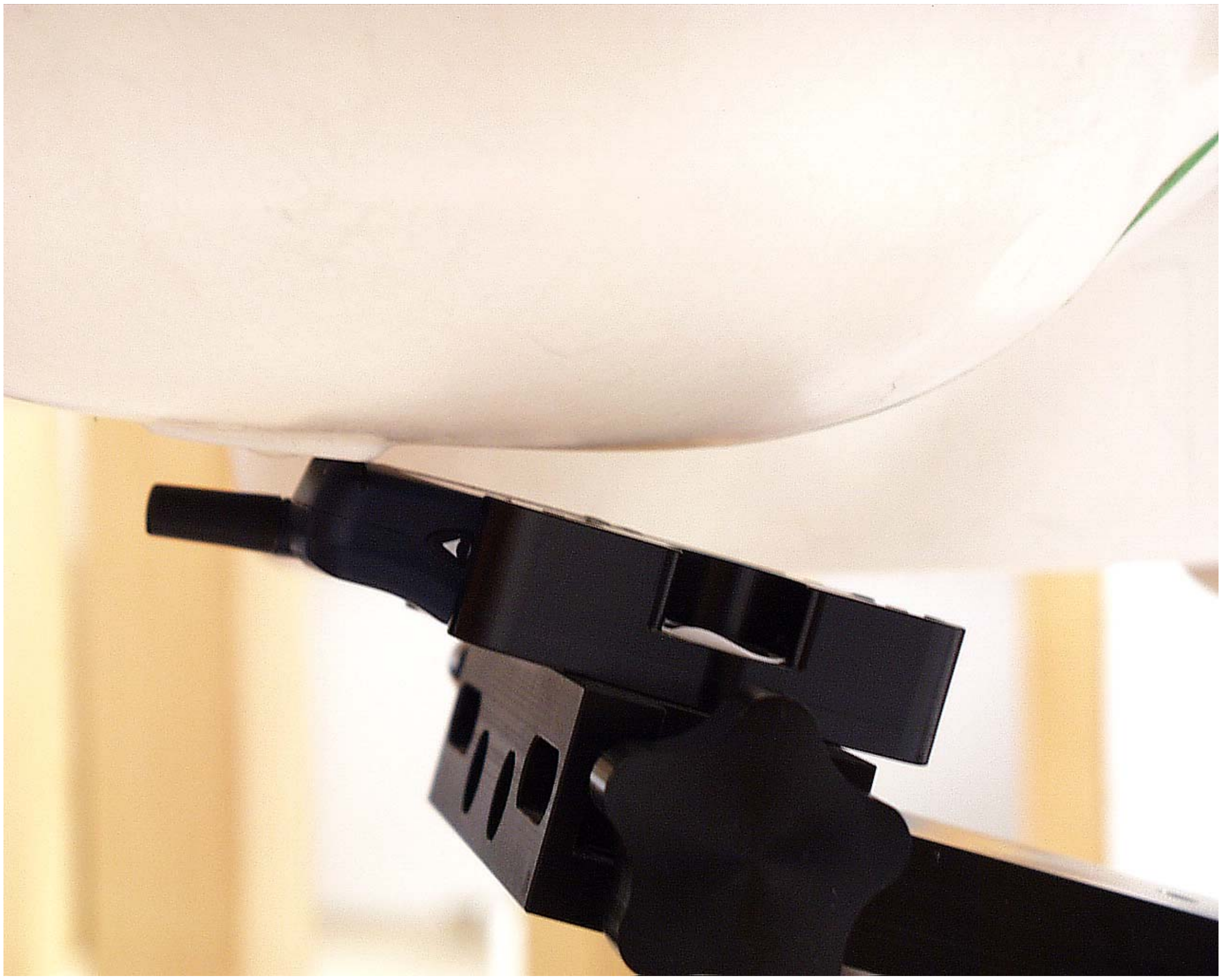


GSM - Duty cycle: 12.5%; Crest factor: 8 Depth of liquid: 15 cm

EUT Position	Antenna	Ch. #	f [MHz]	*Conducted Power [dBm]		SAR_1g [mW/g]	
				Before	After	Measured	Limit
Right Touch	Fixed	512	1850.20			**	1.6
Right Touch	Fixed	661	1880.00	29.20	29.20	0.554	1.6
Right Touch	Fixed	812	1909.80	29.40	29.35	0.654	1.6

Notes:
1. *: Peak power.
2. **: The SAR measured at the middle channel for this configuration is at least 3 dB lower than SAR limit, testing at low channel is optional.
3. Please see attachment for the detailed measurement data and plots showing the maximum SAR location of the EUT.

10.3.4. Right Head Tilt Position

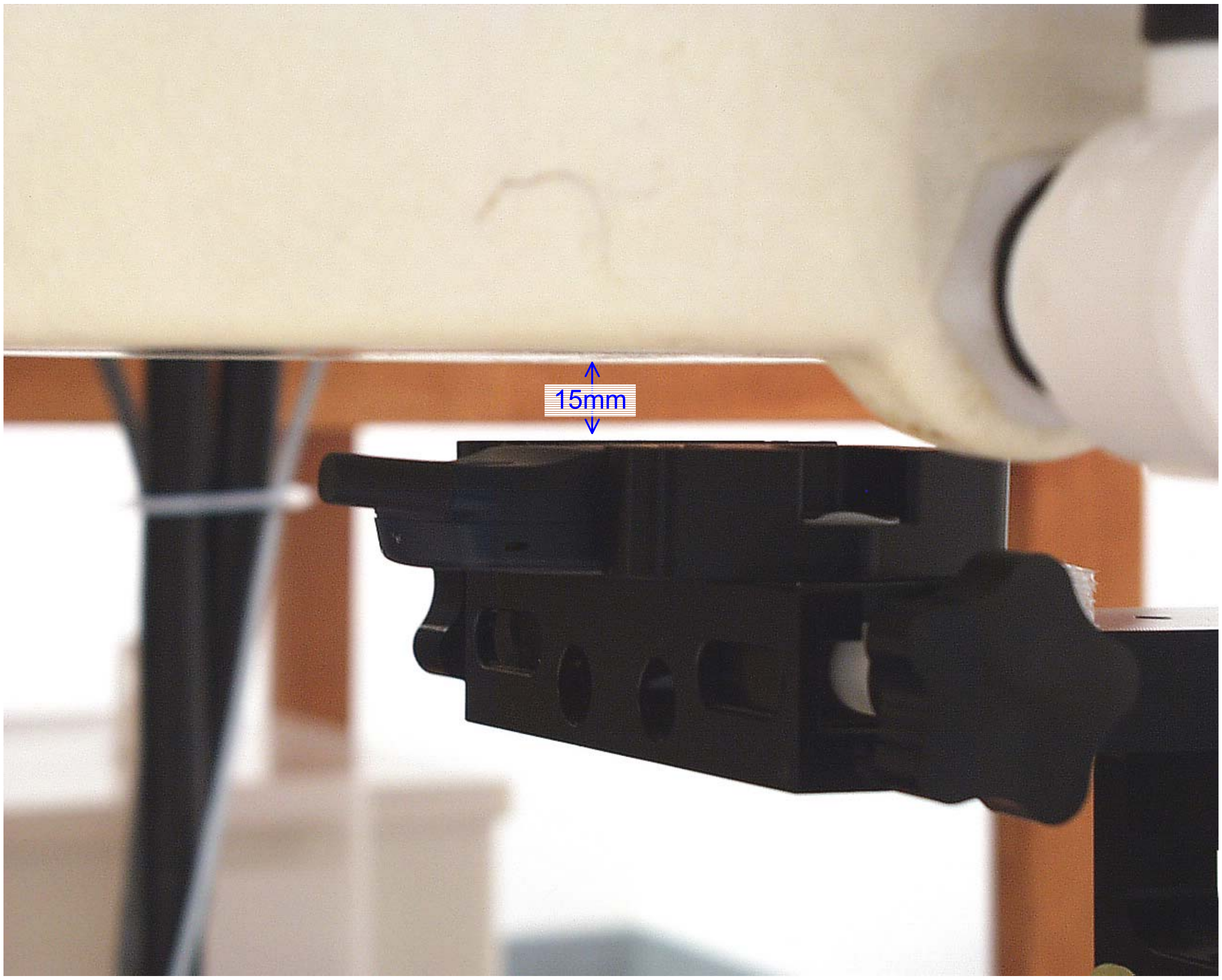


GSM - Duty cycle: 12.5%; Crest factor: 8 Depth of liquid: 15 cm

EUT Position	Antenna	Ch. #	f [MHz]	*Conducted Power [dBm]		SAR_1g [mW/g]	
				Before	After	Measured	Limit
Right Tilt	Fixed	512	1850.20	29.35	29.30	0.494	1.6
Right Tilt	Fixed	661	1880.00	29.20	29.20	0.460	1.6
Right Tilt	Fixed	812	1909.80	29.40	29.35	0.558	1.6

Notes:
1. *: Peak power.
2. Please see attachment for the detailed measurement data and plots showing the maximum SAR location of the EUT.

10.3.5. Body Position



GSM - Duty cycle: 12.5%; Crest factor: 8 Depth of liquid: 15 cm

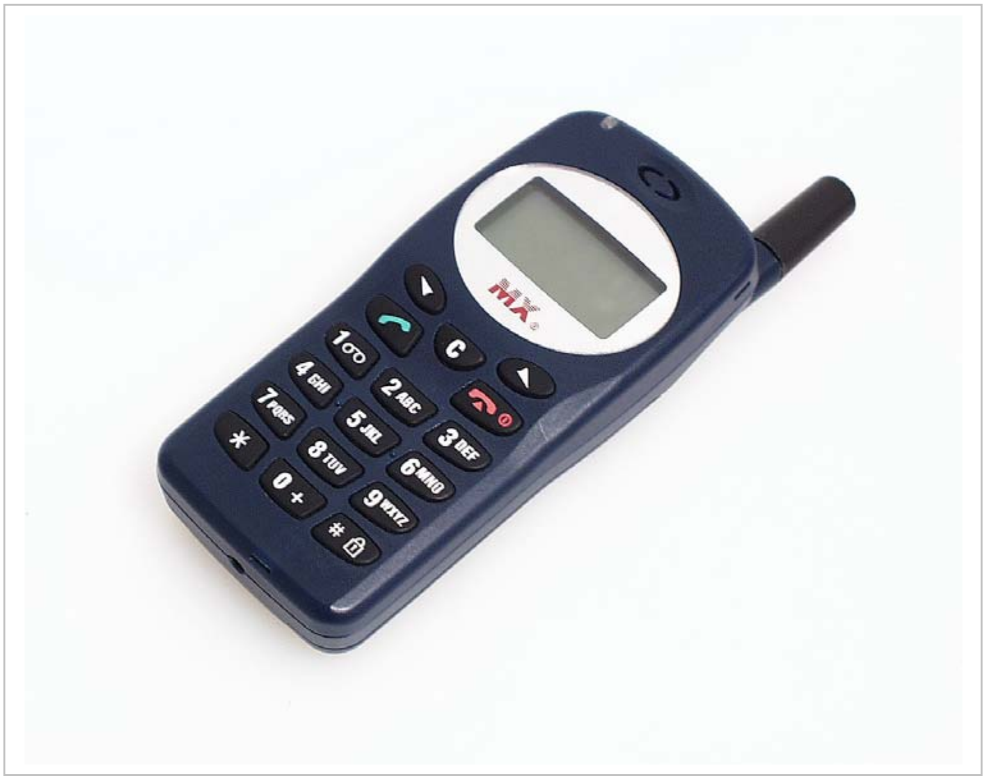
Sep. dist. [mm]	Antenna	Ch. #	f [MHz]	*Conducted Power [dBm]		SAR_1g [mW/g]	
				Before	After	Measured	Limit
15	Fixed	512	1850.20	29.35	29.30	0.158	1.6
15	Fixed	661	1880.00	29.20	29.20	0.142	1.6
15	Fixed	812	1909.80	29.40	29.35	0.167	1.6

Notes:

1. *: Peak power.
2. Please see attachment for the detailed measurement data and plots showing the maximum SAR location of the EUT.

11. EUT PHOTOS

EUT PHOTOS (1/3)



EUT PHOTOS (2/3)

EUT PHOTOS (3/3)

12. EQUIPMENT LIST & CALIBRATION STATUS

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
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	12/23/04
System Validation Dipole	SPEAG	D1900V2	5d043	2/16/04
Signal General	R&H	SMP 04	DE34210	5/5/05
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	12/1/04
Simulating Liquid	CCS	H1900	N/A	Within 24 hrs of first test
Simulating Liquid	CCS	M1900	N/A	Within 24 hrs of first test

13. ATTACHMENTS

No.	Contents	No. of page (s)
1	System Performance Check Plots	6
2	SAR Test Plots (AMPS Mode)	16
3	Certificate of Probe EX3DV3 SN 3521	8
5	System Validation Dipole D1900V2 SN 5d043	6

END OF REPORT