TEST REPORT

1. Applicant

Name	: Uriver Inc
Address	: 3rd., Fl., Bogwang Bldg, Gaepo-dong, 1238-7 Gangnam-gu, Seoul, Korea

2. Products

Name	: HSDPA USB MODEM
Model	: UM100
Manufacturer	: Uriver Inc

3. Test Standard	: FCC 47 CFR § 2.1093
4. Test Method	: OET Bulletin 65, Supplement C(July 2001)
5. Test Result	: Positive
6. Date of Application	: July 18th, 2008
7. Date of Issue	: August 5th, 2008

Tested by	Approved by
Jong-Gon Ban	Seok-Jin Kim
Telecommunication Team Engineer	Telecommunication Team Manager

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Korea Testing Laboratory

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1. EQUIPMENT UNDER TEST

1.1 General Information

1) Name : HSDPA USB MODEM

2) Device Category : Portable Device

3) Model Number : UM100

4) FCC ID : UDTUM100

5) Test Device : Production Unit

6) Applicant & Address : Uriver Inc
3rd., Fl., Bogwang Bldg., Gaepo-dong, 1238-7 Gangnam-gu, Seoul, Korea

7) Contact : TSJEONG, tsjeong@uriver.co.kr (Tel : +82-2-3497-8432, Fax : +82-2-579-6624)

8) Rule and Test Standard : FCC 47 CFR § 2.1093; OET Bulletin 65, Supplement C(July 2001)

9) FCC Clasification : PCS Licensed Transmitter worn on body (PCT)

10) RF exposure Category : General Population/Uncontrolled

11) Maximum SAR : 1.020 W/kg GPRS850 Body 1g SAR / 1.070 W/kg GPRS1900 Body 1g SAR
0.731 W/kg HSDPA Band II Body 1g SAR / 0.528 W/kg HSDPA Band V Body 1g SAR

1.2 Description of Device :

Operation Modes	GPRS/EDGE850/1900, WCDMA Band II / V
Max Conducted RF Power	GPRS850 : 32.37 dBm / GPRS1900 : 29.59 dBm EDGE850 : 27.05 dBm / EDGE1900: 26.27 dBm WCDMA & HSDPA Band II : 23.93 dBm WCDMA & HSDPA Band V : 23.52 dBm
Tx Frequency Range	824.2 ~ 848.8 MHz (GPRS/EDGE850) 1850.2 ~ 1909.8 MHz (GPRS/EDGE1900) 826.4 ~ 846.6 MHz (Cellular WCDMA-HSDPA) 1850.2~ 1909.8 MHz (PCS WCDMA-HSDPA)
GPRS/EDGE Multi-slot class	Class 12
Duty Cycle	1: 2.075 (GPRS/EDGE850/1900) 1:1 (Cellular/PCS WCDMA-HSDPA)
Antenna Type	Internal Antenna (PIFA)
Power Supply	No Battery / USB Port

2. INTRODUCTION

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency(RF) radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emission due to FCC-regulated portable devices.[1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. (c) 1992 by the Institute of Electical and Electronics Engineers, Inc., New York, New York 10017.[2] The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromgnetic Fields – RF and Microwave[3] is used for guidance in measureing SAR due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements(NCRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields "NCRP Report No. 86 (c) NCRP, 1986, Bethesda, MD 20814.[4] SAR is a measure of the rate of energy absorption due to exaposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

2.1 SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (*dU*) absorbed by (dissipated in) an incremental mass (*dm*) contained in a volume element (*dV*) of a given density(*p*). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body. (see Figure.1)

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{pdv}\right)$$

Figure 1. SAR Mathematical Equation

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \sigma E^2 / p$$

Where :

σ = conductivity of the tissue-simulant material (S/m)

p = mass density of the tissue-simulant material (kg/m^3)

E = Total RMS electric field strength (V/m)

Note: The primary factors that control rate or energy absorption were found to be the wavelength of the incident field in realtions to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflectinf surfaces, and whether conductive contact is made by the organism with a ground plane.[4]

3. DESCRIPTION OF SAR MEASREMENT SYSTEM

3.1 SAR Measurement System

These measurements are performed using the DASY4 automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, measurement server, Measurement computer, near-field probe, probe alignment sensor, and the SAM twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Fig.2).

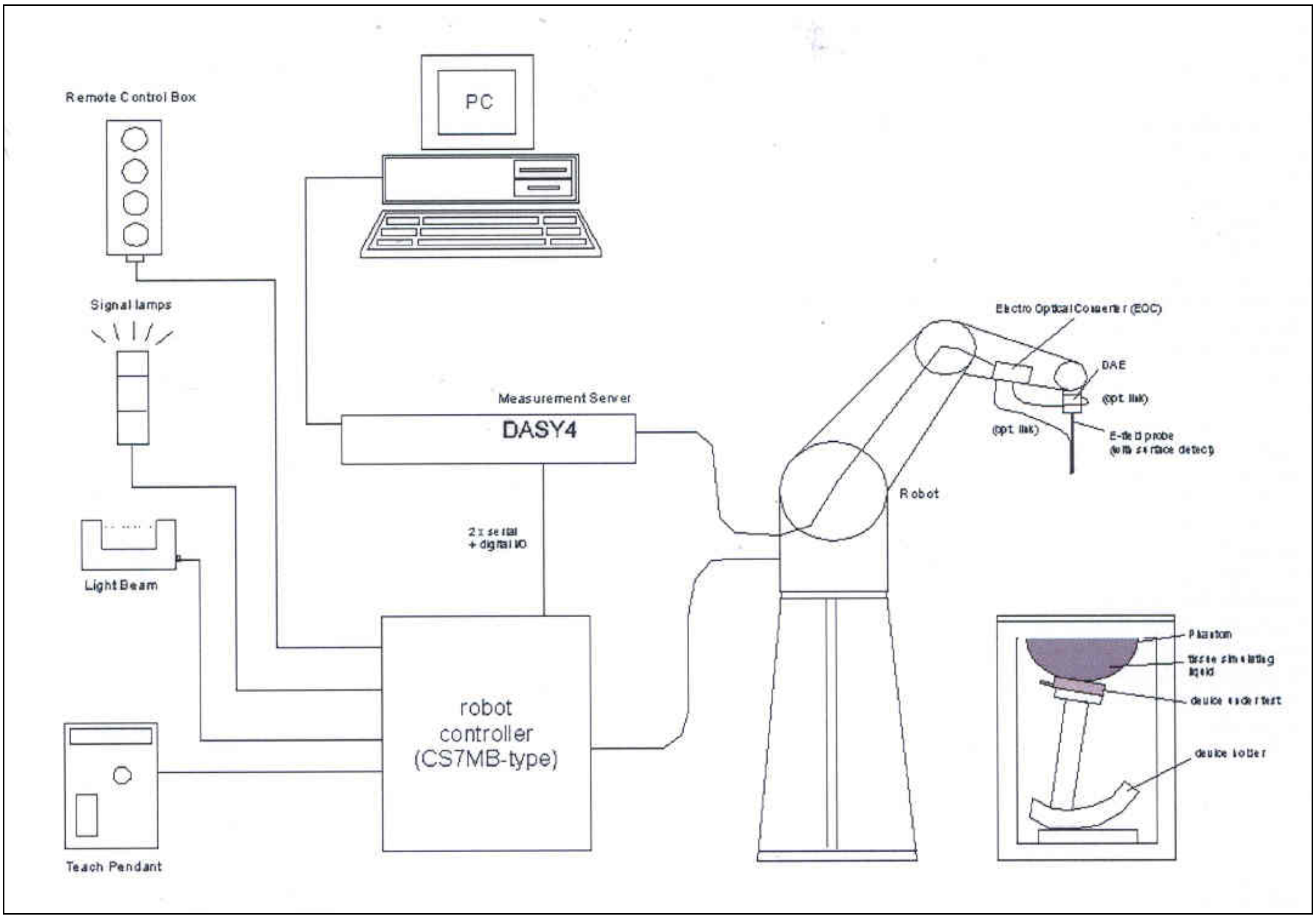

Figure 2. SAR Measurement System

The DAE4 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 PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in [5].

3.2 E-Field Probe Type and Performance

The SAR measurements were conducted with the dosimetric probe ET3DV6, (see Fifure.4) designed in the classical triangular configuration [5] and optimised for dosimetric evaluation. The probe has been is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical mortifier line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches a maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approace and looks for the maximum using a 2nd order fitting. The approach is stopped at reaching the maximum.

Figure 3. Probe and DAE

Probe Specifications

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System Built-in shielding against static charges
Calibration	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at Frequencies of 450 MHz, 900 MHz and 1.8 GHz (accuracy ± 8%)
Frequency	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in brain tissue (rotation around probe axis) ± 0.4 dB in brain tissue (rotation normal probe axis)
Dynamic Range Linearity Surface Detection	5 uW/g to > 100 mW/g; 0.2 dB 0.2 mm repeatability in air and clear liquids Over diffuse reflecting surfaces.
Dimensions	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	General dissymmetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

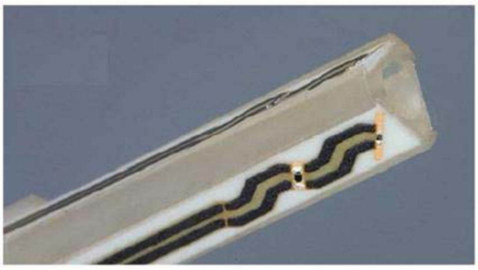

Figure 4. ET3DV6 E-Field Probe

3.3 Probe Calibration Process

Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure described [6] with an accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in [7] and found to be better than +/- 0.25dB. The sensitivity parameters (NornX, NornY, NornZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a waveguide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

where:

Δt = exposure time (30 seconds),

C = heat capacity of tissue (brain or muscle),

ΔT = temperature increase due to RF exposure.

SAR is proportional to $\Delta T/\Delta t$, the initial rate of tissue heating, before thermal diffusion takes place. Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

$$SAR = \frac{|E|^2 \cdot \sigma}{\rho}$$

where:

σ = simulated tissue conductivity,

ρ = Tissue density (1.25 g/cm³ for brain tissue)

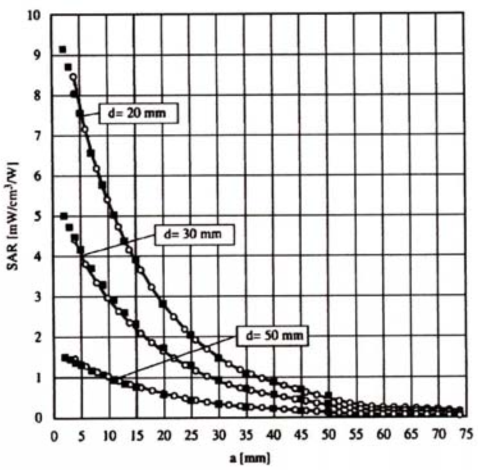

Figure B.1. E-Field and Temperature measurements at 900MHz[5]

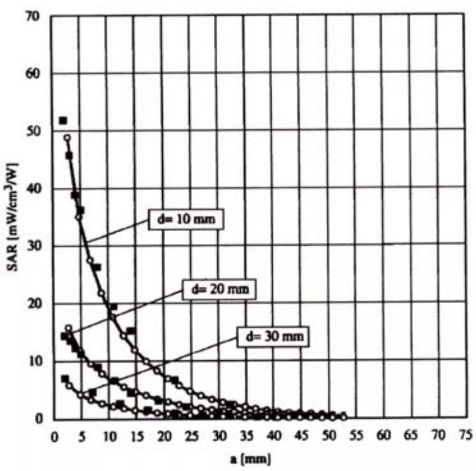

Figure B.2. E -field and temperature measurements at 1.8GHz[5]

3.4 Data Acquisition Electronics

The data acquisition electronics (DAE4) 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. The input impedance of the DAE4 box is 200 Mohm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.Transmission to the PC-card 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.

3.5 Phantom Properties

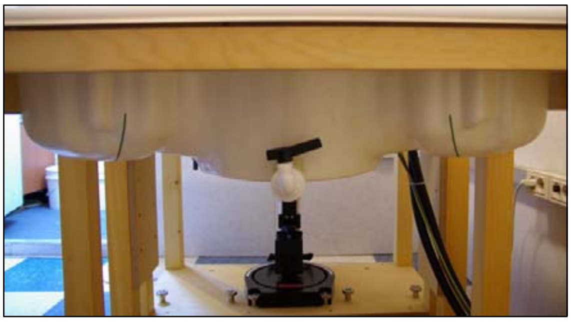

Figure 5. SAM twin phantom

The SAM Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users [9][10]. 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 the 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 in the robot.

Phantom Properties	Requirement for specific EUT	Measured
Depth of Phantom	> 150 mm	200 mm
Width of flat section	> 10 cm (Twice EUT Width)	20 cm
Length of flat section	> 26 cm (Twice EUT Length)	30 cm
Thickness of flat section	2 mm ± 0.2 mm	2.08 ~ 2.20 mm

Table 1. Flat Section Properties of SAM Twin Phantom

3.6 Device Holder for DASY4

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

Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations [10]. To produce the Worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Figure 4. Device Holder

3.7 Brain & Muscle Simulating Mixture Characteristic

The brain and muscle mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution (see Table 2). Preservation with bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The mixture characterizations used for the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Hartsgrove [11].

Ingredients	835MHz Brain	835MHz Muscle	1900MHz Brain	1900MHz Muscle
Water	40.29%	50.75%	55.24%	70.23%
Sugar	57.90%	48.21%	-	-
Salt	1.38%	0.94%	0.31%	0.29%
DGBE	-	-	44.45%	29.47%
Bacteriacide	0.18%	0.10%	-	-
HEC	0.24%	-	-	-

Table 2 : Composition of Tissue Equivalent Matter

4. System Verification

4.1 Tissue Verification

The dielectric parameters of the brain and muscle simulating liquid were measured prior to SAR assessment using the HP85070D dielectric probe kit and Agilent 8753D Network Analyzer. The actual dielectric parameters are shown in the following table.

Freq. [MHz]	Liquid	Date	Liquid Temp [°C]	parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
835	Head	1st August 2008	21.4	εr	41.5	40.6	- 2.2	± 5
				σ	0.90	0.88	- 2.3	± 5
	Body	1st August 2008	21.6	εr	55.2	54.1	- 2.0	± 5
				σ	0.97	0.97	0.0	± 5
1900	Head	2nd August 2008	21.3	εr	40.0	38.8	- 3.0	± 5
				σ	1.40	1.41	+ 0.7	± 5
	Body	2nd August 2008	21.4	εr	53.3	52.3	- 1.9	± 5
				σ	1.52	1.53	+ 0.7	± 5

Table 3 : Measured Simulating Liquid Dielectric Values

The humidity and dielectric/ambient temperatures are recorded during the assessment of the tissue material dielectric parameters. The difference between the ambient temperature of the liquid during the dielectric measurement and the temperature during tests was less than |2|°C.

4.2 System Validation

Figure 5. Validation setup

Prior to the SAR assessment, the system validation kit was used to verify that the DASY4 was operating within its specifications. The validation dipoles are highly symmetric and matched at the centre frequency for the specified liquid and distance to the phantom. The accurate distance between the liquid surface and the dipole centre is achieved with a distance holder that snaps onto the dipole.
System validation is performed by feeding a known power level into a reference dipole, set at a know distance from the phantom. The measured SAR is compared to the theoretically derived level.

The reference SAR values are derived using a reference dipole and flat phantom suitable. The forward power into the reference dipole for each SAR validation was adjusted to 250 mW.

These reference SAR values are obtained from the IEEE Std 1528 and are normalized to 1 W. The measured 1g(10g) SAR should be within 10 % of the expected target reference values shown in table 4 below.

System Validation Kit	Date	Tissue	Liquid Temp.(˚C)	Ambient Temp.(˚C)	Targeted SAR_{1g} (mW/g)	Measured SAR 1 g (mW/g)	Deviation (%)
D835V2 S/N:481	1st August 2008	835MHz Brain	21.4	21.0	9.5	10.0	+ 5.2
D1900V2 S/N:5d038	2nd August 2008	1900MHz Brain	21.3	21.0	39.7	41.6	+ 4.8

Table 4 : Deviation from Reference Validation Values

During the SAR measurement process the liquid depth was maintained to a level of a least 15 tolerance of ± 0.2cm.
The following photo shows the depth of the liquid depth of the liquid maintained during the testing.

Figure 6. Liquid Depth

5. SAR MEASUREMENT PROCEDURE USING DASY4

The SAR evaluation was performed with the SPEAG DASY4 system. 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 side of the phantom is measured at a distance of 3.9 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(or 20mm x 20mm). The actual Area Scan has dimensions surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation.

c) Around this point, a volume is assessed by measuring 5 x 5 x 7 (7 x 7 x 7) 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 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation is based on a least square algorithm[13]. 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)[13][14]. 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 (If the value changed by more than 5%, the evaluation is repeatd.)

6. MEASUREMENT UNCERTAINTY

The uncertainty analysis is based on the template listed in the IEEE Std 1528-2003 for both EUT SAR tests and Validation uncertainty. The measurement uncertainty of a specific device is evaluated independently and the total uncertainty for both evaluations (95 % confidence level) must be less than 25 %.

a	b	c	d	e= f(d,k)	f	g	h=cxf/e	i=cxg/e	k
Uncertainty Component	Sec.	Tol. (%)	Prob. Dist.	Div.	Ci (1 g)	Ci (10 g)	1 g Ui (± %)	10 g Ui (± %)	vi
Measurement System									
Probe Calibration (k=1)	E.2.1	5.9	N	1	1	1	5.9	5.9	∞
Axial Isotropy	E.2.2	4.7	R	√ 3	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	√ 3	0.7	0.7	3.9	3.9	∞
Boundary Effect	E.2.3	1.0	R	√ 3	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	√ 3	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	√ 3	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	R	√ 3	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	√ 3	1	1	1.5	1.5	∞
RF Ambient Noise	E.6.1	3.0	R	√ 3	1	1	1.7	1.7	∞
RF Ambient Refections	E.6.1	3.0	R	√ 3	1	1	1.7	1.7	∞
Probe Positioner	E.6.2	0.4	R	√ 3	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	E.6.3	2.9	R	√ 3	1	1	1.7	1.7	∞
Algorithms for Max. SAR Evaluation	E.5	1.0	R	√ 3	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	2.9	N	1	1	1	2.9	2.9	145
Device Holder Uncertainty	E.4.1	3.6	N	1	1	1	3.6	3.6	5
Output Power Variation — SAR Drift Measurement	6.6.2	5.0	R	√ 3	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1	4.0	R	√ 3	1	1	2.3	2.3	∞
Liquid Conductivity — Deviation from target values	E.3.2	5.0	R	√ 3	0.64	0.43	1.8	1.2	∞
Liquid Conductivity — Measurement uncertainty	E.3.3	2.5	N	1	0.64	0.43	1.6	1.1	∞
Liquid Permititivity — Deviation from target values	E.3.2	5.0	R	√ 3	0.6	0.49	1.7	1.4	∞
Liquid Pemiittivity — Measurement uncertainty	E.3.3	2.5	N	1	0.6	0.49	1.5	1.2	∞
Cornbined standard Uncertainty			RSS				± 10.9	± 10.7	387
Expanded Uncertainty (95% CONFIDENCE LEVEL)			K=2				± 21.9	± 21.4	

Table 5. EUT SAR Test - Uncertainty Budget for DASY4 Version V4.6 Build 19

Estimated total measurement uncertainty for the DASY4 measurement system was ± 10.9 %.
The extended uncertainty (K=2) was assessed to be ± 21.9 % based on 95 % confidence level.
The uncertainity is not added to the measurement result.

7. OPERATIONAL CONDITIONS DURING TEST

7.1 Schematic Test Configuration

SAR measurement are performed according to the KDB 447498 Mobile and Portable Device RF Exposure Equipment Authorization Procedures is referred for the SAR Measurement.

During SAR test of the EUT, it is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a Base Station Simulator (CMU200) by air link for GPRS/EDGE850, GPRS/EDGE1900 and WCDMA Band II / V.

The EUT only has data transmitting function, but not has speech transmitting function. During the test, a HP laptop is used as an assistant to help to setup communication, whose type is HP Compaq nc2400.

The SAR measurements are performed in standard position (USB Dongle is directly connected to the laptop) and also USB cable connected.

7.2 Conducted power comparison between direct connection and USB cable connection.

The power of center frequencies are compared between direct connection to host and USB cable connection.

	GPRS850 190 CH	GPRS1900 661 CH	EDGE850 190 CH	EDGE1900 661 CH	WCDMA Band V 4175 CH	HSDPA Band V 4175 CH	WCDMA Band II 9400 CH	HSDPA Band II 9400 CH
Direct connection to Host	32.32 dBm	29.59 dBm	27.00 dBm	26.25 dBm	23.24 dBm	23.01 dBm	23.57 dBm	23.28 dBm
USB cable connection	**32.32 dBm**	**29.59 dBm**	**27.01 dBm**	**26.26 dBm**	**23.26 dBm**	**23.03 dBm**	**23.61 dBm**	**23.31 dBm**

7.3 Used USB Cable

Manufacturer doesn't provide any USB cable so we used One short USB cable for SAR measurements.
The length of it is 84 cm.

USB cable

7.3 EUT Test Configuration

1) The EUT is directly connected to the laptop computer (HP Compaq nc2400) and the back side (Horizontal down) towards the phantom The separation distance between the EUT and the flat phantom is 7 mm.

2) The EUT is directly connected to the laptop computer (HP Compaq nc2400) and the Top side towards the phantom The separation distance between the EUT and the plat phantom is 5 mm

3) Horizontal up : The EUT is connected to the laptop computer (HP Compaq nc2400) using the USB cable. The separation distance between the front side of the EUT and the flat phantom is 5 mm.

4) Horizontal down : The EUT is connected to the laptop computer (HP Compaq nc2400) using the USB cable. The separation distance between the rear side of the EUT and the flat phantom is 5 mm.

5) Vertical up: The EUT is connected to the laptop computer (HP Compaq nc2400) using the USB cable. The separation distance between the left side of the EUT and the flat phantom is 5 mm.

6) Vertical down: The EUT is connected to the laptop computer (HP Compaq nc2400) using the USB cable. The separation distance between the right side of the EUT and the flat phantom is 5 mm.

7) Top : The EUT is connected to the laptop computer (HP Compaq nc2400) using the USB cable. The separation distance between the top side of the EUT and the flat phantom is 5 mm.

8) At the highest SAR position the EUT is moved away from the phantom in 5 mm increments from the initial touching or minimum separation position. A single point SAR is measured for each of these EUT positions until the SAR is less than 50 % of that measured at the initial position. When the SAR is 25 % higher than the initial position, a complete 1-g SAR evaluation is required for this configuration.

Direct connection to Laptop

USB cable connection

8. FCC RF Exposure Limits

HUMAN EXPOSURE	UNCONTROLLED ENVIRONMENT General Population (W/Kg) or (mW/g)	CONTROLLED ENVIRONMENT Occupational (W/Kg) or (mW/g)
SPATIAL PEAK SAR (Brain)	1.60	8.00
SPATIAL AVERAGE SAR (Whole Body)	0.08	0.40
SPATIAL PEAK SAR (Hand / Feet / Ankle / Wrist)	4.00	20.00

Table. 8 Safety Limits for Partial Body Exposure

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

NOTE 2 : At frequencies above 6.0 GHz, SAR limits ajre not applicable and MPE limits for power density should be appoied at 5 cm or more from the transmitting device.

NOTE 3 : The time averaging criteria for field strength and power density do not apply to general population SAR limit of 47 CFR § 2.1093.

9. SAR MEASUREMENT RESULTS

1) GPRS850 Body SAR Measurement Result

Date of Test : 1st August. 2008
Mixture Type : 835MHz Muscle
Ambient Temperature (C) : 21.0
Dielectric Constant : 54.1
Liquid Temperature (C) : 21.6
Humidity (%) : 45
Conductivuty : 0.97

Frequency		Band	Ant position	Distance Between EUT& Phantom	Horizontal/ Vertical/ facing phantom	EUT up/down	Power Drift (dB)	SAR 1g (W/Kg)
MHz	CH							
824.2	128	GPRS850	Internal Ant.	0.5 cm	Horizontal	Up	-0.113	0.696
836.6	190			0.5 cm			-0.095	**1.020**
848.8	251			0.5 cm			0.004	0.814
836.6	190	GPRS850	Internal Ant.	0.5 cm	Horizontal	Down	0.151	0.928
824.2	128	GPRS850	Internal Ant.	0.5 cm	Vertical	Up		
836.6	190			0.5 cm			-0.140	0.678
848.8	251			0.5 cm				
836.6	190	GPRS850	Internal Ant.	0.5 cm	Vertical	Down	0.003	0.527
836.6	190	GPRS850	Internal Ant.	0.5 cm	Top	-	0.058	0.064
836.6	190	GPRS850	Internal Ant.	1 cm	Horizontal	Up	0.017	0.453
836.6	190	EDGE850	Internal Ant.	0.5 cm	Horizontal	Up	0.120	0.762
836.6	190	GPRS850	Internal Ant.	0.7 cm	Horizontal down towards phantom-**direct connection**		0.021	0.471
836.6	190	GPRS850	Internal Ant.	0.5 cm	Top side towards phantom **direct connection**		0.157	0.010

NOTES:
1.The test data reported are the worst-case SAR value with the position set in a typical configuration
2.All modes of operation were investigated and the worst-case are reported.
3.Power supply : USB port of Laptop (HP Compaq nc2400)
4.Power Measured : Power reference levels are recorded at the begin and end of each measurement.
5.SAR Configuration : Body (worst case found in Horizontal up side facing phantom for GPRS850)
6.Test Signal Call mode : Base Station Simulator CMU200
7.Justification for reduced test configurations: per FCC/OET Supplement C (July,2001), if the SAR measured at the middle channel for each test configuration (Horizontal up/down, Vertical up/down, Top to phantom) 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). EDGE mode result is measured at the worst SAR configuration because it's power max level is 4dBm lower than GPRS mode.

2) GPRS1900 Body SAR Measurement Result

Date of Test : 2nd August. 2008
Mixture Type : 1900MHz Muscle
Liquid Temperature (C) : 21.4
Ambient Temperature (C) : 21.0
Humidity (%) : 46
Dielectric Constant : 52.3
Conductivuty : 1.53

Frequency MHz	Frequency CH	Band	Ant. position	Distance between EUT& Phantom	Horizontal/ Vertical/ facing phantom	EUT up/down	Power Drift (dB)	SAR 1g (W/Kg)
1850.2	512	GPRS1900	Internal Ant.	0.5 cm	Horizontal	Down	-0.136	**1.070**
1880.0	661			0.5 cm			-0.021	1.040
1909.8	810			0.5 cm			-0.055	0.858
1880.0	661	GPRS1900	Internal Ant.	0.5 cm	Horizontal	Up	-0.163	0.974
1850.2	512	GPRS1900	Internal Ant.	0.5 cm	Vertical	Down	-	-
1880.0	661			0.5 cm			-0.108	0.718
1909.8	810			0.5 cm			-	-
1880.0	661	GPRS1900	Internal Ant.	0.5 cm	Vertical	Up	-0.122	0.459
1880.0	661	GPRS1900	Internal Ant.	0.5 cm	Top	-	-0.137	0.195
1880.0	661	GPRS1900	Internal Ant.	1 cm	Horizontal	Down	-0.034	0.387
1880.0	661	EDGE1900	Internal Ant.	0.5 cm	Horizontal	Down	-0.151	0.540
1880.0	661	GPRS1900	Internal Ant.	0.7 cm	Horizontal down towards phantom-**directconnection**		-0.101	0.840
1880.0	661	GPRS1900	Internal Ant.	0.5 cm	Top side towards phantom **direct connection**		0.041	0.130

NOTES:
1.The test data reported are the worst-case SAR value with the position set in a typical configuration
2.All modes of operation were investigated and the worst-case are reported.
3.Power supply : by USB port of Laptop (HP Compaq nc2400)
4.Power Measured : Power reference levels are recorded at the begin and end of each measurement.
5.SAR Configuration : Body (worst case found in Horizontal down side facing phantom for GPRS1900)
6.Test Signal Call mode : Base Station Simulator CMU200
7.Justification for reduced test configurations: per FCC/OET Supplement C (July,2001), if the SAR measured at the middle channel for each test configuration ((Horizontal up/down, Vertical up/down, Top to phantom)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).
EDGE mode result is measured at the worst SAR configuration because it's power max level is 4dBm lower than GPRS mode.

3) WCDMA BAND II Body SAR Measurement Result

Date of Test : 2nd August. 2008
Mixture Type : 1900MHz Muscle
Liquid Temperature (C) : 21.4
Ambient Temperature (C) : 21.0
Humidity (%) : 46
Dielectric Constant : 52.3
Conductivuty : 1.53

Frequency		Band	Ant. position	Distance between EUT& Phantom	Horizontal/Vertical/ facing phantom	EUT up/down	Power Drift (dB)	SAR 1g (W/Kg)
MHz	CH							
1850.2	9262	WCDMA BAND II	Internal Ant.	0.5 cm	Horizontal	Down	-	-
1880.0	9400			0.5 cm			-0.052	0.689
1909.8	9538			0.5 cm			-	-
1880.0	9400	WCDMA BAND II	Internal Ant.	0.5 cm	Horizontal	Up	-0.026	0.619
1850.2	9262	WCDMA BAND II	Internal Ant.	0.5 cm	Vertical	Down	-	-
1880.0	9400			0.5 cm			0.029	**0.731**
1909.8	9538			0.5 cm			-	-
1880.0	9400	WCDMA BAND II	Internal Ant.	0.5 cm	Vertical	Up	-0.004	0.352
1880.0	9400	WCDMA BAND II	Internal Ant.	0.5 cm	Top	-		0.136
1880.0	9400	WCDMA BAND II	Internal Ant.	1 cm	Vertical	Down	0.013	0.276
1880.0	9400	WCDMA BAND II	Internal Ant.	0.7 cm	Horizontal down towards phantom-**directconnection**		-0.070	0.604
1880.0	9400	WCDMA BAND II	Internal Ant.	0.5 cm	Top side towards phantom **direct connection**			

NOTES:
1.The test data reported are the worst-case SAR value with the position set in a typical configuration
2.All modes of operation were investigated and the worst-case are reported.
3.Power supply : by USB port of Laptop (HP Compaq nc2400)
4.Power Measured : Power reference levels are recorded at the begin and end of each measurement.
The base station simulator parameters were set to produce the maximum power from the EUT.
12.2 kbps RMC & TPC set to “All 1”
5.SAR Configuration : Body (worst case found in Vertical down side facing phantom for WCDMA Band II)
6.Test Signal Call mode : Base Station Simulator CMU200
7.Justification for reduced test configurations: per FCC/OET Supplement C (July,2001), if the SAR measured at the middle channel for each test configuration (Horizontal up/down, Vertical up/down, Top to phantom)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).

4) WCDMA BAND V Body SAR Measurement Result

Date of Test : 1st August. 2008
Mixture Type : 835MHz Muscle
Ambient Temperature (C) : 21.0
Dielectric Constant : 54.1

Liquid Temperature (C) : 21.6
Humidity (%) : 45
Conductivuty : 0.97

Frequency		Band	Antenna position	Distance Between EUT& Phantom	Horizontal/Vertical/ facing phantom	EUT up/down	Power Drift (dB)	SAR 1g (W/Kg)
MHz	CH							
824.2	4132	WCDMA BAND V	Internal Ant.	0.5 cm	Horizontal	Up	-	-
835.0	4175			0.5 cm			0.064	**0.528**
848.8	4233			0.5 cm			-	-
835.0	4175	WCDMA BAND V	Internal Ant.	0.5 cm	Horizontal	Down	0.034	0.500
824.2	4132	WCDMA BAND V	Internal Ant.	0.5 cm	Vertical	Up	-	-
835.0	4175			0.5 cm			0.125	0.316
848.8	4233			0.5 cm			-	-
835.0	4175	WCDMA BAND V	Internal Ant.	0.5 cm	Vertical	Down	0.019	0.326
835.0	4175	WCDMA BAND V	Internal Ant.	0.5 cm	Top	-	-0.112	0.029
835.0	4175	WCDMA BAND V	Internal Ant.	1 cm	Horizontal	Up	-0.019	0.332
835.0	4175	WCDMA BAND V	Internal Ant.	1.5 cm	Horizontal	Up	-0.011	0.143
835.0	4175	WCDMA BAND V	Internal Ant.	0.7 cm	Horizontal down towards phantom-**directconnection**		-0.128	0.325
835.0	4175	WCDMA BAND V	Internal Ant.	0.5 cm	Top side towards phantom **direct connection**		0.086	0.009

NOTES:
1.The test data reported are the worst-case SAR value with the position set in a typical configuration
2.All modes of operation were investigated and the worst-case are reported.
3.Power supply : by USB port of Laptop (HP Compaq nc2400)
4.Power Measured : Power reference levels are recorded at the begin and end of each measurement.
The base station simulator parameters were set to produce the maximum power from the EUT.
12.2 kbps RMC & TPC set to "All 1"
5.SAR Configuration : Body (worst case found in Horizontal up side facing phantom for WCDMA Band V)
6.Test Signal Call mode : Base Station Simulator CMU200
7.Justification for reduced test configurations: per FCC/OET Supplement C (July,2001), if the SAR measured at the middle channel for each test configuration (Horizontal up/down, Vertical up/down, Top to phantom) 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).

10. CONCLUSION

The SAR evaluation indicates that UM100 complies with the RF radiation exposure limits of the FCC.
These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions.
Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

11. EQUIPMENT LIST AND CALIBRATION DETAILS

Equipment Type	Manufacturer	Model Number	Serial Number	Calibration Due	Used For this Test?
Robot - Six Axes	Staubli	RX60	N/A	N/A	Yes
Robot Remote Control	SPEAG	CS7MB	F03/5U96A1 /C/01	N/A	Yes
SAM Twin Phantom	SPEAG	TP1276	QD000P40CA	N/A	Yes
Flat Phantom V4.4	SPEAG	QD000P44BA, BB	1001, higher	N/A	No
Data Acquisition Electronics	SPEAG	DAE4	559	2008.04.17	Yes
Probe E-Field	SPEAG	ES3DV3	3161	2009.04.07	Yes
Antenna Dipole 835 MHz	SPEAG	D835V2	481	2009.05.24	No
Antenna Dipole 900 MHz	SPEAG	D900V2	194	2009.11.19	No
Antenna Dipole 1800 MHz	SPEAG	D1800V2	2d066	2009.05.23	No
Antenna Dipole 1900 MHz	SPEAG	D1900V2	5d038	2009.11.20	Yes
Antenna Dipole 1950 MHz	SPEAG	D1950V2	1027	2009.03.14	No
Antenna Dipole 2450 MHz	SPEAG	D2450V2	746	2009.02.20	No
High power RF Amplifier	EMPOWER	2057-BBS3Q5KCK	1002D/C0321	2008.10.12	Yes
Universal Radio Communication Tester	R&S	CMU200	110019	2008.08.29	Yes
Signal Generator	Agilent	E8257D	MY44320379	2009.01.02	Yes
RF Power Meter Dual	Hewlett Packard	E4419A	GB37170495	2009.04.24	Yes
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481A	US37299851	2009.01.12	Yes
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481A	3318A92872	2009.01.12	Yes
S-Parameter Network Analyzer	Agilent	8753D	3410A07251	2009.04.06	Yes
Dual Directional Coupler	Hewlett Packard	778D	1144AO4576	2008.10.12	Yes
Directional Coupler	Agilent	773D	MY28390213	2008.10.12	No
Bluetooth Test Set	Anritsu	MT8852B	6K00006994	2009.03.03	No

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